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A Study on Image Compression with Neural Networks Using Modified Levenberg - Maruardt Method

By Prema Karthikeyan, Narayanan Sreekumar
Department of Computer Science

Abstract- In this paper, an adaptive method for image compression that is subjective on neural networks based on complexity level of the image. The multilayer perceptron artificial neural network uses the different Back-Propagation artificial neural networks in processing of the image. The original images taken, for instance 256*256 pixels of bitmap image, each block of image into one network selection, according to each block the value of pixels in image complexity value is calculated. To estimate each value of the images in a block can be evaluated and trained. Best PSNR in selecting images to be compressed with a modification Levenberg-Marquart for MLP neural network is taken. The algorithm taken a good research of result to each block of image. The taken time reduces the learning procedure for running each block of images. Finally, a neural network taken for the Back Propagation artificial neural network.

Keywords: *Image complexity, PSNR, Levenberg-Marquardt, Multi-layer neural network.*

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A Study on Image Compression with Neural Networks Using Modified Levenberg-Marquardt Method

Prema Karthikeyan[1], Narayanan Sreekumar[2]

Abstract- In this paper, an adaptive method for image compression that is subjective on neural networks based on complexity level of the image. The multilayer perceptron artificial neural network uses the different Back-Propagation artificial neural networks in processing of the image. The original images taken, for instance 256*256 pixels of bitmap image, each block of image into one network selection, according to each block the value of pixels in image complexity value is calculated. To estimate each value of the images in a block can be evaluated and trained. Best PSNR in selecting images to be compressed with a modification Levenberg-Marquart for MLP neural network is taken. The algorithm taken a good research of result to each block of image. The taken time reduces the learning procedure for running each block of images. Finally, a neural network taken for the Back Propagation artificial neural network.

Keywords- Image complexity, PSNR, Levenberg-Marquardt, Multi-layer neural network.

I. Introduction

The compression of an image is very useful in many important areas such as data storage, communication, computation purpose and neural network purpose. The neural networks are being well developed in software computing process. Noise suppression, transform extraction, Parallelism and optimized approximations are some main reasons that useful to artificial neural network for image compression method. The activities of image compression on neural networks implemented in Multi-Layer Perceptron (MLP) [2-13], learning vector quantization (LVQ), [14], Self-Organizing Map(SOM),Learning Vector quantization (LVQ) [15,16]. From these network methods, the Back propagation neural network is used for MLP process. In artificial neural network (ANN) uses, Back-Propagation algorithm processed in image compression method [3].The experts used a three-layer BPNN method for compression. The image is used for compression, it is divided into blocks and taken to input neurons, the neurons of input are compressed are taken at output of the hidden layer and the de-compressed images are stored in the output of the hidden layer. This process was implemented in the NCUBE parallel computer and the simulation results produced from network taken a poor image quality in 4:1 compression ratio [3]. By using single network for compression of an image, the result produced from a single network one simple BPNN are poor one. The researches try to increase the performance of an image in neural-network based compression technique. The compress/decompress (CODEC) image blocks are used on various methods for different image blocks regarding to the complexity of blocks. The results produced from image compression are good with neural networks. The cluster of an image blocks into some basic classes based on a complexity measure called activity. The researchers used four BPNNs with different compression rates for each class with neural network. It produces more benefit improvement over basic BPNN. The adaptive approach with proposed the use of complexity measure with block orientation by six BPNNs has given better visual quality [11]. The BPNNs were used for compressing image blocks, after that each pixel in a block was subtracted from the mean value of the block. This method gives some Best-SNR method is used to select the network that gives the best SNR for the block of an image. The overlapping of image blocks in a particular area is used in order to reduce the chess-board effect in de-compressed image. The Best-SNR methods in PSNR produce the visual quality of reconstructed image compared to standard images in JPEG coding.

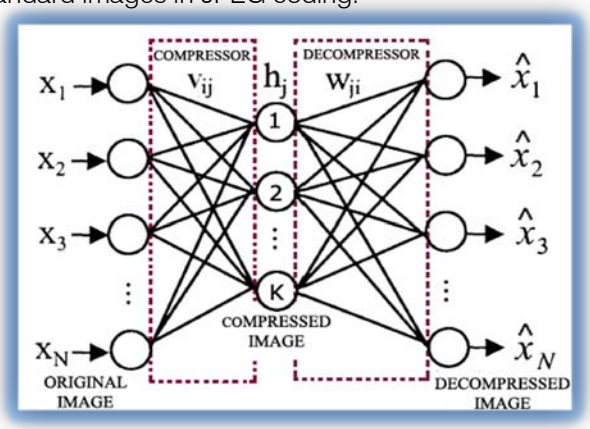

Fig.1-Basic image compression structure using neural network

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This paper is taken as follows. In section II we discuss multi-layer neural network for image compression. Section III describes the Modified-Levenberg method used in this paper. In section IV, the experimental results of our implementations are taken and discussed and finally in section V we conclude this research and give a summary on it.

II. Image Compression Used With Multi-Layer Neural Networks

The image compression used with Back-propagation algorithm in multi-layer neural network. The multi-layer neural network is given in Fig.1. It taken the network with three layers, input, hidden and output layer. Both the input and output layers have the same number of neurons, N. The input and output are connected to each network; the compression can be done with the value of the neurons at the hidden layer. In compression methods, the input image is divided into blocks, for example with 8×8 , 4× 4 or 16 ×16 pixels the block sizes of neurons in the input/output layers which convert to a column vector and fed to the input layer of network; one neuron per pixel. With this basic MLP neural network, compression is conducted in training and application phases as follow.

1) *Training*

In image compression, the image samples are used to train each network with the back propagation learning rule. In network, the output layer of network will be equal to the input pattern with each layer in a narrow channel. The normalized gray level range, training samples of blocks are converted into vectors. In compression and de-compression can be given in the following equations.

$$H_j^{in} = \sum_{i=1}^{N} V_{ij} X_i \,, h_f\left(H_j^{in}\right); 1 \le j \le K \qquad (1)$$

$$\hat{X}_j^{in} = \sum_{j=1}^{K} W_{ij} h_j \,, g\left(\hat{X}_j^{in}\right); 1 \le i \le N \qquad (2)$$

In the above equations, f and g are the activation functions which can be linear or nonlinear. ij V and ji W represent the weights of compressor and decompress or, respectively. The extracted N × K transform matrix in compressor and K × N inde-compressor of linear neural network are in PCA transform. It minimizes the mean square error between original and reconstructed image. The new spaces are decorrelated led to better compression. For data-dependent transform by using linear and nonlinear activation functions in this network results linear and non-linear PCA respectively. In training process of the neural network structure in Fig. 1 is iterative and stopped when the weights convert to their true values. In real applications the training is stopped when the error of equation (3) reaches to a threshold or maximum number of iterations limits the iterative process.

$$Err = \frac{1}{2\sum_{k=1}^{N}\left([X]_k - \hat{X}_k\right)^2} \qquad (3)$$

2) *Application*

When training process is completed and the coupling weights are corrected and the test image is fed into the network and compressed image is obtained in the outputs of hidden layer. The outputs must be applied to the correct number of bits. The same number of total bits is used to represent input and hidden neurons, and then the Compression Ratio (CR) will be the ratio of number of input to hidden neurons. For example, to compress an image block of 8×8, 64 input and output neurons are required. In this case, if the number of hidden neurons is 16 (i.e. block image of size 4× 4), the compression ratio would be 64:16=4:1. But for the same network, if 32 bits floating point is used for coding the compressed image, then the compression ratio will be 1:1, which indicates no compression has occurred. In general, the compression ratio of the basic network is illustrated in Fig (1) for an image with n blocks is computed as Eq. (4).

$$F(w) = e^T e \qquad (4)$$

Where w = [w1, w2… wN] consists of all weights of the network, e is the error vector comprising the error for all the training examples.

When training with the LM method, the increment of weights Δw can be obtained as follows:

$$\Delta w = \left[J^T J + \mu I\right]^{-1} J^T e \qquad (5)$$

Where J is the Jacobian matrix, μ is the learning rate which is to be updated using the β depending on the outcome. In particular, μ is multiplied by decay rate β (0<β<1) whenever F(w) decreases, whereas μ is divided by β whenever F(w) increases in a new step.

In de-compressor, the compressed image is converted to a version similar to original image by applying the hidden to output layer de-compression weights on outputs of hidden layer. The outputs of output neurons must be scaled back to the original grayscale range, i.e.[0~255] for 8 bit pixels.

3) *Adaptive Approach*

The neural network for image compression provides an value for PCA transform. The structure tries to implement the input samples of pixels in the network

data compression. This is not used in many real applications. This is the main reason that PCA is replaced with its nearest approximate, the data-independent Discrete Cosine Transform (DCT) transform in real applications. One method for improving the performance of this simple structure is the adaptive approach which uses different networks to compress blocks of the image [2,5-11]. The networks have identical structure, but they have different number of neurons in hidden layers, which will result in different compression ratios.

Considering the network of Fig. 1 as the basic structure, we can present the adaptive method as in Fig. 2. In each block is estimated by means of a value to a complexity measure like average of the gray-levels in image block or some other methods. Then for complexity value, one of the available networks is selected and used by Back-propagation algorithm. The code should be transmitted or be saved along the compressed image. In de-compressor or transmitted code along with the compressed image is extracted from the corresponding network. In adaptive approach, the M different networks with k1 - kM neurons in hidden layer. The image with n blocks each having N pixels, the compression ratio is as equation (5) that is obtained by modifying equation (4).

III. Existing Levenberg-Marquardt Thods

The standard LM training process can be illustrated in the following pseudo-codes,

1. Initialize the weights and parameter μ0 (μ=.01 is appropriate).
2. Compute the sum of the squared errors over all inputs F(w) .
3. Solve (2) to obtain the increment of weights Δw
4. Recomputed the sum of squared errors F(w) Using w + Δw as the trial w, and judge

IF trial F(w) < F(w) in step 2 THEN
w = w + Δw
μ = μ · β (β = .1)
Go back to step 2

ELSE $\mu = \frac{\mu}{\beta}$

Go back to step 4
END IF

4) *Modification Of The LM Method*

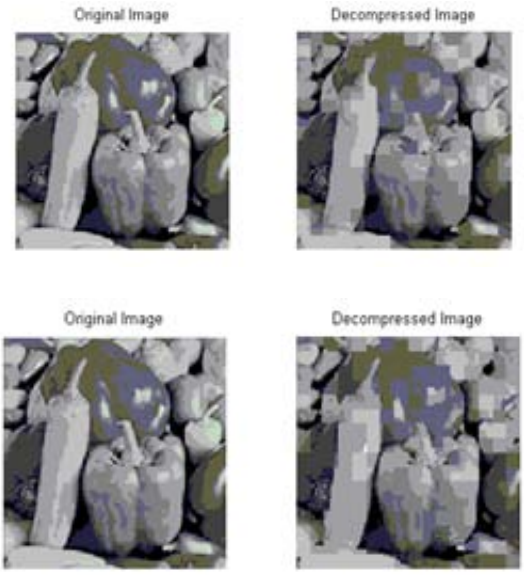
To consider performance of index is F(w) = eT e using the Newton method.
STEP 1: J (w) is called the Jacobian matrix.
STEP 2: Next to find the Hessian matrix in k, j elements of the Hessian matrix.
STEP 3: The eigenvectors of G are the same as the eigenvectors of H, and the eigen values of G are (λi+μ).
STEP 4: The matrix G is positive definite by increasing μ until (λi+μ)>0 for all i therefore the matrix will be invertible it leads to Levenberg-Marquardt algorithm.
STEP 5: For learning parameter, μ is illustrator of steps of actual output movement to desired output. In the standard LM method, μ is a constant number.
This paper modifies LM method using μ as:

$$\mu = 0.01 e^T e$$

Where e is a k ×1 matrix therefore eTe is a 1 × 1 therefore
[JTJ+μI] is invertible.

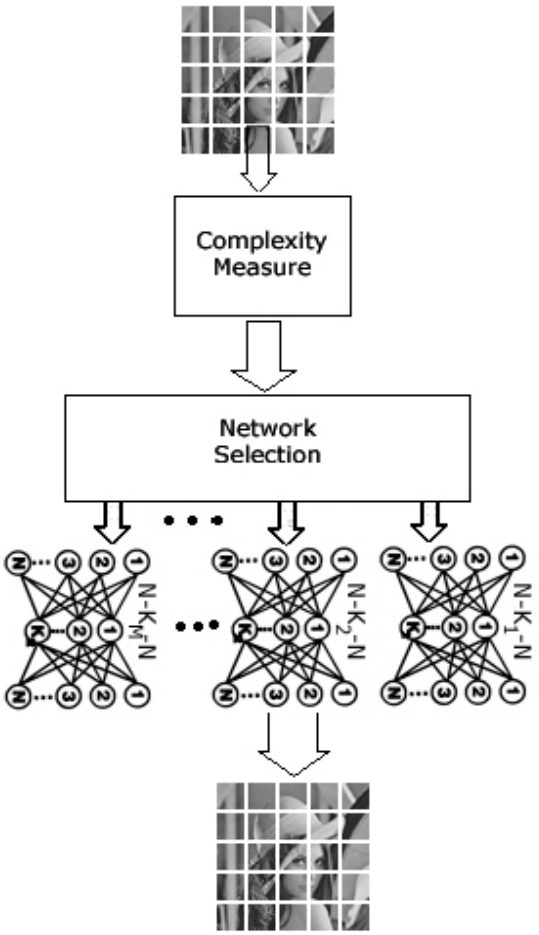
For actual output is taken for desired output or errors. The measurement of error is small then, actual output approaches to desired output with soft steps. Therefore error oscillation reduces.

IV. Results and Discussion



128 IMAGE SIZE	LEVENBERG-MARQUARDT METHOD			MODIFIED LEVENBERGMARQUARDT METHOD		
IMAGE	PSNR	MSE	TIME(SECONDS)	PSNR	MSE	TIME(SECONDS)
LENA	20.76	58.672	5136.215000	21.06	193.0357	4875.6325
PEPPER	12.8889	312.9567	909.765000	13.9682	252.5264	547.625000
BABOON	15.9707	201.3197	902.05320	16.9616	141.2765	546.140000
CROWD	8.6035	329.4677	921.844000	8.6449	141.2765	544.578000

256 IMAGE SIZE	LEVENBERG-MARQUARDT METHOD			MODIFIED LEVENBERGMARQUARDT METHOD		
IMAGE	PSNR	MSE	TIME(SECONDS)	PSNR	MSE	TIME(SECONDS)
LENA	21.7006	161.4895	3303.3698	22.3675	148.7677	2169.579000
PEPPER	15.0934	188.6425	3411.375000	15.3527	172.4312	2151.516000
BABOON	13.9517	195.6905	3614.437000	16.4312	123.0598	2376.734000
CROWD	14.3570	301.0073	4065.17200	15.7204	322.2830	2208.1410
BIRD	25.8375	54.5497	3112.781000	26.0312	55.6387	2056.3698



Neural network-based adaptive structure for image compression

V. Conclusion

A picture can say more than a thousand words. However, storing an image can cost more than a million words. This is not always a problem because now computers are capable enough to handle large amounts of data. However, it is often desirable to use the limited resources more efficiently. For instance, digital cameras often have a totally unsatisfactory amount of memory and the internet can be very slow. In these cases, the importance of the compression of image is greatly felt. The rapid increase in the range and use of electronic imaging justifies attention for systematic design of an image compression system and for providing the image quality needed in different applications. There are a lot of techniques available for image compression. Image compression using neural network technique is efficient when referring to the literature.

In this thesis the use of Multi-Layer Perceptron Neural Networks for image compression is reviewed. Since acceptable result is not resulted by compression with one network, an adaptive approach is used by changing the Training algorithm of the network with LM Method. It uses different networks for different image blocks regarding to their complexity values. The experimental results show that better visual quality is obtained by overlapping neighboring image blocks.

Also selecting images with Best-SNR criterion rather than the complexity criterion provides higher image quality and better PSNR. Higher number of networks provides better performance in Best-SNR approach but this will result in lower CR. However, overlapping and network selection need more investigations and it can be accepted to obtain better reconstructed image quality. Comparing results with basic BNN algorithm shows better performance for the proposed method both with PSNR measure and visibility quality.

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An Efficient Fuzzy Possibilistic C-Means with Penalized and Compensated Constraints

By D.Vanisri, Dr.C.Loganathan
Department of Computer Technology

Abstract- Improvement in sensing and storage devices and impressive growth in applications such as Internet search, digital imaging, and video surveillance have generated many high-volume, high-dimensional data. The raise in both the quantity and the kind of data requires improvement in techniques to understand, process and summarize the data. Categorizing data into reasonable groupings is one of the most essential techniques for understanding and learning. This is performed with the help of technique called clustering. This clustering technique is widely helpful in fields such as pattern recognition, image processing, and data analysis. The commonly used clustering technique is K-Means clustering. But this clustering results in misclassification when large data are involved in clustering. To overcome this disadvantage, Fuzzy-Possibilistic C-Means (FPCM) algorithm can be used for clustering. FPCM combines the advantages of Possibilistic C-Means (PCM) algorithm and fuzzy logic. For further improving the performance of clustering, penalized and compensated constraints are used in this paper. Penalized and compensated terms are embedded with the modified fuzzy possibilistic clustering method's objective function to construct the clustering with enhanced performance. The experimental result illustrates the enhanced performance of the proposed clustering technique when compared to the fuzzy possibilistic c-means clustering algorithm.

Keywords: Fuzzy Possibilistic C-Means, Modified Fuzzy Possibilistic C-Means, Penalized and Compensated constraints

Classification: GJCST Classification: I.2.3

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Keywords- Fuzzy Possibilistic C-Means, Modified Fuzzy Possibilistic C-Means, Penalized and Compensated constraints

I. Introduction

Clustering is one of the most popular approaches to unsupervised pattern recognition. Fuzzy C-Means (FCM) algorithm [8] is a typical clustering algorithm, which has been widely utilized in engineering and scientific disciplines such as medicine imaging, bioinformatics, pattern recognition, and data mining. As the basic FCM clustering approach employs the squared-norm to measure similarity between prototypes and data points, it can be effective in clustering only the 'spherical' clusters and many algorithms are derived from the FCM to cluster more general dataset. FCM approach is very sensitive to noise. To avoid such an effect, Krishnapuram and Keller[1] removed the constraint of memberships in FCM and propose the Possibilistic C-Means (PCM) algorithm [15]. To classify a data point they deducted an approach that the data point must closely have their cluster centroid, and it is the role of membership. Also for the centroid estimation, the typicality is used for alleviating the unwanted effect of outliers. So Pal proposed a clustering algorithm called Fuzzy Possibilistic C-Means (FPCM) that combines the characteristics of both fuzzy and possibilistic c-means [9]–[14]. In order to enhance the FPCM, Modified Fuzzy Possibilistic C-Means (MFPCM) approach is presented. This new approach provides better results compared to the previous algorithms by modifying the Objective function used in FPCM. The objective function is enhanced by adding new weight of data points in relation to every cluster and modifying the exponent of the distance between a point and a class.

The existing approach use the probabilistic constraint to enable the memberships of a training sample across clusters that sum up to 1, which means the different grades of a training sample are shared by distinct clusters, but not as degrees of typicality. In contrast, each component created by FPCM belongs to a dense region in the data set. Each cluster is independent of the other clusters in the FPCM strategy. Typicalities and Memberships are very important factors for the correct feature of data substructure in clustering problem. If a training sample has been effectively classified to a particular suitable cluster, then membership is considered as a better constraint for which the training sample is closest to this cluster. In other words, typicality is an important factor to overcome the undesirable effects of outliers to compute the cluster centers. In order to enhance the above mentioned existing approach in MFPCM, penalized and compensated constraints are incorporated. Yang [16] and Yang and Su [17] have added the penalized term into fuzzy c-means to construct the penalized fuzzy c-means (PFCM) algorithm. The compensated constraint is embedded into FCM by Lin [18] to create

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compensated fuzzy c-means (CFCM) algorithm. In this paper the penalized and compensated constraints are combined with the MFPCM which is said to be Penalized and Compensated constraints based Modified Fuzzy Possibilistic C-Means clustering algorithm (PCMFPCM).

The remainder of this paper is organized as follows. Section II discusses the various related works to the approach discussed in this paper. Section III presents the proposed methodology. Experimental studies with two datasets are given in section 4 and section 5 concludes the paper.

II. Related Works

Clustering is found to be the widely used approach in most of the data mining systems. Compared with the clustering algorithms, the Fuzzy c means approach is found to be efficient and this section discusses some the literature studies on the fuzzy probabilistic c means approach for the clustering problem.

In 1997, Pal et al., proposed the Fuzzy-Possibilistic C-Means (FPCM) algorithm that generated both membership and typicality values when clustering unlabeled data. The typicality values are constrained by FPCM so that the sum of the overall data points of typicalities to a cluster is one. For large data sets the row sum constraint produces unrealistic typicality values. In this paper, a novel approach is presented called possibilistic-fuzzy c-means (PFCM) model. PFCM produces memberships and possibilities concurrently, along with the usual point prototypes or cluster centers for each cluster. PFCM is a hybridization of fuzzy c-means (FCM) and possibilistic c-means (PCM) that often avoids various problems of PCM, FCM and FPCM. The noise sensitivity defect of FCM is resolved in PFCM, overcomes the problem of coincident clusters of PCM and purges the row sum constraints of FPCM. The first-order essential conditions for extrema of the PFCM objective function is driven, and used them as the basis for a standard alternating optimization approach to finding local minima of the PFCM objective functional. With Some numerical examples FCM and PCM are compared to PFCM in [1]. The examples illustrate that PFCM compares favorably to both of the previous models. Since PFCM prototypes are fewer sensitive to outliers and can avoid coincident clusters, PFCM is a strong candidate for fuzzy rule-based system identification.

Xiao-Hong et al., [3] presented a novel approach on Possibilistic Fuzzy c-Means Clustering Model Using Kernel Methods. The author insisted that fuzzy clustering method is based on kernel methods. This technique is said to be kernel possibilistic fuzzy c-means model (KPFCM). KPFCM is an improvement in possibilistic fuzzy c-means model (PFCM) which is superior to fuzzy c-means (FCM) model. The KPFCM model is different from PFCM and FCM which are based on Euclidean distance. The KPFCM model is based on non-Euclidean distance by using kernel methods. In addition, with kernel methods the input data can be mapped implicitly into a high-dimensional feature space where the nonlinear pattern now appears linear. KPFCM can deal with noises or outliers better than PFCM. The KPFCM model is interesting and provides good solution. The experimental results show better performance of KPFCM.

Ojeda-Magafia et al., [4] proposed a new technique to use the Gustafson-Kessel (GK) algorithm within the PFCM (Possibilistic Fuzzy c-Means), such that the cluster distributions have a better adaptation with the natural distribution of the data. The PFCM, proposed by Pal et al. on 2005, introduced the fuzzy membership degrees of the FCM and the typicality values of the PCM. However, this algorithm uses the Euclidian distance which gives circular clusters. So, combining the GK algorithm and the Mahalanobis measure for the calculus of the distance, there is the possibility to get ellipsoidal forms as well, allowing a better representation of the clusters.

Chunhui et al., [6] presented a similarity based fuzzy and possibilistic c-means algorithm called SFPCM. It is derived from original fuzzy and possibilistic-means algorithm (FPCM) which was proposed by Bezdek. The difference between the two algorithms is that the proposed SFPCM algorithm processes relational data, and the original FPCM algorithm processes propositional data. Experiments are performed on 22 data sets from the UCI repository to compare SFPCM with FPCM. The results show that these two algorithms can generate similar results on the same data sets. SFPCM performs a little better than FPCM in the sense of classification accuracy, and it also converges more quickly than FPCM on these data sets.

Yang et al., [5] puts forth an unlabeled data clustering method using a possibilistic fuzzy c-means (PFCM). PFCM is the combination of possibilistic c-means (PCM) and fuzzy c-means (FCM), therefore it has been shown that PFCM is able to solve the noise sensitivity issue in FCM, and at the same time it helps to avoid coincident clusters problem in PCM with some numerical examples in low-dimensional data sets. Further evaluation of PFCM for high-dimensional data is conducted in this paper and presented a revised version of PFCM called Hyperspherical PFCM (HPFCM). The original PFCM objective function is modified, so that cosine similarity measure could be incorporated in the approach. When compared their performance with some of the traditional and recent

clustering algorithms for automatic document categorization the FPCM performs better. The study shows HPFCM is promising for handling complex high dimensional data sets and achieves more stable performance. The remaining problem of PFCM approach is also discussed in this research.

A robust interval type-2 possibilistic C-means (IT2PCM) clustering algorithm is presented by Long Yu et al., [6] which is essentially alternating cluster estimation, but membership functions are selected with interval type-2 fuzzy sets by the users. The cluster prototypes are computed by type reduction combined with defuzzification; consequently they could be directly extracted to generate interval type-2 fuzzy rules that can be used to obtain a first approximation to the interval type-2 fuzzy logic system (IT2FLS). The IT2PCM clustering algorithm is robust to uncertain inliers and outliers, at the same time provides a good initial structure of IT2FLS for further tuning in a subsequent process. The better simulation results are obtained for the problem of classification and forecasting.

Sreenivasarao et al., [2] presented a Comparative Analysis of Fuzzy C- Mean and Modified Fuzzy Possibilistic C -Mean Algorithms in Data Mining. There are various algorithms used to solve the problem of data mining. FCM (Fuzzy C mean) clustering algorithm and MFPCM (Modified Fuzzy Possibililstic C mean) clustering algorithm are comparatively studied. The performance of Fuzzy C mean (FCM) clustering algorithm is analyzed and compared it with Modified Fuzzy possibilistic C mean algorithm. Complexity of FCM and MFPCM are measured for different data sets. FCM clustering technique is separated from Modified Fuzzy Possibililstic C mean and that employs Possibililstic partitioning. The FCM employs fuzzy portioning such that a point can belong to all groups with different membership grades between 0 and 1. The author concludes that the Fuzzy clustering, which constitute the oldest component of soft computing. This method of clustering is suitable for handling the issues related to understandability of patterns; incomplete/noisy data, mixed media information and human interaction, and can provide approximate solutions faster. The proposed approach for the unlabeled data clustering is presented in the following section.

III. Methodology

1) *Fuzzy Possibilistic Clustering Algorithm*

The fuzzified version of the k-means algorithm is Fuzzy C-Means (FCM). It is a clustering approach which allows one piece of data to correspond to two or more clusters. Dunn in 1973 developed this technique and it was modified by Bezdek in 1981 [8] and this is widely used in pattern recognition. The algorithm is an iterative clustering approach that brings out an optimal c partition by minimizing the weighted within group sum of squared error objective function JFCM:

$$J_{FCM}(V,U,X) = \sum_{i=1}^{c}\sum_{j=1}^{n} u_{ij}^{m}\, d?X_j, v_i, 1 < m < +\infty \qquad (1)$$

In the equation X = {x1, x2,...,xn} ⊆ Rp is the data set in the p-dimensional vector space, the number of data items is represented as p, c represents the number of clusters with 2≤ c ≤ n -1. V = {v1, v2, . . . ,vc} is the c centers or prototypes of the clusters, vi represents the p-dimension center of the cluster i, and d2(xj, vi) represents a distance measure between object xj and cluster centre vi. U = {μij} represents a fuzzy partition matrix with uij = ui (xj) is the degree of membership of xj in the ith cluster; xj is the jth of p-dimensional measured data. The fuzzy partition matrix satisfies:

$$0 < \sum_{j=1}^{n} \mu_{ij} < n, \forall i \in \{1,\dots,c\} \qquad (2)$$

$$\sum_{i=1}^{c} \mu_{ij} = 1, \forall j \in \{1,\dots,n\} \qquad (3)$$

m is a weighting exponent parameter on each fuzzy membership and establishes the amount of fuzziness of the resulting classification; it is a fixed number greater than one. Under the constraint of U the objective function JFCM can be minimized. Specifically, taking of JFCM with respect to uij and vi and zeroing them respectively, is necessary but not sufficient conditions for JFCM to be at its local extrema will be as the following:

$$\mu_{ij} = \left[\sum_{k=1}^{c}\left(\frac{d?X_j v_i}{d?X_j v_k}\right)^{2/(m-1)}\right]^{-1}, 1 \le i \le c, 1 \le j \le n. \qquad (4)$$

$$v_i = \frac{\sum_{k=1}^{n}\mu_{ik}^{m} x_k}{\sum_{k=1}^{n}\mu_{ik}^{m}}, 1 \le i \le c. \qquad (5)$$

In noisy environment, the memberships of FCM do not always correspond well to the degree of belonging of the data, and may be inaccurate. This is mainly because the real data unavoidably involves some noises. To recover this weakness of FCM, the constrained condition (3) of the fuzzy c-partition is not taken into account to obtain a possibilistic type of membership function and PCM for unsupervised clustering is proposed. The component generated by the PCM belongs to a dense region in the data set; each cluster is independent of the other clusters in the PCM strategy. The following formulation is the objective function of the PCM.

$$J_{PCM}(V,U,X) = \sum_{i=1}^{c}\sum_{j=1}^{n}\mu_{ik}^{m}\, d?X_j v_i + \sum_{i=1}^{c}\eta_i \sum_{j=1}^{n}(1-u_{ij})^m \quad (6)$$

Where

$$\eta_i = \frac{\sum_{j=1}^{n}\mu_{ik}^{m}||x_j - v_i||^2}{\sum_{j=1}^{n}\mu_{ij}^{m}} \quad (7)$$

η_i is the scale parameter at the ith cluster,

$$u_{ij} = \frac{1}{1+\left[\frac{d^2(x_j,v_i)}{\eta_i}\right]^{\frac{1}{m-1}}} \quad (8)$$

u_{ij} represents the possibilistic typicality value of training sample xj belong to the cluster i. m ∈ [1,∞] is a weighting factor said to be the possibilistic parameter. PCM is also based on initialization typical of other cluster approaches. The clusters do not have a lot of mobility in PCM techniques, as each data point is classified as only one cluster at a time rather than all the clusters simultaneously. Consequently, a suitable initialization is necessary for the algorithms to converge to nearly global minimum.

The characteristics of both fuzzy and possibilistic c-means approaches is incorporated. Memberships and typicalities are very important factors for the correct feature of data substructure in clustering problem. Consequently, an objective function in the FPCM depending on both memberships and typicalities can be represented as below:

$$J_{FPCM}(U,T,V) = \sum_{i=1}^{c}\sum_{j=1}^{n}(\mu_{ij}^{m} + t^n)\, d?X_j, v_i \quad (9)$$

with the following constraints :

$$\sum_{i=1}^{c}\mu_{ij} = 1, \forall j \in \{1,\ldots,n\} \quad (3)$$

$$\sum_{j=1}^{n} t_{ij} = 1, \forall i \in \{1,\ldots,c\} \quad (10)$$

A solution of the objective function can be obtained through an iterative process where the degrees of membership, typicality and the cluster centers are update with the equations as follows.

$$\mu_{ij} = \left[\sum_{k=1}^{c}\left(\frac{d?X_j v_i}{d?X_j v_k}\right)^{2/(m-1)}\right]^{-1}, 1 \le i \le c, 1 \le j \le n. \quad (4)$$

$$t_{ij} = \left[\sum_{k=1}^{n}\left(\frac{d?X_j v_i}{d?X_j v_k}\right)^{2/(\eta-1)}\right]^{-1}, 1 \le i \le c, 1 \le j \le n. \quad (11)$$

$$v_i = \frac{\sum_{k=1}^{n}(\mu_{ik}^{m} + t_{ik}^{\eta})X_K}{\sum_{k=1}^{n}(\mu_{ik}^{m} + t_{ik}^{\eta})}, 1 \le i \le c. \quad (12)$$

PFCM constructs memberships and possibilities simultaneously, along with the usual point prototypes or cluster centers for each cluster. Hybridization of possibilistic c-means (PCM) and fuzzy c-means (FCM) is the PFCM that often avoids various problems of PCM, FCM and FPCM. The noise sensitivity defect of FCM is solved by PFCM, which overcomes the coincident clusters problem of PCM. But the estimation of centroids is influenced by the noise data.

2) *Modified Fuzzy Possibilistic C-Means Technique (FPCM)*

Objective function is very much necessary to enhance the quality of the clustering results. Wen-Liang Hung presented a new approach called Modified Suppressed Fuzzy c-means (MS-FCM), which significantly improves the performance of FCM due to a prototype-driven learning of parameter **α** [19]. Exponential separation strength between clusters is the base for the learning process of **α** and is updated at each of the iteration. The parameter **α** can be computed as

$$\alpha = exp\left[-\min_{i\neq k}\frac{||v_i - v_k||^2}{\beta}\right] \quad (13)$$

In the above equation **β** is a normalized term so that **β** is chosen as a sample variance. That is, **β** is defined:

$$\beta = \frac{\sum_{j=1}^{n}||x_j - \bar{x}||^2}{n} \; where\; \bar{x} = \frac{\sum_{j=n}^{n} x_j}{n}$$

But the remark which must be pointed out here is the common value used for this parameter by all the data at each of the iteration, which may induce in error. A new parameter is added with this which suppresses this common value of **α** and replaces it by a new parameter like a weight to each vector. Or every point of the data set possesses a weight in relation to every cluster. Consequently this weight permits to have a better classification especially in the case of noise data. The following equation is used to calculate the weight.

$$w_{ji} = exp\left[-\frac{\|x_j - v_i\|^2}{\left[\sum_{j=1}^{n}\|x_j - \bar{v}\|^2\right] * c/n}\right] \quad (14)$$

In the previous equation wji represents weight of the point j in relation to the class i. In order to alter the fuzzy and typical partition, this weight is used. The objective function is composed of two expressions: the first is the fuzzy function and uses a fuzziness weighting exponent, the second is possibililstic function and uses a typical weighting exponent; but the two coefficients in the objective function are only used as exhibitor of membership and typicality. A new relation, lightly different, enabling a more rapid decrease in the function and increase in the membership and the typicality when they tend toward 1 and decrease this degree when they tend toward 0. This relation is to add Weighting

exponent as exhibitor of distance in the two under objective functions. The objective function of the MFPCM can be given as follows:

$$J_{MFPCM} = \sum_{i=1}^{c}\sum_{j=1}^{n}(\mu_{ij}^{m} w_{ij}^{m} d^{2m}(x_j, v) + t_{ij}^{\eta}\ w_{ij}^{\eta} d^{2\eta}(x_j, v_i)) \quad (15)$$

U = {μij} represents a fuzzy partition matrix, is defined as:

$$\mu_{ij} = \left[\sum_{k=1}^{c}\left(\frac{d?\,X_j, v_i}{d?\,X_j, v_k}\right)^{2m/(m-1)}\right]^{-1} \quad (16)$$

T = {tij} represents a typical partition matrix, is defined as:

$$t_{ij} = \left[\sum_{k=1}^{n}\left(\frac{d?\,X_j, v_i}{d?\,X_j, v_k}\right)^{2\eta/(\eta-1)}\right]^{-1} \quad (17)$$

V = {vi} represents c centers of the clusters, is defined as:

$$v_i = \frac{\sum_{j=1}^{n}(\mu_{ij}^{m}\ w_{ji}^{m} + t_{ij}^{\eta} w_{ji}^{\eta}) * X_j}{\sum_{j=1}^{n}(\mu_{ik}^{m}\ w_{ji}^{m} + t_{ik}^{\eta} w_{ij}^{\eta})} \quad (18)$$

3) *Penalized and Compensated constraints based Modified Fuzzy Possibilistic C-Means(PCMFPCM)*

The Penalized and compensated constraints are embedded with the previously discussed Modified Fuzzy Possibilistic C-Means algorithm. The objective function of the FPCM is given in equation (15). In the proposed approach the penalized and compensated terms are added to the objective function of FPCM to construct the objective function of PCMFPCM. The penalized constraint can be represented as follows

$$\frac{1}{2} v \sum_{x=1}^{n}\sum_{i-1}^{c}(\mu_{x,i}^{m} ln\alpha_i + t_{x,i}^{\eta} ln\beta_x) \quad 19)$$

Where

$$\alpha_i = \frac{\sum_{x=1}^{n}\mu_{x,i}^{m}}{\sum_{x=1}^{n}\sum_{i=1}^{c}\mu_{x,i}^{m}},\ \ i = 1,2,\ldots\ldots c,$$

$$\beta_x = \frac{\sum_{i=1}^{c} t_{x,i}^{\eta}}{\sum_{x=1}^{n}\sum_{i=1}^{c} t_{x,i}^{\eta}}\quad x = 1,2,\ldots,n$$

where α_i is a proportional constant of class i; β_x is a proportional constant of training vector z_x, and v (v≥0); τ (τ≥0) are also constants. In these functions, α_i and β_x are defined in equations above. Membership $\mu_{x,i}$ and typicality $t_{x,i}$ for the penalize is presented below.

$$(\mu_{x,i})_P = \left(\sum_{l=1}^{c}\frac{(\|z_x - \varpi_i\|^2 - v\ ln\alpha_i)^{1/(m-1)}}{(\|z_x - \varpi_i\|^2 - v\ ln\alpha_l)^{1/(m-1)}}\right)^{-1}$$
$$x = 1,2,\ldots,n, i = 1,2,\ldots c,$$

$$(t_{x,i})_P = \left(\sum_{y=1}^{n}\frac{(\|z_x - \varpi_i\|^2 - v\ ln\beta_x)^{1/(\eta-1)}}{(\|z_x - \varpi_i\|^2 - v\ ln\beta_y)^{1/(\eta-1)}}\right)^{-1}$$
$$x = 1,2,\ldots,n, i = 1,2,\ldots c,$$

In the previous expression $\varpi_i = v_i = \frac{\sum_{k=1}^{n}(\mu_{ik}^{m} + t_{ik}^{\eta})X_K}{\sum_{k=1}^{n}(\mu_{ik}^{m} + t_{ik}^{\eta})}, 1 \le i \le c.$ which is the centroid. The compensated constraints can represented as follows

$$\frac{1}{2}\tau\sum_{x=1}^{n}\sum_{i=1}^{c}(\mu_{x,i}^{m} tanh\ \alpha_i + t_{x,i}^{\eta} tanh\ \beta_x) \quad 20)$$

Where Membership $\mu_{x,i}$ and typicality $t_{x,i}$ for the compenzation is presented below

$$(\mu_{x,i})_C = \left(\sum_{l=1}^{c}\frac{(\|z_x - \varpi_i\|^2 - \tau\ \tanh(\alpha_i))^{1/(m-1)}}{(\|z_x - \varpi_l\|^2 - \tau\ tanh(\alpha_l))^{1/(m-1)}}\right)^{-1}$$
$$x = 1,2,\ldots,n, i = 1,2,\ldots c,$$

$$(t_{x,i})_C = \left(\sum_{y=1}^{n}\frac{(\|z_x - \varpi_i\|^2 - \tau\ tanh(\beta_x))^{1/(\eta-1)}}{(\|z_x - \varpi_i\|^2 - \tau\ \tanh(\beta_y))^{1/(\eta-1)}}\right)^{-1}$$
$$x = 1,2,\ldots,n, i = 1,2,\ldots c,$$

To obtain an efficient clustering the penalization term must be removed and the compensation term must be added to the basic objective function of the existing FPCM. This brings out the objective function of PCFPCM and it is given in equation (21)

$$J_{MFPCM} = \sum_{i=1}^{c}\sum_{j=1}^{n}(\mu_{ij}^{m}\ w_{ji}^{m} d^{2m}(x_j v) + t_{ij}^{\eta}\ w_{ji}^{\eta} d^{2\eta}(x_j, v_i))$$
$$-\frac{1}{2} v \sum_{x=1}^{n}\sum_{i=1}^{c}(\mu_{x,i}^{m} \ln\alpha_i + t_{x,i}^{\eta} \ln\beta_x) \quad 21)$$
$$+\frac{1}{2} v \sum_{x=1}^{n}\sum_{i=1}^{c}(\mu_{x,i}^{m} \tanh\alpha_i + t_{x,i}^{\eta} \tanh\beta_x)$$

The centroid of ith cluster is calculated in the similar way as the definition in Eq. (18). The final objective function is presented in equation (21).

IV. Experimental Results

The proposed approach for clustering unlabeled data is experimented using the Iris dataset from the UCI machine learning Repository. All algorithms are implemented under the same initial values and stopping conditions. The experiments are all performed on a GENX computer with 2.6 GHz Core (TM) 2 Duo processors using MATLAB version 7.5.

Iris data set contains 150 patterns with dimension 4 and 3 classes. This is one of the most popular data sets studied by the Machine Learning community. The data set contains three classes of 50 patterns each; each class refers to a type of iris plant. One class is linearly separable from the other two that are overlapped. The features are four: sepal length, sepal width, petal length, and petal width.

To evaluate the efficiency of the proposed approach, this technique is compared with the existing FPCM and Modified FPCM approach.

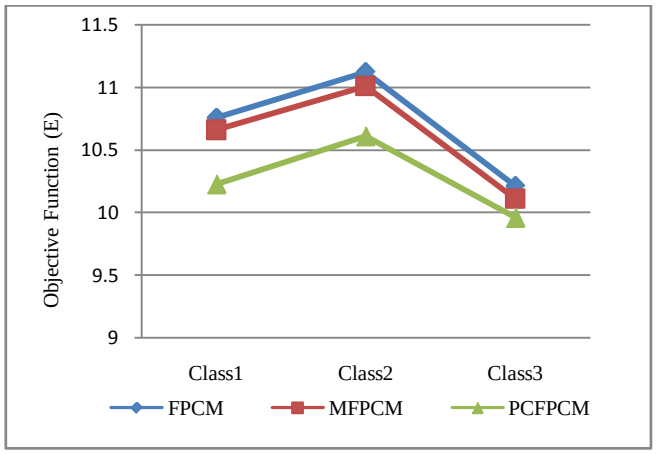

Figure 1. Objective Function Comparison for the Proposed Technique and Existing Technique

Table 1: Objective Function for Different Clustering Methods

Clustering Method	Objective Function		
	Class 1	Class 2	Class 3
FPCM	10.76	11.12	10.21
MFPCM	10.66	11.01	10.11
PCFPCM	10.23	10.67	9.96

The objective function value obtained for clustering the Iris data using the proposed clustering technique and existing clustering techniques is shown in table 1. When considering the class 1, the objective function obtained by using the proposed technique is 10.23 which is lesser than the objective function obtained by K-Means clustering and Genetic algorithm i.e. 10.76 and 10.66 respectively. This clearly indicates that the proposed technique results in better clustering when compared to existing clustering techniques. When class 2 is considered, the objective function for existing methods are 11.12 and 11.01, whereas, for the proposed clustering technique the objective function is 10.67 which are much lesser than conventional methods. The objective function obtained for the class 3 using the proposed technique is 9.96 that is lesser when compared to the usage of K-Means and GA techniques i.e. 10.21 and 10.11. From these data, it can be clearly seen that the proposed technique will produce better clusters when compared to the existing techniques.

The performance of the proposed and existing techniques in terms of comparison with their objective function is shown in figure 1. It can be clearly observed that the proposed clustering technique results in lesser objective function for the considered all classes of iris dataset when compared to the existing techniques. This clearly indicates that the proposed clustering technique will produce better clusters for the large database when compared to the conventional techniques.

V. Conclusion

Fuzzy clustering is considered as one of the oldest components of soft computing which is suitable for handling the issues related to understandability of patterns, incomplete/noisy data, and mixed media information and is mainly used in data mining technologies. In this paper, a penalized and compensated constraints based Fuzzy possibilistic c-Means clustering algorithm is presented, which is developed to obtain better quality of clustering results. The need for both membership and typicality values in clustering is argued, and clustering model named as PCMFPCM is proposed in this paper. The proposed PCMFPCM approach differ from the conventional FPCM, PFCM, and CFCM by imposing the possibilistic reasoning strategy on fuzzy clustering with penalized and compensated constraints for updating the grades of membership and typicality. The experimental results shows that the proposed PCMFPCM approach performs better clustering and the value of objective function is very much reduced when compared to the conventional fuzzy clustering approaches.

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A Swarm-based Approach to Medical Image Analysis

By Manisha Sutar, N. J. Janwe

Abstract- Image segmentation is an indispensable part of the visualization of human tissues, particularly during analysis of Magnetic Resonance (MR) images. Unfortunately images always contain a significant amount of noise due to operator performance, equipment, and the environment can lead to serious inaccuracies with segmentation. A segmentation technique based on an extension to the traditional C-means (FCM) clustering algorithm is proposed in this paper. A neighborhood attraction, which is dependent on the relative location and features of neighboring pixels considered.. The degree of attraction is optimized by a Particle Swarm Optimization model. Paper demonstrates the superiority of the proposed technique to FCM-based method. This segmentation method is component of an MR image-based classification system for tumors, currently being developed.

Keywords: *MR images, Segmentation, Improved-FCM, Particle Swarm Optimization.*

Classification: *GJCST Classification: I.4.8, J.3*

Strictly as per the compliance and regulations of:

A Swarm-based Approach to Medical Image Analysis

Mrs. Manisha Sutar[1], Prof. N. J. Janwe[2]

Abstract- **Image segmentation is an indispensable part of the visualization of human tissues, particularly during analysis of Magnetic Resonance (MR) images. Unfortunately images always contain a significant amount of noise due to operator performance, equipment, and the environment can lead to serious inaccuracies with segmentation. A segmentation technique based on an extension to the traditional C-means (FCM) clustering algorithm is proposed in this paper. A neighborhood attraction, which is dependent on the relative location and features of neighboring pixels considered.. The degree of attraction is optimized by a Particle Swarm Optimization model. Paper demonstrates the superiority of the proposed technique to FCM-based method. This segmentation method is component of an MR image-based classification system for tumors, currently being developed.**

Keywords- MR images, Segmentation, Improved-FCM, Particle Swarm Optimization.

I. Introduction

In the analysis of medical images for computer-aided diagnosis and therapy, segmentations is often required as a preliminary stage. Medical image segmentation is a complex

and challenging task due to the intrinsic nature of the images. The brain has a particularly complicated structure and its precise segmentation is very important for detecting prescribe appropriate therapy. Magnetic resonance imaging (MRI) is an important diagnostic imaging technique for the early detection of abnormal changes in tissues and organs. It possesses good contrast resolution for different tissues and has advantages over computerized tomography (CT) for brain studies due to its superior contrast properties. Therefore, the majority of research in medical image segmentation concerns MR images.

Many image processing techniques have been proposed for brain MRI segmentation, most notably thresholding, region-growing, and clustering. Since the distribution of tissue intensities in brain images is very complex, it leads to difficulties of threshold determination.

Therefore, thresholding methods are generally restrictive and have to be combined with other methods [1], [2]. Region growing extends thresholding by combining it with connectivity conditions or region homeogeneity criteria. Successful methods require precise anatomical information to locate single or multiple seed pixels for each region and together with their associated homogeneity [3]-[5], Clustering is the most popular method for medical image segmentation, with fuzzy c-means (FCM) clustering and expectation-maximization (EM) algorithms being the typical methods. The applications of the EM algorithm to brain MR image segmentation were reported by Wells et al. [6] and Leemput et al. [7]. A common disadvantage of EM algorithms is that the intensity distribution of brain images is modeled as a normal distribution, which is untrue, especially for noisy images.

The FCM algoirthm has also been employed by many researchers. Li et al. [8] presented a knowledge-based classification and tissue labeling approach to initially segment MR brain images using the FCM algorithm FCM was shown to be superior on normal brains, but worse on abnormal brains with edema, tumor, etc. Pham and Prince [10] extended the traditional FCM algorithm to deal with MR images corrupted by intensity inhomogeneities. Unfortunately, the greatest shortcoming of FCM is its over-sensitivity to noise, which is also a flaw of many other intensity-based segmentation methods. Since medical images always include considerable uncertainty and unknown noise, this generally leads to further degradation with segmentation.

An MR image-based brain tumor classification system is being developed by the authors, and this was the initial motivation to develop a robust segmentation method, since accurate and robust segmentation is a key stage in successful classification. Many extensions of the FCM algorithm have been reported in the literature to overcome the effects of noise, but most of them still have major drawbacks. In this paper, new extensions to FCM are described which consider two influential factors in segmentation, both of which address issues of neighborhood attraction. One is the feature difference between neighboring pixels in the image; the other is the relative locations of neighboring pixels. Segmentation is therefore decided not only by the pixel intensities themselves, but also by the neighboring pixel intensities and locations. Consideration of these neighboring pixels greatly restrains the influence of noise. The parameters

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referring to the degree of neighborhood attraction are determined using a simple PSO model.

1) *IFCM Algorithm*

To overcome the drawbacks of FCM, Shen et al. presented an improved algorithm. They found that the similarity function d2 (xj, vi) is the key to segmentation success. In their approach, an attraction entitled neighborhood attraction is considered to exist between neighboring pixels. During clustering, each pixel attempts to attract its neighboring pixels towards its own cluster. This neighborhood attraction depends on two factors; the pixel intensities or feature attraction λ, and the spatial position of the neighbors or distance attraction ζ, which also depends on the neighborhood structure. Considering this neighborhood attraction, they defined the similarity function as below:

$$d^2(x_j, v_i) = \|x_j - v_i\|^2 (1 - \lambda H_{ij} - \zeta F_{ij})$$

where Hij represents the feature attraction and Fij represents the distance attraction. Magnitudes of two parameters λ and ζ are between 0 and 1; adjust the degree of the two neighborhood attractions. Hij and Fij are computed in a neighborhood containing S pixels as follow:

$$H_{ij} = \frac{\sum_{k=1}^{s} \mu_{jk} g_{jk}}{\sum_{k=1}^{s} \mu_{jk}}$$

$$F_{ij} = \frac{\sum_{k=1}^{s} \mu_{ik}^2 q_{jk}^2}{\sum_{k=1}^{s} \mu_{ik}^2}$$

With

$$gjk = |x_j - x_k|, q_{jk} = (a_j - a_k)^2 + (b_j - b_k)^2$$

where (aj,bj) and (ak,bk) denote the coordinate of pixel j and k, respectively. It should be noted that a higher value of λ leads to stronger feature attraction and a higher value of ζ leads to stronger distance attraction. Optimized values of these parameters enable the best segmentation results to be achieved. However, inappropriate values can be detrimental. Therefore,

$$\vec{x}_i(\tau + 1) = \vec{x}_i(\tau) + h(\tau)\vec{v}_i(\tau + 1)$$

parameter optimization is an important issue in IFCM algorithm that can significantly affect the segmentation results.

2) *Parameter Optimization Of IFCM Algorithm*

Optimization algorithms are search methods, where the goal is to find a solution to an optimization problem, such that a given quantity is optimized, possibly subject to a set of constrains. Although this definition is simple, it hides a number of complex issues. For example, the solution may consist of a combination of different data types, nonlinear constrains may restrict the search area, the search space can be convoluted with many candidate solutions, the characteristics of the problem may change over time, or the quantity being optimized may have conflicting objectives As mentioned earlier, the problem of determining optimum attraction parameters constitutes an important part of implementing the IFCM algorithm. Shen et al. (2005) computed these two parameters using an ANN through an optimization problem. However, designing the neural network architecture and setting its parameters are always complicated tasks which slow down the algorithm and may lead to inappropriate attraction parameters and consequently degrade the partitioning performance. In this paper, a new computational method based on particle swarm optimisation introduced in order to compute optimum values of these two parameters.

3) *Structure of Particle Swarm Algorithm*

The PSO conducts searches using a population of particles which correspond to individuals in GAs. The population of particles is randomly generated initially. Each particle represents a potential solution and has a position represented by a position vector &xi. A swarm of particles moves through the problem space, with the moving velocity of each particle represented by a position vector &vi. At each time step, a function fi representing a quality measure is calculated by using &xi as input. Each particle keeps track of its own best position, which is associated with the best fitness it has achieved so far in a vector & pi. Furthermore, the best position among all the particles obtained so far in the population is kept track of as &pg. At each time step τ , by using the individual best position, &pi(τ), and global best position, &pg(τ), a new velocity for particle i is updated by

$$\vec{\upsilon}_i(\tau + 1) = w\vec{\upsilon}_i(\tau) + c_1\phi_1\left(\vec{p}_i(\tau) - \vec{x}_i(\tau)\right) + C_2\phi_2\left(\vec{p}_g(\tau) - \vec{x}_i(\tau)\right)$$

Where c1 and c2 are acceleration constants and φ1 and φ2 are uniformly distributed random numbers in [0, 1]. The term &vi is limited to its bounds. If the velocity violates this limit, it is set to its proper limit. w is the inertia weight factor and in general, it is set according to the following equation:

$$w = w_{\max} - \frac{w_{\max} - w_{\min}}{T}.\tau$$

Where wmax and wmin is maximum and minimum value of the weighting factor respectively. T is the maximum number of iterations and τ is the current iteration number. Based on the updated velocities, each particle changes its position according to the following:

Where

$$h(\tau) = h_{\max} - \frac{(h_{\max} - h_o).\ \tau}{T}$$

Where h max and h0 are positive constants.

The population of particles tend to cluster together with each particle moving in a random direction. The computation of PSO is easy and adds only a slight computation load when it is incorporated into IGA. Furthermore, the flexibility of PSO to control the balance between local and global exploration of the problem space helps to overcome premature convergence of elite strategy in GAs, and also enhances searching ability. The global best individual is shared by the two algorithms, which means the global best individual can be achieved by the GA or by PSO, also it can avoid the premature convergence in PSO.

After completion of above processes, a new population is produced and the current iteration is completed. We iterated the above procedures until a certain criterion is met. At this point, the most fitted particle represented the optimum values λ and ζ.

II. Simulation Results

Table1- Values of λ and ζ in different experiments

	1st experiment	2nd experiment	3rd experiment
λ	0.9392	0.9438	0.9375
ζ	0.9812	0.8801	0.8859

Fig. 1. Experimental results of the first experiment; from left to right: original noiseless image: white matter, gray matter, CSF.

Fig. 2. Experimental results of the second experiment; from left to right: corrupted MR image, white matter, gray matter and CSF.

Fig. 3. Experimental results of the third experiment; from left to right: corrupted MR image, white matter, gray matter and CSF.

Simulations are done on one sample TI weighted MR image. In first experiment, noise is absent and in second and third experiments, noise is present and effect of noise increases. In each experiment, parameters λ and ζ are computed using proposed optimization method based on PSO algorithm. Then we used IFCM clustering algorithm in order to segment MR images. Figure 1 shows a noiseless MR image and segmented images, from left to right they are, original image, white matter, gray matter and CSF.

In the second experiment, TI weighted MR image destroyed with Gaussian noise. Figure 2 demonstrates the results of segmentation. In third experiment, we increased amount of Gaussian noise and corrupted the original image. Figure 3 shows results of segmentation in this case. Table 1 shows values of λ and ζ for each experiment. It is clear that for every new input image values of λ and ζ will change.

New proposed algorithm based on PSO makes it available to computed and f without using ANN. Experimental results demonstrate improved performance of FCM clustering algorithm against noisy MR images. New proposed algorithm based on PSO, simplifies computation of λ and ζ without using complicated ANN.

III. Conclusion

There are different sources of noise, arising from environment, operator, and equipments. These sources influence the medical images. As a result, performance of traditional FCM for segmentation of noisy images reduces. IFCM algorithm is proposed to solve sensitivity of FCM algorithm to noise. This version of FCM introduces two new parameters X and in order to consider pixel's neighborhood and location effect. The new parameters are computed using an ANN through optimization of an objective function. In this paper a new method based on PSOs is introduced for computation of the optimal values of these parameters. Simplified computation of X and (, is an Advantage of the proposed algorithm compared with ANN optimization technique. Simulation results demonstrated effectiveness of the new proposed method to find optimal values of X and (, that are used for efficient segmentation of noisy MR images.

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Simulation & Performance Analysis of Wired and Wireless Computer Networks

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Abstract- In this paper, performance analysis of the Wireless and Wired computer networks through simulation has been attempted using OPNET as simulating tool. For wired networks, the performance parameters like delay and throughput have been investigated with varying transmission links and load balancers. The load-balancing has been analyzed through parameters like analysis of traffic sent and traffic received. While in wireless networks the metrics like delay, retransmission attempts and throughput have been estimated with varying physical characteristic and buffer size. From the obtained results, it is gathered that performance of the wired networks is good if high speed Ethernet links like 1000 Base X and server-load balancing policy are used whereas the performance of Wireless LAN can be improved by fine tuning and properly choosing the WLAN parameters. For the tested simulation scenarios the performance is observed to be better with wireless networks using infra-red type physical characteristics and higher buffer size (1024Kb.

Keywords: *OPNET, load-balancing, physical characteristics, buffer size.*

Classification: *GJCST Classification: C.2.1*

Strictly as per the compliance and regulations of:

Simulation & Performance Analysis of Wired and Wireless Computer Networks

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Abstract- In this paper, performance analysis of the Wireless and Wired computer networks through simulation has been attempted using OPNET as simulating tool. For wired networks, the performance parameters like delay and throughput have been investigated with varying transmission links and load balancers. The load-balancing has been analyzed through parameters like analysis of traffic sent and traffic received. While in wireless networks the metrics like delay, retransmission attempts and throughput have been estimated with varying physical characteristic and buffer size. From the obtained results, it is gathered that performance of the wired networks is good if high speed Ethernet links like 1000 Base X and server-load balancing policy are used whereas the performance of Wireless LAN can be improved by fine tuning and properly choosing the WLAN parameters. For the tested simulation scenarios the performance is observed to be better with wireless networks using infra-red type physical characteristics and higher buffer size (1024Kb.

Keywords:OPNET, load-balancing, physical characteristics, buffer size.

I. Introduction

Computer Network is an interconnection of computers for sharing of data and network resources. With the evolution of Internet, the networking technology has not been just confined to resource sharing but has boomed in the arena of cellular and mobile communication as well. Rapid development in the field of very large scale integration of complex circuits on to a smaller chip has led to the evolution of high-speed computer networks. The traditional wired transmission medium poses constraints like mobility and extensive cabling. But wireless communication is a flexible data communication system implemented as an extension to or as an alternative for wired communication.

The bandwidth and the services provided by the wireless communication networks are similar to that provided the wired networks. So, as the networks are being upgraded from scratch all over the world, network planning is becoming all the more important. Computing the viability and performance of computer networks in real can be very expensive and painstaking task. To ease and comfort the process of estimating and predicting a network design, simulation and modeling techniques are widely used and put into practice. The network simulation thus becomes an indispensable tool for carrying out the design and redesign operations and for evaluating the performance of the network. A variety of simulation tools like NS-2, NetSim, and OPNET are available for the purpose of modeling and simulation but the choice of a simulator depends upon the features available and the requirements of network application. OPNET is one of the simulation softwares which can provide statistical analysis of data for network planning and design operations.

In this paper, the wired and wireless networks have been modeled and simulated using OPNET Modeler. The analysis helped to estimate and optimize the performance of wired and wireless networks using the proposed optimization techniques.

II. Related Work

An important issue related to the network performance is congestion which may occur in a network when the number of packets sent to the network is greater than the number of packets that the network can handle. The intermediate devices like routers and switches in a network have buffers where the packets wait in a queue before and after processing. Depending on the packet arrival rate and the packet departure rate which may be higher or lesser than the packet processing rate, the size of input or the output queue may increase. This increase in queue size may lead to congestion. A key issue in designing any good network is to use congestion control mechanism. The congestion control involves two factors that measure the performance of a network: delay and throughput. Efforts have been made to analyse the effect of various parameters on the performance of both wired and wireless networks.

Wired local area networks includes several technologies like Ethernet, token ring, token bus, Fiber distributed data interface and asynchronous transfer mode local area networks. The Ethernet is a contention media access method. In its purest form, contention

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means that the computers are contending for use of the transmission medium. Any computer in the network can transmit at any time (first come, first serve).

IEEE 802.3 standard specifies CSMA/CD as the access method for first-generation 10-Mbps Ethernet [1], a protocol that help devices share the bandwidth evenly without having the two devices transmit at the same time on the network medium. When the two devices transmit at the same time the collision can occur. This collision generates a jam signal that causes all nodes on the segment to stop sending data, which informs all the devices that a collision has occurred. The collision also invokes a random back off algorithm (which determines when the colliding stations can retransmit). Each device on the Ethernet segment stops transmitting for a short time until the timers expires. Thus the collisions are overcome.This CSMA/CD protocol was created to overcome the problem of collisions that occur when the packets are transmitted simultaneously from different nodes over the same medium. The CSMA/CD network sustaining heavy collisions causes following effects:

Delay: Backoff introduces the transmission delay which is enforced when a collision occurs. The retransmissions are resumed on the expiry of this delay time.

Low throughput: Throughput in a network is defined as the number of packets passing through the network in a unit of time. The throughput is reduced as a result of collisions.

Congestion: Congestion occurs when load on the network (the number of packets to be sent to the network) is greater than the capacity of the network (the number of packets that a network can handle). The collisions in the network cause the routers and switches to have queues (buffers that hold packets before and after processing). If either packet arrival rate or packet departure rate is higher than the packet processing rate the input/output queue becomes longer, thus leading to congestion. So collisions introduce congestion.

The evolutions of Ethernet to bridged LAN lead to the division of larger LAN into smaller networks and then connecting them by using multi-port Bridges. This provided an advantage of separate collision domains. The evolution from bridged LAN to switched LAN lead to technology of connecting multiple workstations using a device called switch. This causes the bandwidth to be shared between switch and workstation (5 Mbps each) leading to a faster switched Ethernet like 10 Base2 and 10 Base 5 Ethernets which provide half-duplex communication. But evolution from switched Ethernet (half-duplex) to full-duplex switched Ethernet increased the capacity from 10 to 20 Mbps.

Due to the various drawbacks of wired LANs like extensive cabling and immobility etc., the wireless technology gained momentum. Wireless local area networks (WLAN) enabled people on the move to communicate with anyone, anywhere, at any time, using range of multimedia services. The tremendous growth of cellular telephone and mobile systems coupled with spreading of laptop and palmtop computers indicates a bright future for such networks, both as standalone and as part of large networking infrastructure [2]. The next stage of this development will be complementing or replacing the traditional wired network. Wireless communication technologies employ infrared, spread spectrum and microwave radio transmission techniques with varying data rates. Figure 1 provides an overview of various types of transmission techniques, data rates and network coverage area.

The demand of wireless LAN has increased over a span of time because of its comparative simplicity, flexibility, high rate access and low cost. The wireless network infrastructure is useful to provide accessibility in rough terrains and even rural areas where establishing wired infrastructure is difficult.

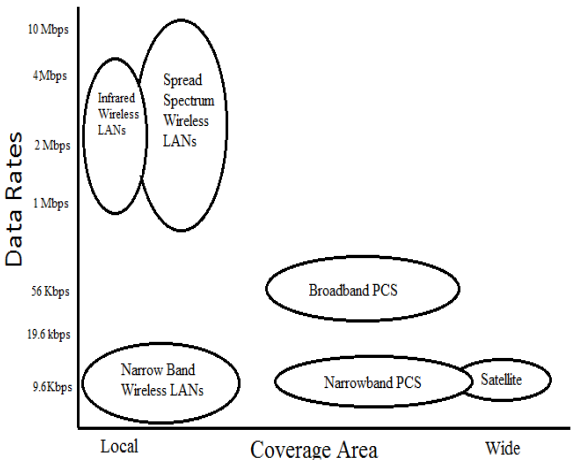

Figure 1 Network coverage vs. coverage area

Wireless LAN protocol is based on IEEE 802.11 standard. This standard defines a medium access control (MAC) sublayer and three physical (PHY) layers. This protocol describes a wireless LAN that delivers services commonly found in wired networks, e.g. throughput, reliable data delivery and continuous network connections. The architecture of IEEE 802.11 WLAN is designed to support a network where a number of mobile stations are involved.

Within the MAC layer, DCF (Distributed Coordination Function) is used as fundamental access method while Point Coordination Function (PCF) is known as Carrier Sense Multiple Access with collision avoidance (CSMA/CA) protocol [1]. It is an asynchronous access method based on the contention for the usage of shared channels. PCF provides a contention free access mechanism through RTS/CTS (Request to Send/ Clear to Send) exchange. The IEEE 802.11 protocol includes authentication, association and re-association services, an optional encryption/decryption procedure, power management and time-bound transfer of data. Though wireless

technology provides convenience and advantages like ease of mobility, scalability and flexibility but it has certain downfalls like:

Speed: The speed of the wireless networks (ranging from 2Mbps to more than 100 Mbps according to the IEEE 802.11n standards) is comparatively less than the wired LANs (available in Gbps). The data rate decreases with the increase in the number of nodes.

Range: The devices operate within a limited distance from an access point. The distance between the devices is determined by the standard used. It is distance between the buildings and other obstacles between the access point and the user.

Cost: The wireless connecting devices are more costly as compared to connecting devices used in wired networks.

Reliability: The wireless networks are subject to interference and can thus pose a problem in the administration of Wireless Infrastructure.

Security: Technically wired LANs are more secure than WLANs. Since wireless signals are transmitted through the air, they can be captured by devices outside the network. However, the majority of wireless local area networks protect their data with the Wired Equivalent Privacy (WEP) encryption standard or Wi-Fi Protected Access (WAP) which makes wireless communications almost as safe as wired ones

Bit Error Rate (BER): The wireless network's media is error prone hence; its BER is higher than the wired LANs [1].

Carrier Sensing: Carrier sensing is difficult in wireless networks because a station is incapable of listening to its own transmissions.

Hidden Terminal Problem: The hidden terminals decrease the performance of the wireless LANs [1].

Moreover, analysis and optimization is difficult in real but simulation is one of the alternative options for the same. Though wireless networks, in contrary to wired networks, are relatively a new field of research, there exist some simulators to develop networks and test the effect of change in conditions on various performance parameters. This paper has been focused on the estimation of effects on throughput & delay using varying transmission links, varying physical characteristics, load balancing and buffer size for the wired and wireless networks using OPNET. The proceeding sections involve the implementation of wired and wireless local area network models and the performance analysis of both wired and wireless local area networks using OPNET (Optimized Network Engineering Tool).

III. Modelling and Simulation

A model is a logical, physical, mathematical representation of an entity, process, a system or phenomenon. These models are analyzed by the network designers to predict how these networks would perform in real-time. This adoption of low cost simulation techniques helps to overcome expenses and design an accurate network model. Models can be static or dynamic. While static models are not effective for changing environments, the dynamic models are much effective over there.

This dynamic modeling is called simulation. Simulation can be used to model the ideas, evaluate the pros and cons of the network designs, make alternatives and finally choose a better configuration just by sitting at one place .i.e. the designers can predict and estimate the performance of the system. It is the replica of a dynamic process within a model to achieve knowledge, which one can carry over to reality. Network simulations allow alternatives to be compared under a wider variety of workloads and environments.

Among the various simulators available, Optimized Network Engineering Tools (OPNET) IT Guru Academic Edition is a simulator which is comprehensive and technology neutral in its capabilities [3]. IT Guru enables the network designers to create a virtual network consisting of relevant hardware, protocols, and application software. This virtual network is a pure software entity that can run on an individual workstation. The network devices like routers, switches etc. can be modelled in IT Guru virtual network. This network can be scaled from a small LAN to wide area network. Once a virtual network has been created it can be manipulated according to the need of the application. The network devices can be changed, removed or inserted into the virtual network as desired to find out the most appropriate configuration and also implement the given application. The effects of various manipulations can be quantifiably examined and analyzed. The OPNET IT Guru provides a GUI to create the virtual network conveniently. OPNET simulator is built on top of discrete event system (DES) and it simulates the system behaviour by modeling each event in the system and processing it through user defined processes. OPNET is very powerful software to simulate heterogeneous network with various protocols. It has several distinct methods of creating topologies. Modeler supports almost all network types and technologies [4]. OPNET runs on top of a C compiler and provides a GUI. Models are built in hierarchical fashion (as shown in Figure 3.5). OPNET Modeler is based on a series of hierarchical editors that directly parallel the structure of real networks, equipment, and protocols. These editors are Project editor, node editor and process editors.

IV. Performance Analysis

This section describes the performance analysis of wireless and wired computer networks using simulation. The simulation was done using the network simulator - OPNET. In case I : First of all, a comparison

was done by varying the types of transmission links (Ethernet links) used in the wired networks for communication between the server and the clients. Secondly, a load balancing mechanism has been used to balance traffic load in the wired network. In this, different load balancing policies were used. Investigations were done to find the policy using which the traffic sent/ received can be balanced to improve the performance. The performance metrics evaluated are delay, throughput, traffic sent and traffic received. In case II: the performance analysis of the wireless computer networks has been illustrated by tuning the Wireless local area network parameters (such as physical characteristics and buffer Size among many other parameters). The performance metrics analyzed are delay and throughput for wireless networks.

Case I: For Wired Networks

In the simulation scenario shown in Figure 2, comparison has been done by varying the types of transmission links (Ethernet links) used in the networks for communication between the server and the clients in a wired local area network.

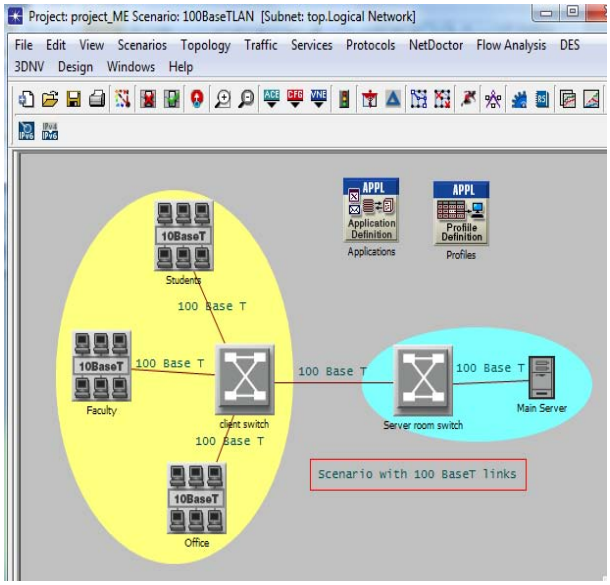

Figure 2 Wired local area network model I

Figure 2 shows the wired network being modeled and simulated for performance analysis using OPNET. The comparison was made for same number of users but different types of links like 10 Base T, 100 Base T and 1000 Base X. The analysis of performance metrics like Ethernet – Delay shown in figure 3 illustrates that the maximum delay occurs for 10 Base T.

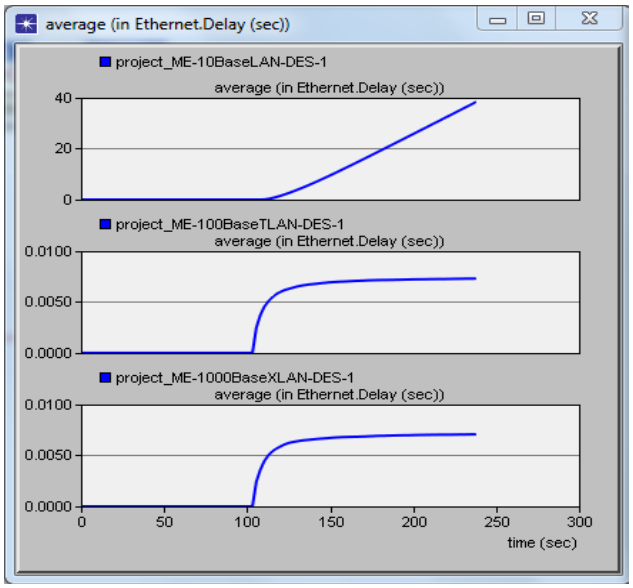

Figure 3 Ethernet Delay (sec)

The performance analysis in figure 4 of network model shown in figure 2 illustrates the impact of varying types of links on the Ethernet traffic received. The traffic received using 100 Base T and 1000 base X is maximum because of the reduction in delay.

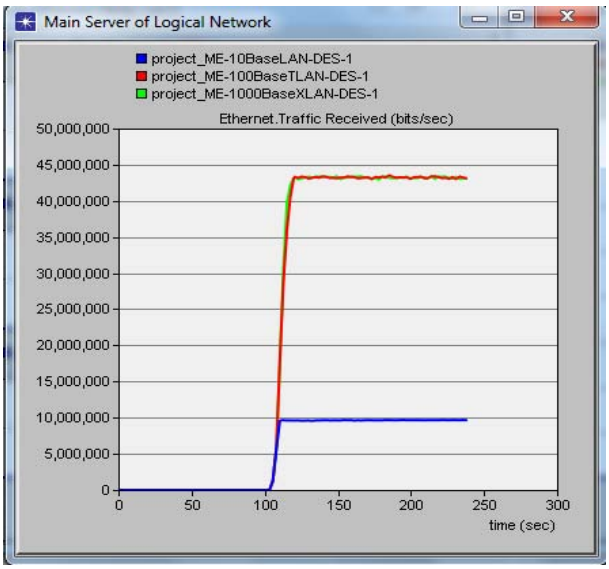

Figure 4 Ethernet traffic received (bits/sec)

Now in the simulation scenario shown in Figure 5, the network has been modeled using the load-balancer using various load-balancing policies. When the load balancer receives a packet from a client machine, it must choose the appropriate server to handle the request. The load balancer will use the load balancing policy to determine which server is most appropriate. Following load-balancing policies can be used:

Random: The load balancer chooses one of the candidate servers at random.

Round-Robin: The load balancer cycles through the list of candidate servers.
Server Load: The load balancer chooses the candidate server with the lowest CPU load.
Number of Connections: The load balancer keeps track of the number of connections it has assigned to each server. When a new request is made, it chooses the server with the fewest connections.

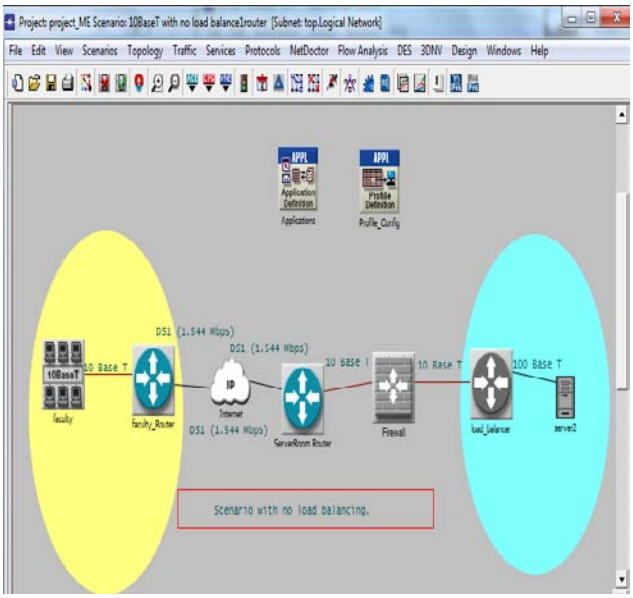

Figure 5 Wired Network using Load Balancer

The performance analysis has been done for networks with and without load balancing policy. When no load balancing policy is used, the number of users is varied to vary the network load. Then the performance analysis was done to compare the networks with maximum network load (but without load balancing policy) and network with same network load and the load balancer implementing random load balancing policy. Figure 6 shows the performance analysis for network with and without load balancer.

As can be seen in Figure 6, as the number of user increases, more traffic is generated.

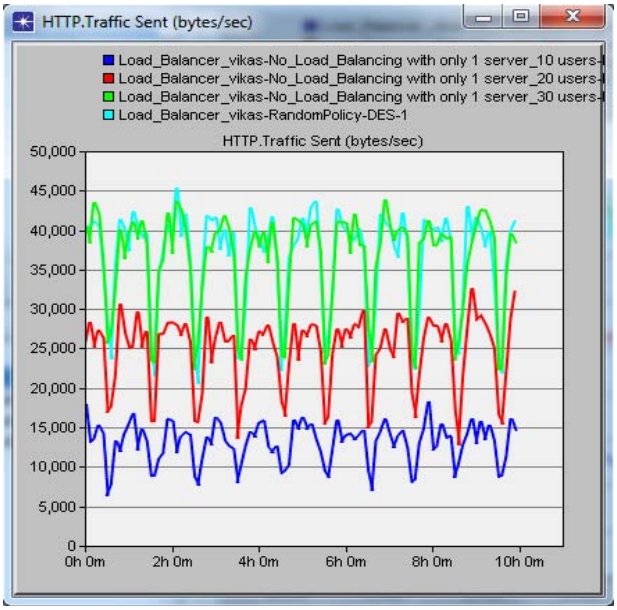

Figure 6 Traffic sent in a wired network

t is also observed that the introduction of load balancing for a single server has no effect on the level of generated traffic. The network model shown in figure 7 shows implementation of wire local area networks using load balanced multiple servers.

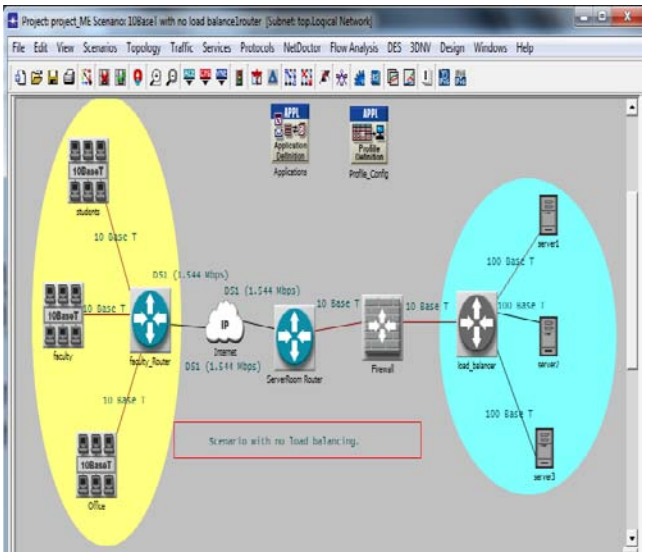

Figure 7 Wired LAN with load-balanced multiple servers

The performance analysis of the network model shown in figure 7 using various load balancing policies has been illustrated in figure 8 for the traffic sent and Figure 9 for the traffic received.

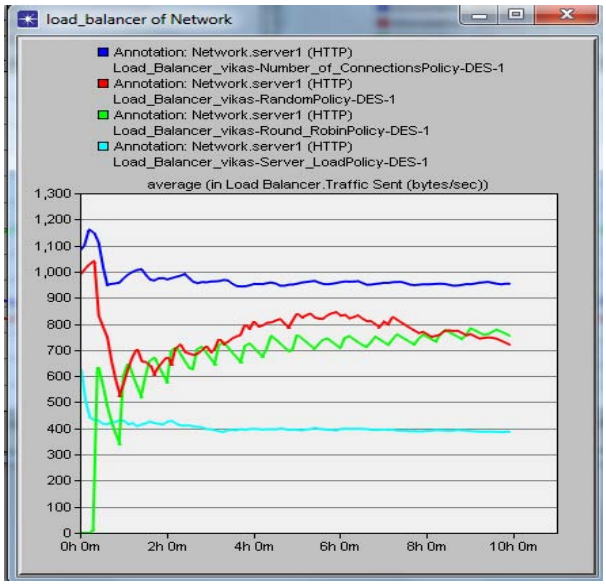

Figure 8 Traffic sent using different load balancing policies

The investigations present that while average traffic received or sent (in bytes/sec) with the number of connections policy is more than others, the average traffic received or sent (in bytes/sec) with the server-load policy is lesser than others. The performance analysis is illustrated in figure 8 and figure 9.

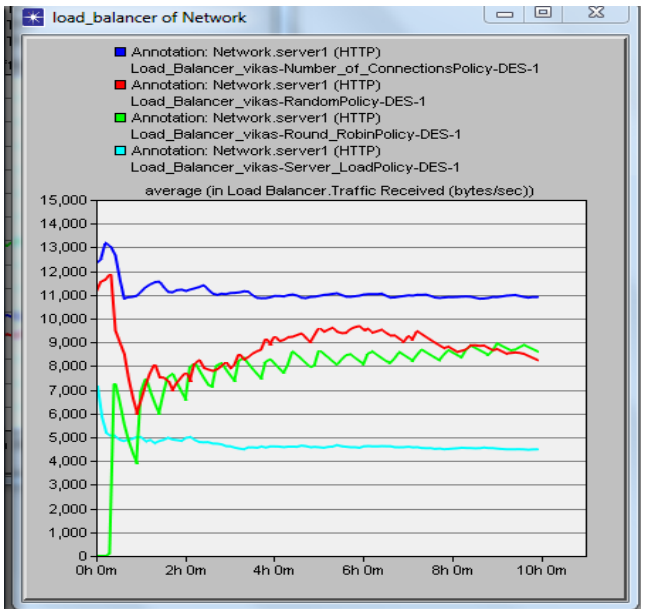

Figure 9 Traffic received using different load balancing policies

Case II: for Wireless Local area networks

In this case the wireless local area networks were simulated using OPNET as shown in figure 10.

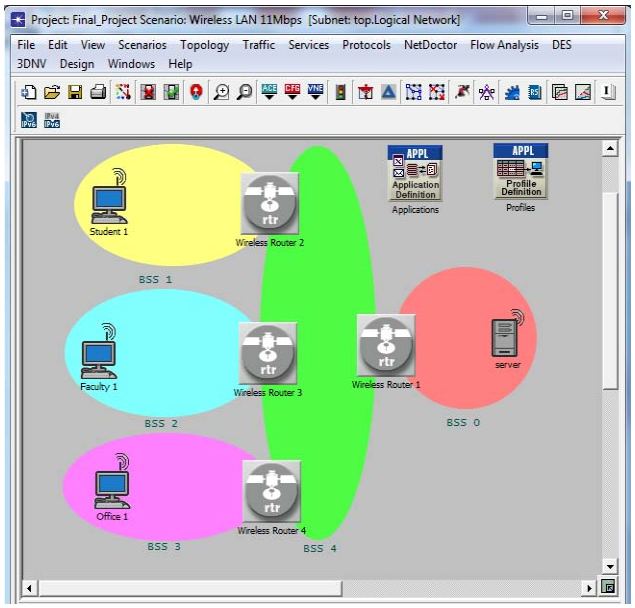

Figure 10 Network Model of the Wireless LAN

The performance analysis of wireless networks can involve the following considerations like RTS Threshold, Fragmentation Threshold, Data rate and buffer size. In this section, an insight has been provided on the variations occurring due to the change in physical characteristics and Buffer size.

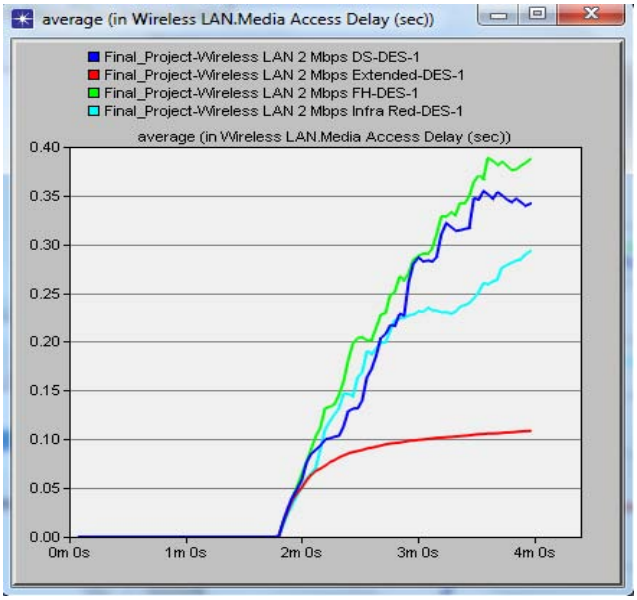

Figure 11Media Access Delay for varying physical characteristics

Various scenarios were modelled to estimate the performance of wireless networks at a constant data rate of 2 Mbps but varying physical characteristics like Frequency Hopping, Direct Sequence, Infra red and Extended Rate PHY (IEEE 802.11g). The performance analysis for media access delay has been illustrated in figure 11. The figure 11 shows lower delays for IR and

ERP as compared to the higher delays for DSSS and FHSS. For each packet the delay is recorded when the packet is sent to the physical layer for the first time.

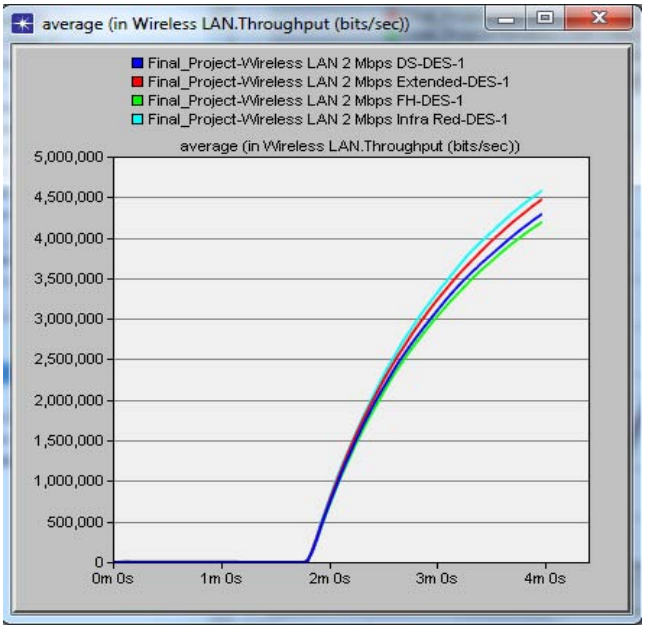

Figure 12 Throughput (bits/sec) for varying physical characteristics

The investigations show that the network attains the maximum throughput using IR layer. The worst results are achieved when IEEE 802.11 protocol uses FHSS layer. But an important thing to focus on is, that the throughput may vary according to the type of the network modelled, the network objects variation may occur in terms of number of stations, data rate and type of network load too among certain other parameters. The effect of change in physical characteristics on throughput i.e. on the bit rate sent to the higher layer is shown in Figure 12.

Buffer size (bits) specifies the maximum size of the higher layer data buffer in bits. Once the buffer limit is reached, the data packets arrived from higher layer will be discarded until some packets are removed from the buffer, so that the buffer has some free space to store these new packets. The optimum size of buffer can stabilize the queue size, the packet drop probability and hence the packet loss rate. The benefits of stabilizing queues in a network are high resource utilization. When the queue buffer appears to be congested the packet discard probability increases. On the other hand, the buffer overflow can be used to manage congestion. The performance analysis has been done for a buffer size of 256kbits and 1024kbits.

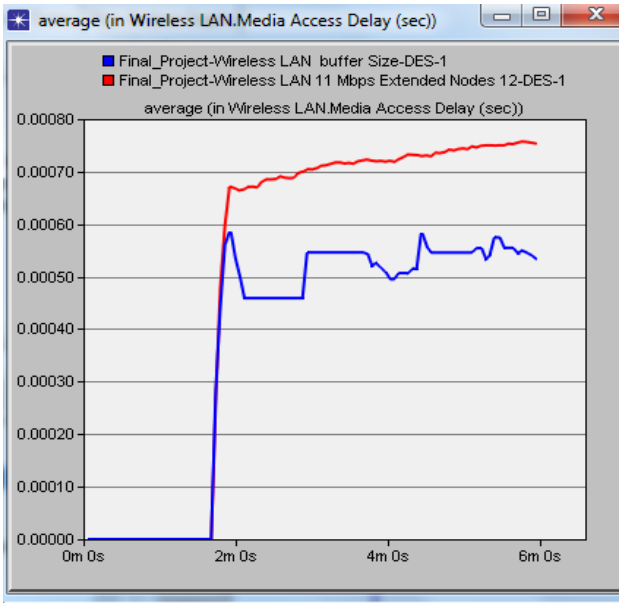

Figure 13 Media Access Delay for varying buffer size

The buffer configuration defines the buffer size, the maximum allocated bandwidth and minimum guaranteed bandwidth. If an incoming flow suddenly becomes bursty, then it is possible for the entire buffer space to be filled by this single flow and other flows will not be serviced until the buffer is emptied. If the buffer size is increased, (Figure 14) then the number of retransmission attempts would be reduced. Also the size of the queue will be decreased for larger buffer due to the fact that the larger buffer will take less time to send the packets, so the queue size will not build up continuously for larger buffer. This shows the reduction in delay as shown in Figure 13. The result of packet loss is the change of queue length. When packet loss is relatively low, packets usually can be transmitted without retransmission, so the queue length may be relatively low. But when the packet loss is high, the MAC packet retransmission (Figure 14) will prolong the delay of packet (Figure 13). So, a small buffer size can increase packet drop rate and hence change the queue length and thus impact the throughput and delay. Hence, the buffer size has been increased, to improve performance by reducing packet drop rate and thus increasing throughput.

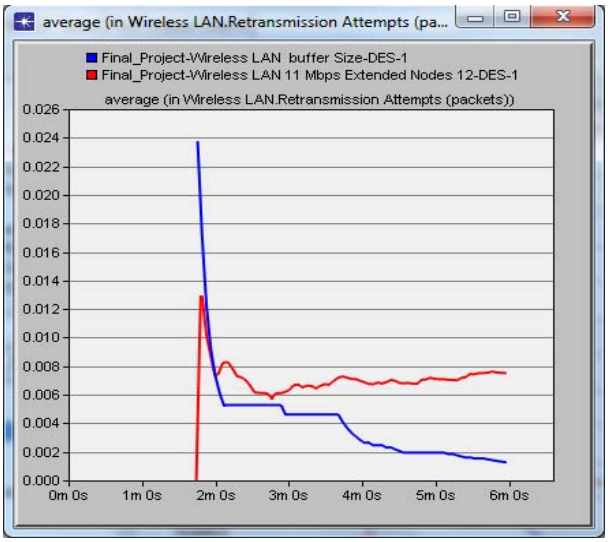

Figure14 Retransmission Attempts for varying buffer size

The increase of packet discard rate can lead to the decrease of throughput. This happens due to frequent retransmissions of the MAC layer data packets when the packet loss rate increases. However, the packet loss may happen due to low buffer size.

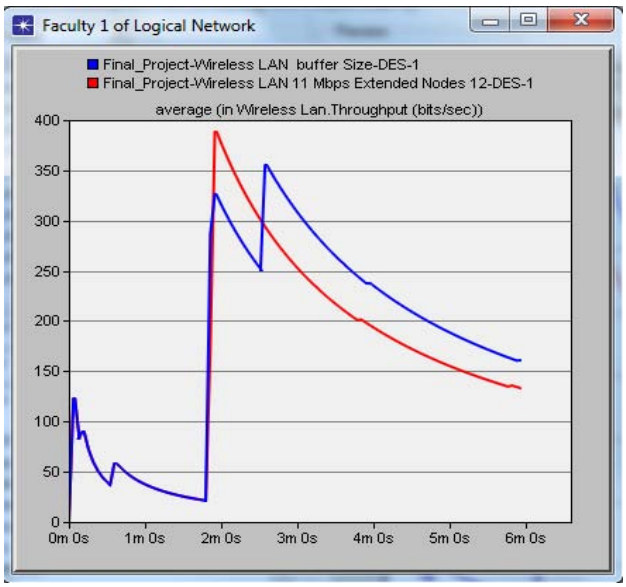

Figure 15 Throughput (bits/sec) for varying buffer size (Node level)

The analysis in figure 15 shows that if buffer size is increased then the retransmission attempts would be reduced as the size of the queue is decreased for a large buffer size. The time to deliver the packets decreases, due to large buffer size. The throughput always increases monotonically with the buffer size, reaching a maximum above a threshold buffer size.

Similarly, the performance analysis can be done for varying data rates, RTS threshold and fragmentation Threshold.

V. Conclusions

The impact of various network configurations on the network performance was analyzed using the network simulator- OPNET. It has been investigated that performance of the wired Networks is good if high speed Ethernet links are used under heavy network loads. The mechanism of load balancing also improves the performance by reducing and balancing the load equally among multiple servers. This lowers the response time to access server as investigated. In addition performance analysis of wireless computer networks has been done for improving the performance of wireless LAN. The investigations of physical characteristics reveal that the infrared type is best in terms of throughput. The variation in buffer size varies the queue size and hence optimizes the throughput.

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The Design and Implementation of Integrated E-Cart on E-Hyper Market

By Hassan Ghanim Khalid, Zhang Zuping, M. Sami Soliman, Mohamed Nadhir Djekidel
Central South University

Abstract- The idea in this paper is to design and build an E-Business Market that is very huge; the purpose is to enable customers to buy through the World Wide Web by applying the Browser-server architecture in Electronic Commerce. With the possibility of selling any type of goods, whether it's digital or physical, you would need to increase the proportion of sales to ensure customer convenience.

The hypermarket is trying as much as possible to make the process of purchasing goods very simple, therefore it is building and configuring a comprehensive electronic commercial site on the Internet. The new hypermarket provides novel services. It includes a number of commercial sites. The management of products that are offered by each site are done through the site owner. The site owner will manage the system and modify the products of his site through a set of tools provided by the main site. A new way is used to display the various products type which makes the navigation in the site and comparing its products with other related sites very easy.

The E-Hyper Market website provides a flexible method of payment that allows the customer to select a payment plan that suits him.

Also, unique search schema is offered. The searching process of the products according to certain conditions can be accomplished in a detailed search. This properties based search depends on determining the values and the ranges of the characteristics of the product, which provides accurate results.

We have used ASP.NET as a programming language to implement this project and the database program that is used to store the products data is MY SQL. Given the extra services mentioned above, our site will be more flexible and easier to use compared with other similar sites.

Keywords: Ecommerce, B2B, Electronic Markets, Flexible Payment.

Classification: GJCST Classification: K.4.4

Strictly as per the compliance and regulations of:

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I. Introduction

Nowadays the wealth of information and means of modern technologies has become diverse and vast, thus, an individual has several options to face. A person may choose to watch TV channels, while another may prefer to read magazines and newspapers. The new millennium and the bulk of generations interact with each other using the World Wide Web (WWW) [1]. The WWW is increasingly important as a source of basic information and a place for trade [2] or so-called Electronic Commerce (EC).

EC in short, is the use of computer networks to improve organizational performance as well as increasing the profitability ratio. Moreover, it helps to get a share in the market and improve customer service by creating a Web page and supporting the investors' relations or communicating electronically with customers [3].

Overall, there are many excellent electronic commerce sites such as Amazon.com, ebay.com, disneystore.com, and others. Commerce is reasonable to the process of shopping on the web site. It is becoming a commonly used business pattern for households and implements web sites that provide functionality for performing commercial transactions over the web.

The customers can browse the catalogue and select products of interest. The selected items may then be collected into an electronic shopping cart. At checkout time, the items in the shopping cart will be presented as an order. Afterwards, more information will be required to complete the transaction. Usually, the customer will be asked to fill or select a billing address, a shipping address, a shipping option, and payment information such as credit card number. An e-mail notification is sent to the customer as soon as the order is placed.

Along with EC areas, the B2B (Business to Business) EC is being spotlighted as an interesting research area considering its size and the potential impact it has overall. Now various B2B systems are being used in seller-centric E-marketplaces, intermediary-centric E-marketplaces, and buyer-centric E-marketplaces etc. [4]

The Internet combines the entire purchasing process, from product exposure to product purchase, into one easily accessible medium. Although there are many ways in which the Internet differs from other advertising channels, three are consistently mentioned in the advertising literature Quinn [5] Berthon [6]. These components are interactivity, customer intimacy, and the ability to shop online. Many argue that these are the characteristics that are provoking interest among consumers, and will generate success for e-companies.

In this paper, we have created a hypermarket on the Internet that contains several commercial sites to sell

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a wide range of goods to customers. We analyzed the treatment of three cases, the first case being multi-payment. The purchase process, as from the beginning of the late 70's, is an impressive number of innovative electronic payment systems that have been developed and tested commercially. However, the resulting variety and complexity of the systems has turned out to be one of the obstacles for the broad acceptance of electronic payment [7]. Second case is how to compare products with each other to save time and effort to the customer before the purchase process. The third case is the search process (Properties Based Search), rooted in the characteristics of the product to save time and effort for the customer.

II. Problems

Along with IT (Information Technology), the Internet high-speed development, electronic commerce has caused the current distribution realm to significantly transform, which can be smoothly developed [8]. We offer an electronic commerce site that we call HS (Home Site). The purpose of HS is to sell products and goods to the customers. This site displays the products from a large number of commercial sites that deal and have a contract with it (Site1, Site2…, and Site N).The customers can view and buy any product from different sites through this Site. The site owner of each site that has a contract with the main site (HS) can add, modify, and delete the products through the product management system.

There is a payment system also in the HS as shown in the following figure. The customer deals with one site instead of visiting each site separately, which saves time and provides convenience for the customer.

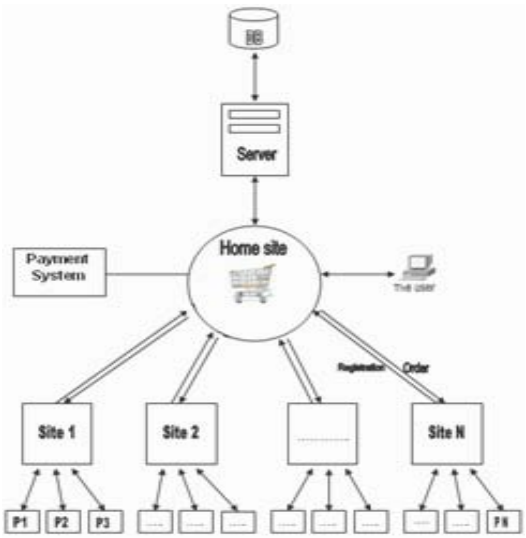

Figure1- The architecture of E-Hyper Market System

Based on the proposed design of the system, this site provides several additional services that allow the client to perform the purchase process with flexibility and high efficiency. When a customer visits a site there will be three additional services available for him, these services help him to avoid the following situations:

1) *The payment method*

The on-line Electronic Payment System (EPS) uses transactions between three kinds of entities: A client (payers), electronic shops (payees) and the bank (Trusted Third Party) .The Architecture of system is shown in Figure (2) [9].

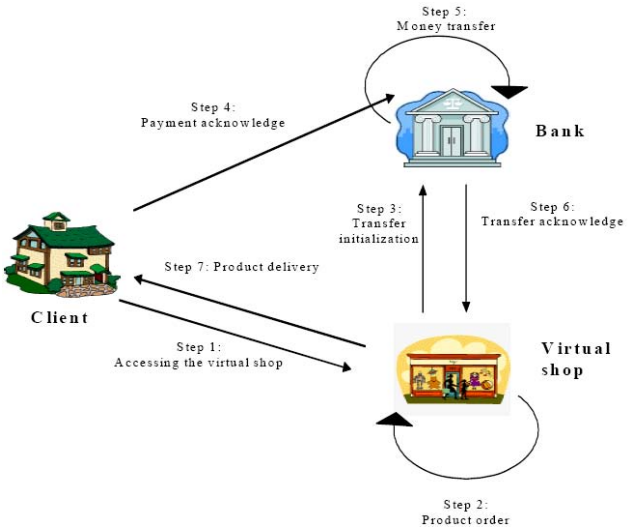

Figure2- The Architecture of on-line EPS

In general, EPS is classified into two categories, the systems with on-line verification and the systems with off-line verification [10]. The process of shopping in any E-commerce site on the Internet includes paying the total amount instead of payment plans. For example, when the customer chooses a product like a laptop by e-cart and when he reaches the payment stage, he must pay the total amount of the computer at once (Is it not true?) through one of the payment methods such as credit card, Internet Bank or other means of payment over the Internet.

Perhaps this customer does not have enough money now to buy this product in one of the payment methods. Therefore, he could not pay the full price at once, making him unable to buy this item. This will lead him to stop the purchasing process and thus, the commercial site along with the company/manufacturer that made this product will lose this trade process or maybe more. This customer can be a possible representative for one of the clients of that commercial site or to its customers!

2) *Compare Products*

Despite the vast amount of unstructured data on the web, 'Keyword-search' is often the only way to find

needed information [11]. In this case, there exists a large group of various products that result from searching for products on different sites. Some consumers may find it difficult to compare the features and specifications of the product from one site to another. In one of the stages of the purchasing process, the customer needs to determine the most suitable product for his/her needs. This is done by evaluating the different products through comparing the characteristics of the product that he/she wishes to buy as well as choosing the right price before buying this product.

However, the customer cannot compare this product with something similar to it in the same commercial site. Therefore, he may feel the need to visit other commercial sites. Each site is visited separately in order to compare with each other to help him make the final decision of the purchasing process or perhaps find the same product in another commercial site with best specifications; this will take more time on the customer's behalf by wasting his/her efforts, afterwards resulting in the customer registering with another commercial site.

3) *Process (Advanced Search)*

One of the main obstacles in e-commerce is that it is not easy for customers to search for relevant information about the products they want [12].When a customer searches for a specific product using traditional search the result contains a huge number of products, making it difficult for the customer to review and check each of the search results. Even the outcome of the advance search is vague and inaccurate. With using general search, the search is non-specific in terms of characteristics and qualities, and this causes the frustration, loss of time, and more effort for the customer.

III. Methods

This section is the architectural design proposed for the databases using My SQL. The figure (3) below is architectural structure, which represents the logical schema.

Through the design, we will be dealing with all the cases that are mentioned above, which are supported with the database table and it include:

1) *The payment method*

There are various proposals for EPS the vast majority have been failed to achieve, rely on a large scale. Reasons for non-success of some of the proposals and others fail remains unclear [13]. After that product has been selected to be bought by the customer, the system of payment will automatically divide the total amount to be optional through the mechanism of a payment-plan. It contains several methods of payment such as (Credit Card, Internet Bank or on delivery ... etc.). If we take an example of payment process, which is in the form of three payment parts:

- The first part of payment can be by card credit for example, using 30% of the total amount.
- The second part of payment via the Internet Bank uses 40% of the total amount.
- The remaining part of the total amount can be paid via delivery.

The customer is also free to choose one method or more depending on his payment plan. The payment will vary in terms of percentage of each payment method depending on the customer's credit situation in each method. In this way, we achieve flexibility in terms of paying through the different payment methods. The following tables facilitate this flexible payment process:

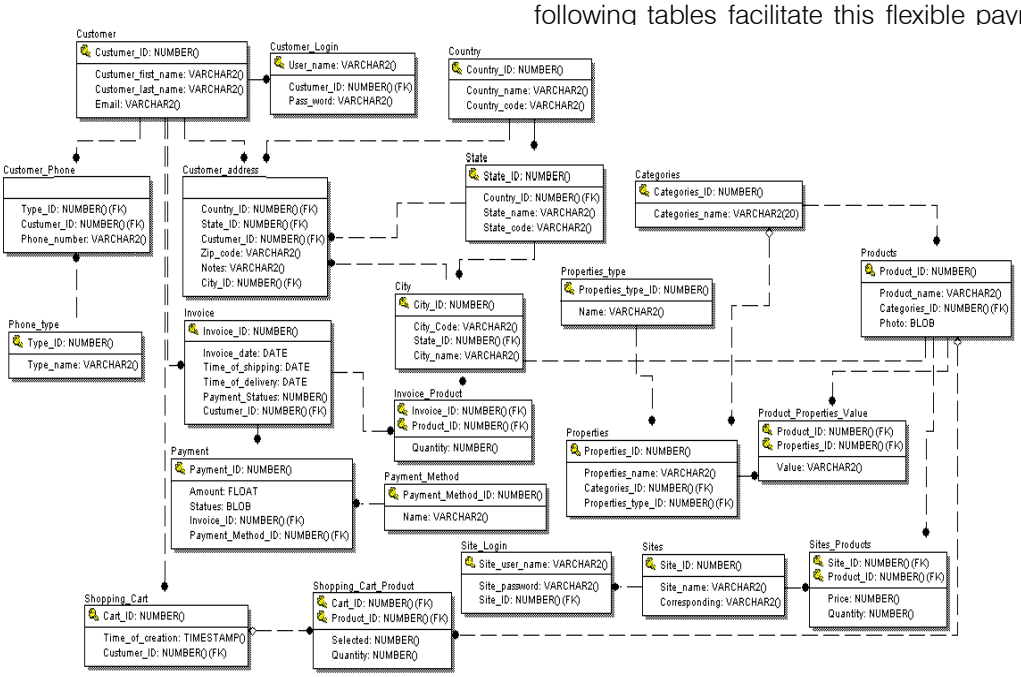

Figure 3.Logical Schema

Table1- Payment table schema

SNO	NAME	TYPE	DESCRIPTION
1	Payment_ID	Number	Primary key for Payment
2	Invoice_ID	Number	Foreign key from Invoice
3	Payment_Method_ID	Number	Foreign key from Payment Method
4	Amount	Number (float)	
5	Statues	Number	

Table2- Payment Method table schema

SNO	NAME	TYPE	DESCRIPTION
1	Payment Method ID	Number	Primary key for Payment Method
2	Name	Varchar	

2) *Compare Products*

Electronic commerce is the area that requires ontology mapping on product comparison over different product classification taxonomies of various shopping malls [14]. The customer will browse/search and select the products that he wants to compare. Then he may choose to compare selected products. The system will show the selected products side by side, so the customer can easily see the differences. These products can be from more than one commercial site and different manufacturers. In addition, the view contains information about whether this product is genuine or not.

Because the home site contains several commercial sites there is no need to go out of it and look at other business sites, so the comparison process between the same products will be faster and easier to use so the client can save his time and efforts. The following tables facilitate this process:

Table3- Products table schema

SNO	NAME	TYPE	DESCRIPTION
1	Product_ID	Number(int)	Primary key for Products
2	Product_name	Varchar	
3	Category_ID	Number	Foreign key from Category
4	Photo	Blob	
5	Site_ID	Number	Foreign key from Sites

Table4- Product Properties Value table schema

SNO	NAME	TYPE	DESCRIPTION
1	Product_ID	Number(int)	Foreign key from Product
2	Properties_ID	Number(int)	Foreign key from Properties
3	Value	Varchar	

Table5- Properties table schema

SNO	NAME	TYPE	DESCRIPTION
1	Properties_ID	Number(int)	Primary key for Properties
2	Properties_name	Varchar	
3	Categories_ID	Number	Foreign key from Categories
4	Properties_type ID	Number	Foreign key from Properties_type

Table6- Properties_type table schema

SNO	NAME	TYPE	DESCRIPTION
1	Properties_Type_ID	Number	Primary key for Properties type
2	Name	Varchar	

Table7- Categories table schema

SNO	NAME	TYPE	DESCRIPTION
1	Categories_ID	Number	Primary key for Categories
2	Categories_name	Varchar	

3) *Process (Advanced Search)*

When pressing the button (Properties-based Search) the customer will enter the specific characteristics. He can search using a specific value for the property or a specific range (For example: colour of the product: black - price: 100-200 ... etc.).He can leave the other properties without conditions, when pressing the button (Search). The search results will be shown in an acceptable manner, correct, and 100% accurate. Here, the client will get exactly what he wants from using a precise search.

Here we mean that the search process is based on the characteristics of the product itself. Because there are different product categories, the characteristics will vary. Properties-based Search will be for different properties and characteristics and not for specific category. Nevertheless, according to the category of the product and not like other commercial sites, the search result will be precise in achieving the customer satisfaction along with excellent service of the Site.

IV. Project Implementation

C# language in Asp.net technology is used to construct and implement this project. C# language is feathered by Asp.net and gives the user the ability to design an Internet website.

As we can see in figure (4) which represents the main page of the E-Hyper Market, it contains a large number of goods and products. If the site owner is a member and is registered in this commercial site, he can be granted access by entering his name and password. Then, he will have the ability to delete, add, and modify the information of goods that belongs to his site. This information for example can be quantities, specifications, prices and other information.

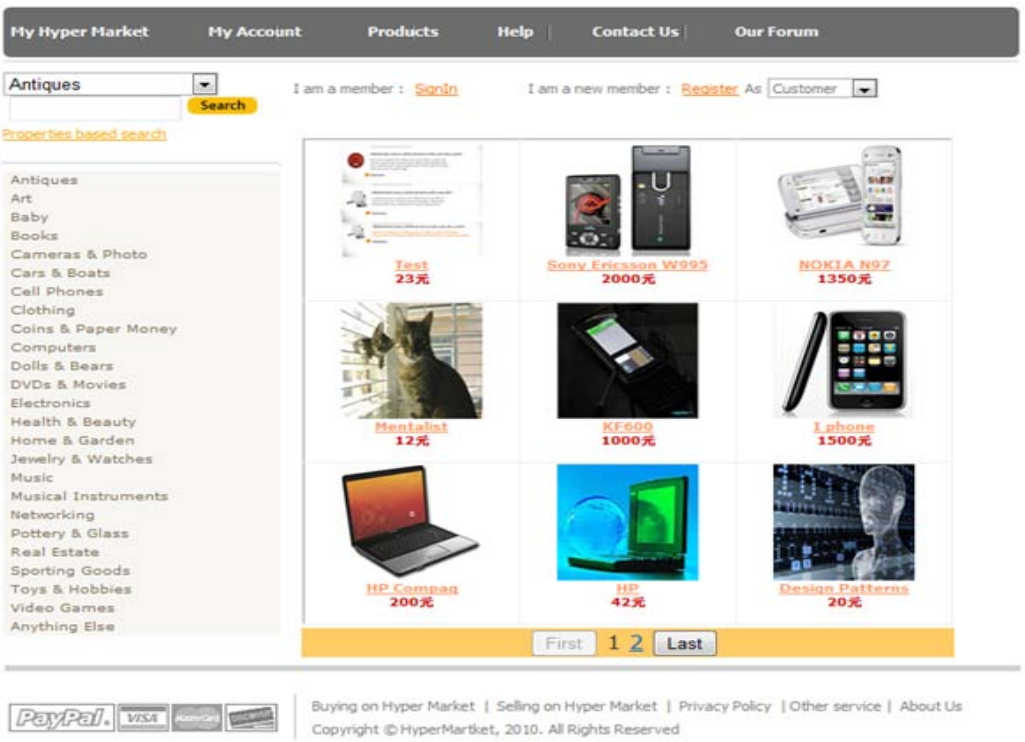

Figure4- The main page of E-Hyper Market

However, if he is not a member or he is not registered then he can register on this commercial site after getting the approval from the administration of this site.

For the customer, he can visit this site or register on it. In addition, he can visit one of the commercial sites which is affiliated to the E-Hyper Market through the link that appears under the name of each product that belongs to one of these companies.

After presenting the contents of the home page, now we will turn to the three cases mentioned above.

1) *The payment method*

Generally, EPS can be classified into four categories: Online Credit Card Payment System, Online Electronic Cash System, Electronic Cheque System and Smart Cards based Electronic Payment System [15].

After the customer chooses the product that he wishes to buy and reaches the payment phase, the customer has to establish his own payment plan. Figure (5) shows how to implement and choose the multiple means of payment (Credit Card, Internet Bank, on delivery…..etc.)

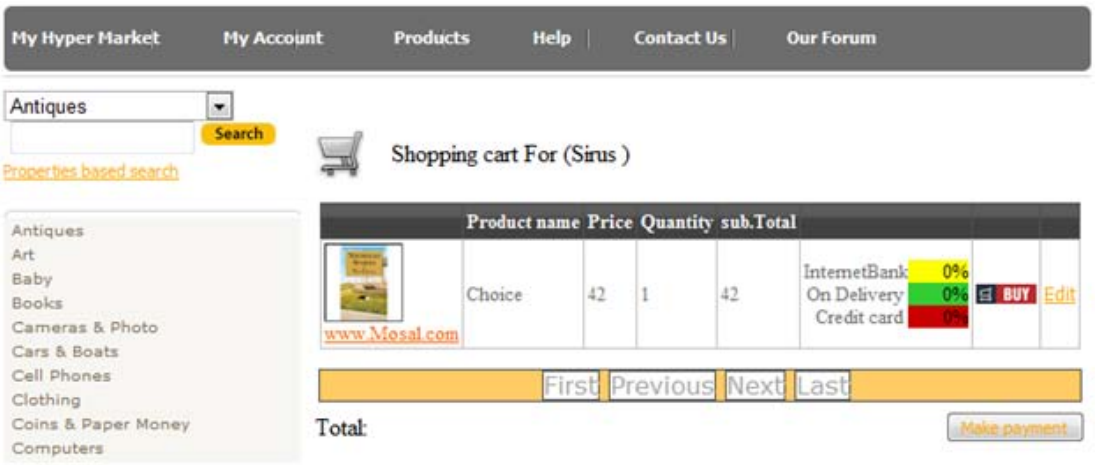

Figure5- Empty Payment-Plan

For example, if the customer decided to pay 25% of the total amount for the price of the product by credit card and 25% by Internet Bank and the remaining 50% through on delivery the payment plan will materialize in the following format figure (6).

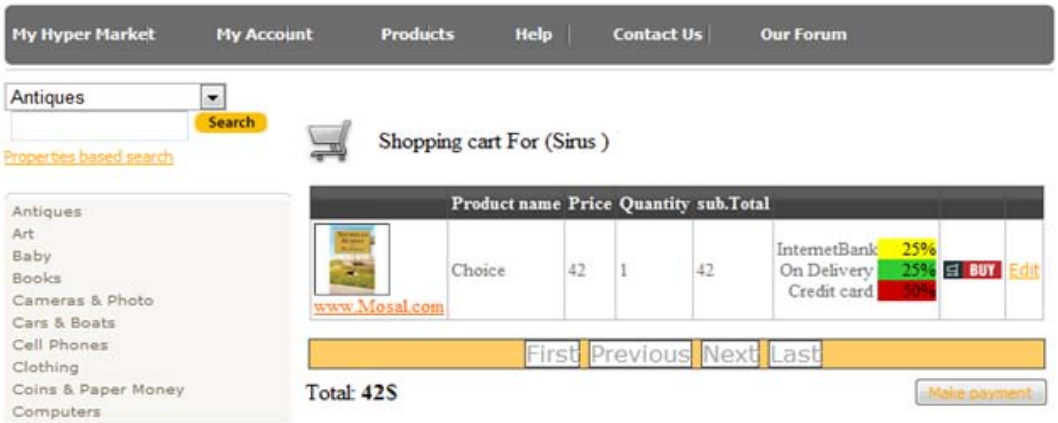

Figure6- Payment-Plan example

Yellow Colour: Internet Bank: 10.5 $
Red Colour: Credit Card: 10.5 $
Green Colour: On Delivery: 21$
This payment plan would be changeable depending on the possibility and situation chosen by the customer.

2) *Compare Products*

The study results show that people are inclined to use featured information paths when they are given the vertical disposition style and product information paths when they are given the horizontal disposition style [16].After the customer finishes his process research and selects a set of products to compare by displaying all the characteristics and qualities that have been selected, he then facilitates the comparison among them as in the following figure (7).

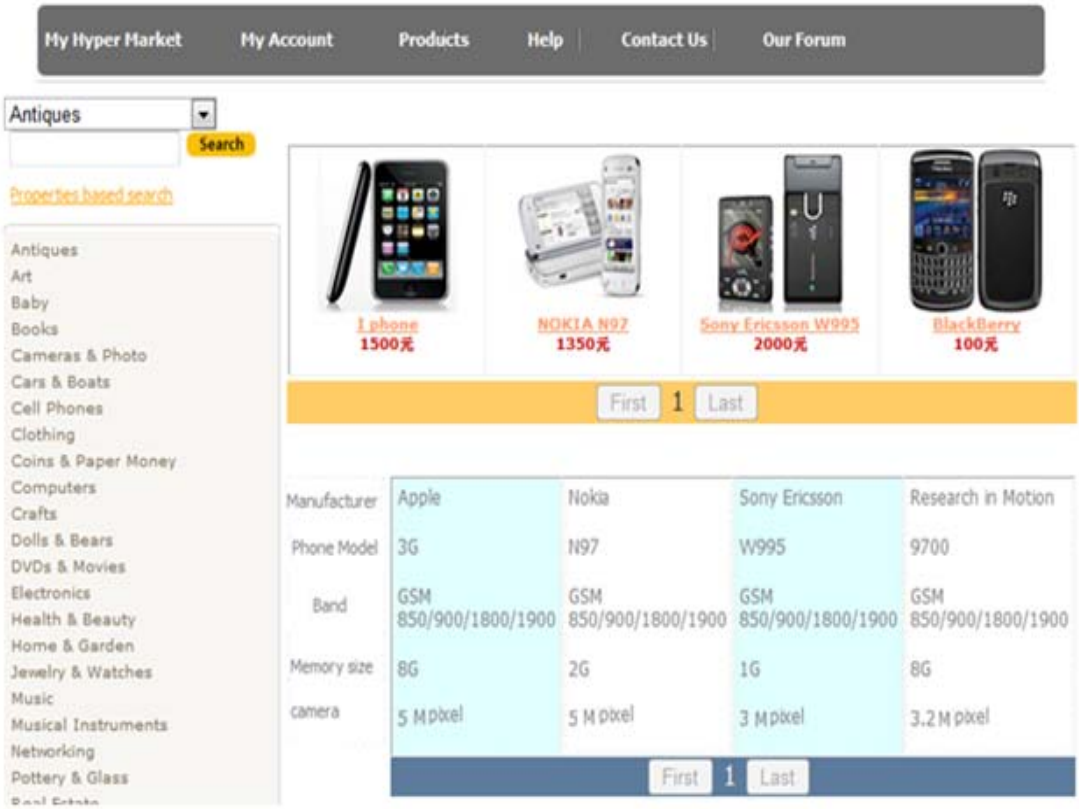

Figure7- Comparison between Products

3) *Properties-based Search*

The customer reviews the properties in detail by typing in the text box, or chooses values from a specialist for each property after selecting the category of the product. For example, searching for a book as shown in the following figure (8).

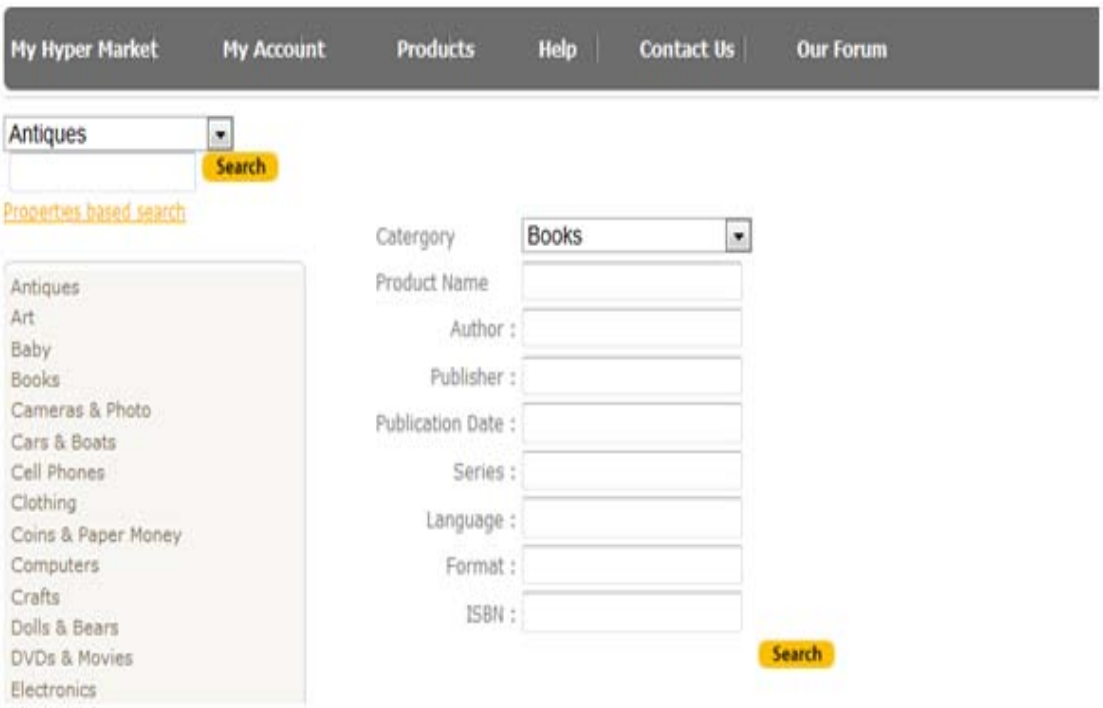

Figure8- Properties-based Search

Then click on the search button to obtain the search results as accurate as shown in the following figure (9).

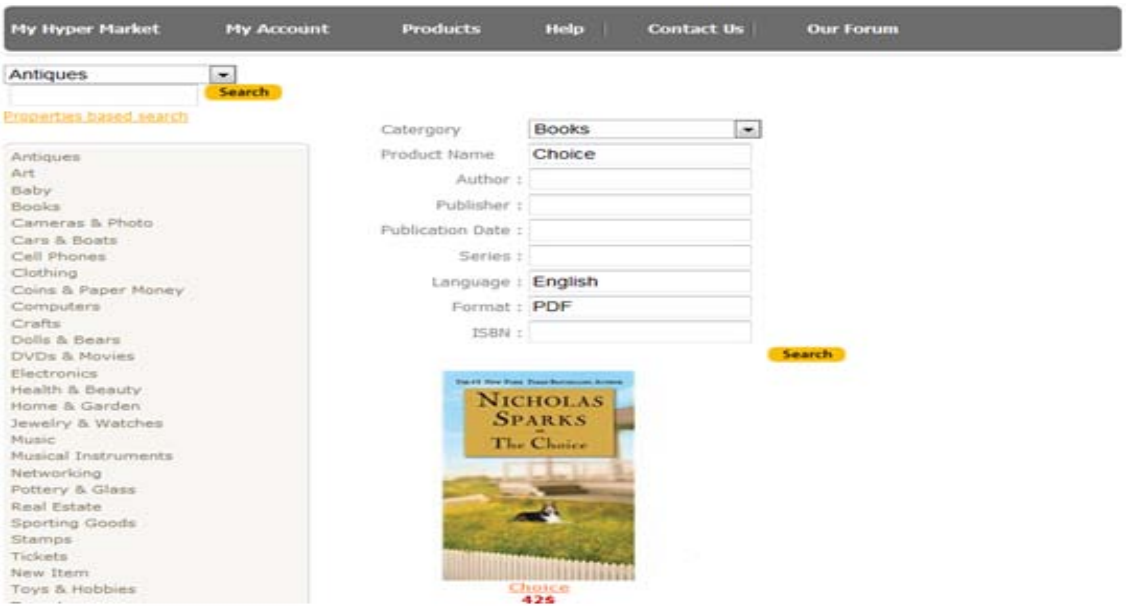

Figure9- The result of Properties-based Search

V. Conclusions

The aim of this article is to design and build an E-Hyper Market on the Internet, which integrates a large number of commercial sites. The purpose is to attract and entice the largest number of customers as much as possible.

Moreover, facilitate the purchase process in order to increase of the percentage of sales (retail) for this commercial site, thereby increasing the profits of the companies and the factories that contribute to the success of the commercial site through the following:

1. Flexible payment process by dividing the total amount of the product that will be bought to a number of payments methods that fits each customer (Credit Card, Internet Bank, on delivery…etc.), given that E-payments help in avoiding long queues and other hassles and provide freedom for individuals to pay taxes, licenses and fees.
2. 2-Gain time and save effort for the customer and assisting him by facilitating the comparison between different products in terms of specifications and characteristics of the product that he wants to buy before beginning the purchase process.
3. 3-Properties-Based Search method was introduced. It searches accurately depending on the characteristics and specifications of the product according to the product category.

ASP.NET is used as a programming language to build this project, and MY-SQL is used as a database engine. With the extra services that this commercial site renders; it will be more flexible and easier to use when comparing with other similar sites.

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Dispersion Post-Compensation Using DCF at 10 GBPS

By Ramesh Pawase, R.P.Labade,.S.B.Deosarkar
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Abstract- In this paper, the performance of negative dispersion fiber used as a dispersion compensating module is investigated. The optimal operating condition of the DCM was obtained by considering dispersion management configurations i.e. post-compensation. The DCF was tested on a single span, single channel system operating at a speed of 10 Gbit/s with the transmitting wavelength of 1550 nm, over 120 km of convention single mode fibre. Furthermore, the performance of the system at 240 km,480km,720km,960km,1200km were also used to examine the results for the over- and under compensation links respectively. So far, most investigations for SMF transmission at high amplifier spacings in the order of 90 km to 120 km focused on conventional NRZ-format. The Q-factor and BER was estimated. The results indicate performance for all the configurations.

Keywords: Dispersion, Dispersion Compensating Management(DCM) , Dispersion Compensating Fiber (DCF), Non Return to Zero(NRZ).

Classification: GJCST Classification: C.2.5

Strictly as per the compliance and regulations of:

Dispersion Post-Compensation Using DCF at 10GBPS

Mr.Ramesh Pawase[1], Mrs. R.P.Labade[2], Dr.S.B.Deosarkar[3]

Abstract-In this paper, the performance of negative dispersion fiber used as a dispersion compensating module is investigated. The optimal operating condition of the DCM was obtained by considering dispersion management configurations i.e. post-compensation. The DCF was tested on a single span, single channel system operating at a speed of 10 Gbit/s with the transmitting wavelength of 1550 nm, over 120 km of convention single mode fibre. Furthermore, the performance of the system at 240 km,480km,720km,960km,1200km were also used to examine the results for the over- and under compensation links respectively. So far, most investigations for SMF transmission at high amplifier spacings in the order of 90 km to 120 km focused on conventional NRZ-format. The Q-factor and BER was estimated. The results indicate performance for all the configurations.

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I. Introduction

Light wave systems used in the core transport network of telecommunication systems operate in the second transmission window. The 1550 nm wavelength region exhibits the lowest attenuation coefficient, thus expanding the repeater distance in the network. However, the influence of the large dispersion coefficient associated with the second transmission window limits the operating speed of the network to 2.5 Gbit/s or less. In order for the network to operate at higher bit-rate, a dispersion management scheme is needed. Dispersion compensation in Optical systems operating at 1550 nm can be achieved by employing dispersion mapping techniques. In this technique, fibres of opposing dispersion coefficient are made to alternate along the length of the optical link. In general NDFs have a large dispersion in comparison to standard SMFs, thus a relatively short NDF can compensate for dispersion accumulated over long links of SMFs . NDFs are easy to install and require little modification to an already existing system.

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The major disadvantage of NDF is that it exhibits a large attenuation in signal power, as a result more optical amplifiers are generally deployed in the system. This in turn enhances the other limitations in the system because the non-linear attributes of this fibre is considerably higher. Results have also been validated through numerical simulations with the optical system simulator OptSim.

II. DCF Information

In order to meet the growing demand of bandwidth for internet and other related communication applications, future long-haul systems are required to operate at bit-rate of 10 Gbit/s, 40 Gbit/s or even higher. In high capacity systems, dispersion compensation is critical. The transmission fibers in the existing network are the standard non-zero dispersion fibres (NZDF)5 with nominal value for dispersion equal to +17 ps / nm · km . Although these fibers were deployed several decades ago, they are still preferred by system designers today because the high dispersion of the fiber is used efficiently to impair the non-linear manifestation of fibre in systems. However, the accumulation of dispersion in these fibres limits the transmission distance to approximately 60 to 300 km for 10 Gbit/s systems and 4 to 18 km for 40 Gbit/s systems if dispersion compensation is not employed. Hence dispersion compensation is required to increase the transmission distance in systems operating at high bit -rates. Furthermore, the DC device is required to have a sufficiently large bandwidth in order to achieve simultaneous compensation across all the channels. This implies that the DC device must be capable of dispersion slope compensation. Several dispersion and dispersion slope compensating devices have been demonstrated, including single-mode and higher-order-mode dispersion compensating fibres, fibre Bragg grating devices, Although many of these devices have great potential, including tuneable dispersion, single mode dispersion compensating fibres (DCF) are still the only one that is widely deployed.

III. Dispersion Management

Dispersion management1 can be achieved with various combinations of fibre layout. The widely implemented configurations are post-compensation depicted as type 1 in the schematic below, and pre-compensation depicted as type 2. The accumulated dispersion and relative power for both pre- and post-configuration are depicted in figure.

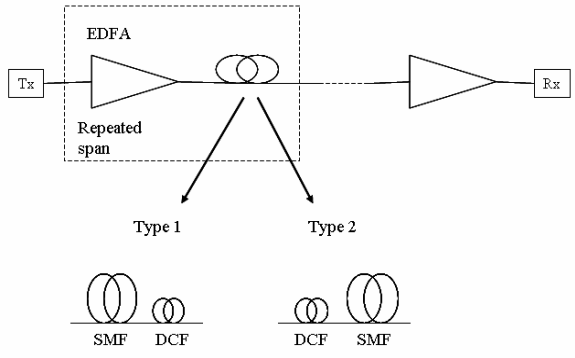

Fig1: Dispersion Management Schemes

IV. Dispersion Management System in Optsim

The considered system configurations are depicted in Fig. 1 . In all schemes the transmission line consists of equal numbers of 120 kin SMF and 24 kin DCF sections. The fibre parameters for SMF and DCF are listed in Table 1 . We assumed a partial compensation of second-order dispersion by DCF units. We assumed zero path-average dispersion in all schemes. The amplifier gain, 26.4 dB after SMF section and 19.2 dB after DCF section, equalizes the loss. The amplifier noise figure is supposed to be 6dB. or NRZ-modulation format the transmitter emits chirp-free modulated pulses with a risetime of 25% f the bitslot. At the receiver the signal was optically filtered, detected and then electrically filtered. As a measure of system performance Q factor and BER are evaluated that in standard fibre transmissions operating at 10Gb/s at high amplifier spacings of l20km the impact of fibre nonlinearity is diminished by symmetrical ordering of dispersion compensating fibres allowing 1200km

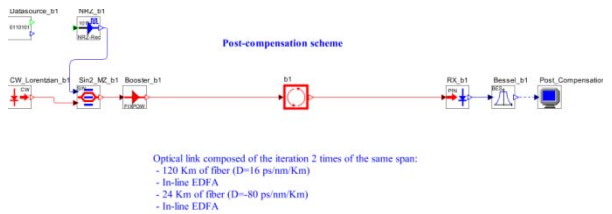

Fig 2: Dispersion Management Schemes implemented in OptSim

Fibre Parameters	SMF	DCF
Length(km)	120	24
Dispersion [ps/km/nm]	+16.2	-81
Dispersion slope [ps/km/nm^2]	+0.08	-0.15
Loss(dB/km)	0.22	0.8
Nonlinear Coefficient(Wkm)$^{-1}$	1.28	4.05
Transmitter /Receiver Param.	NRZ	
Bit rate [Gb/s]	10	
Pattern length	2^7	
Sampling points	2^{14}	

Table1: Parameters of Fibers used

Following schematics shows implementation of PRE Dispersion Compensation Post Dispersion Compensation and Symmetrical Dispersion Compensation.

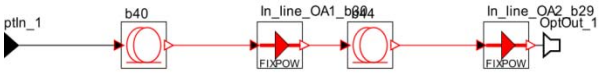

Fig3: Dispersion Management Schemes implemented in OptSim(Internal part)

V. Results and Discussions

Span (Km)	Q factor	BER(bits/s)
240	27.904850	1e-40
480	22.938838	1 e-40
720	21.812637	4.09423 e-35
960	20.306856	4.67606e-24
1200	18.896957	9.45207 e-19

Table2: Results at various spans

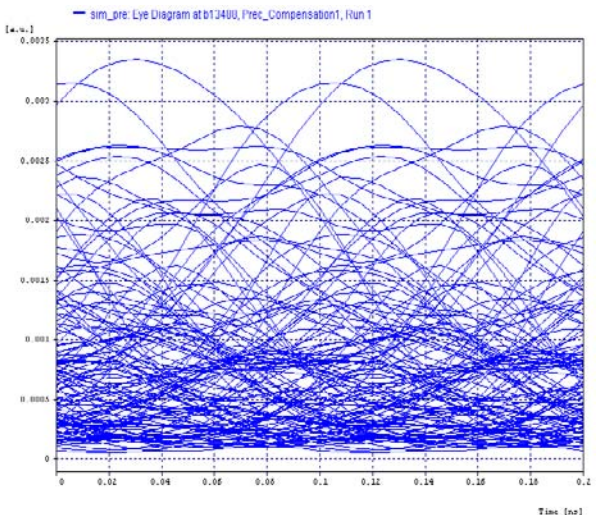

Figure4: Eye diagram at 240 km without compensation

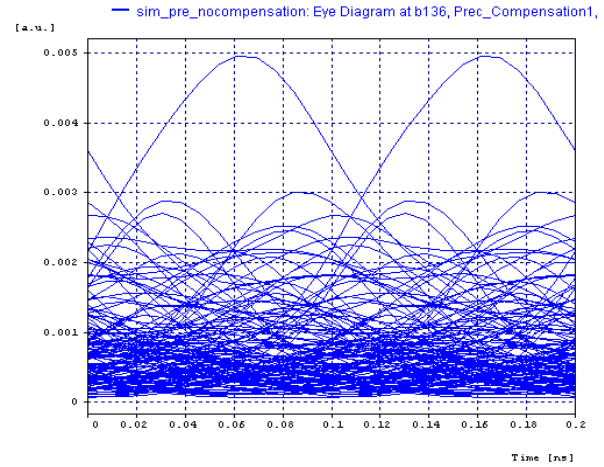

Figure5: Eye diagram at 1200 km without compensation

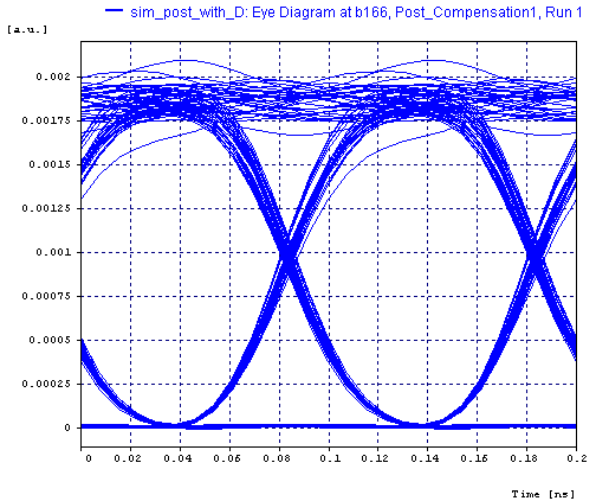

Figure6: Eye diagram at 240 km with Post compensation

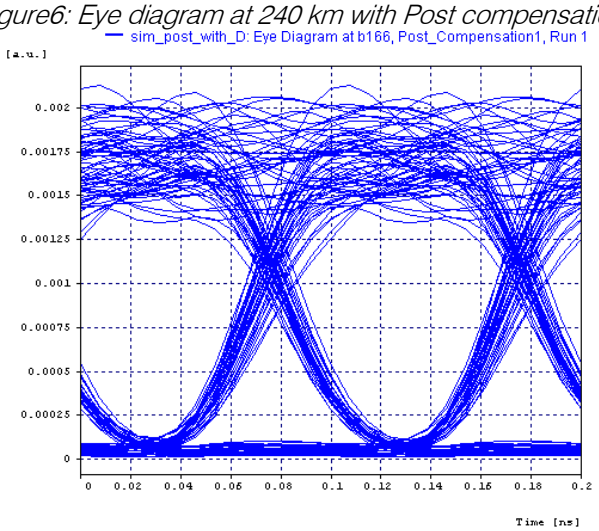

Figure7: Eye diagram at 1200 km with Post compensation

The experiment showed that the amount of negative dispersion introduced, with respect to the total accumulated dispersion of the transmission fibre, also impacted on the performance of the system.

In the single channel optical system experiment, it was found that the system performance gradually improved as the total dispersion of the transmission fibre tended toward that of the DCF and in a similar fashion, the system performance decreased as the total dispersion of fibre exceeded that of the DCF. Results obtained with no compensation, to for the post- compensation Furthermore, analysis of the Q-factor also revealed that system performance had exceeded the minimum requirement of 6 by a large margin.

VI. Conclusion

From the above summary, one may conclude that for a single channel, single span optical communication system, the dispersion distance limit increased by introducing dispersion management into the network.

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Strengths and Weaknesses of Near Field Communication (NFC) Technology

By Mohamed Mostafa Abd Allah
Minia University

About- This paper gives a comprehensive analysis of security with respect to NFC. We propose a protocol that can be used between an RFID tag and a reader to exchange a secret without performing any expensive computation. The paper introduced an NFC specific key agreement mechanism, which provides cheap and fast secure key agreement. Key agreement techniques without authentication can be used to provide a standard secure channel. This resistance against Man-in-the-Middle attacks makes NFC an ideal method for secure pairing of devices. The paper lists some of threats, which are applicable to NFC, and describes solutions to protect against these threats.

Keywords: *Near Field Communication, threats, key agreement.*

Classification: *GJCST Classification: E.3, E.4, C.2.0*

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Keywords: *Near Field Communication, threats, key agreement.*

I. Introduction

Near Field Communication (NFC) is a technology for high frequency wireless short-distance point-to-point communication. The operational range for NFC is within less than 20 cm which is good from a security perspective as it diminishes the threat of eavesdropping. Other reasons to use NFC are the low cost of the necessary components and that the connecting time is negligible. It is small circuit attached to a small antenna, capable of transmitting data to a distance of several meters to a reader device (reader) in response to a query. Most RFID tags are passive, meaning that they are battery-less, and obtain their power from the query signal. They are already attached to almost anything: clothing, foods, access cards and so on. It is impossible to give a complete picture of NFC applications as NFC is just an interface. Contactless Token covers most of applications, which use NFC to retrieve some data from a passive token. The passive token could be a contactless Smart Card, an RFID label, or a key fob. In Ticketing / Micro Payment application example, the NFC interface is used to transfer some valuable information. The ticket or the micro payment data is stored in a secure device. This could be a contactless Smart Card, but could as well be a mobile phone.

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When the user wants to perform a payment or use the stored ticket, the user presents the device to a reader, which checks the received information and processes the payment or accepts/rejects the ticket. In this application example the user device must be able to perform a certain protocol with the reader. A simple read operation will not be sufficient in most cases. Also, the user device is likely to have a second interface which is used to load money or to buy tickets. This second interface can for example be linked to the mobile phone CPU. The ticket data could then be loaded into the mobile phone via the cellular network. Because NFC is a wireless communication interface it is obvious that threat is an important issue. When two devices communicate via NFC they use RF waves to talk to each other. An attacker can of course use an antenna to also receive the transmitted signals. Either by experimenting or by literature research the attacker can have the required knowledge on how to extract the transmitted data out of the received RF signal. Also the equipment required to receive the RF signal as well as the equipment to decode the RF signal must be assumed to be available to an attacker as there is no special equipment necessary. In this paper we use a systematic approach to analyze the various aspects of security whenever an NFC interface is used. We want to clear up many misconceptions about security and NFC in various applications. The paper lists the threats, which are applicable to NFC, and describes solutions to protect against these threats. The rest of this paper is organized as follows. A brief description about NFC operation modes are given in Section (2). A list of threats technique is discussed in Section (3). Real solution against these threats and establishes a secure channel is presented in Section (4). Finally, concluding remarks are made in Section (5).

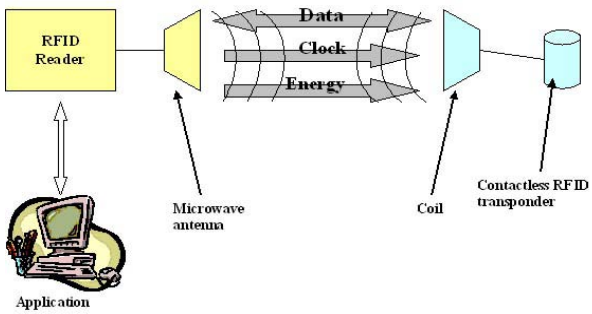

Figure1– Typical communication procedure

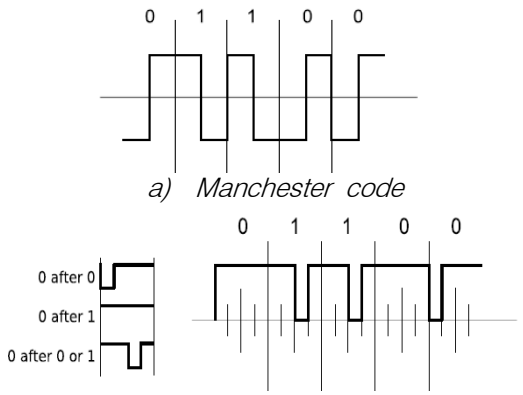

Figure.2 (b) Modified Miller code

II. NFC Operation Modes

NFC can operate in two modes. The modes are distinguished whether a device creates its own RF field or whether a device retrieves the power from the RF field generated by another device. If the device generates its own field and has a power supply, it is called an active device; otherwise it is called a passive device. When two devices communicate three different configurations are possible (Active-Active, Active-Passive, and Passive-Active). These configurations are important because the way data is transmitted depends on whether the transmitting device is in active or passive mode.

In active mode the data is sent using amplitude shift keying (ASK) [1],[2]. This means the base RF signal (13,56 MHz) is modulated with the data according to a coding scheme. If the baudrate is 106 kBaud, the coding scheme is the so-called modified Miller coding. If the baudrate is greater than 106 kBaud the Manchester coding scheme is applied. As shown in figure 2, each single data bit in both coding schemes is sent in a fixed time slot. This time slot is divided into two halves, called half bits. In Miller coding a zero is encoded with a pause in the first half bit and no pause in the second half bit. A one is encoded with no pause in the first bit, but a pause in the second half bit. In the modified Miller coding some additional rules are applied on the coding of zeros. In the case of a one followed by a zero, two subsequent half bits would have a pause. Modified Miller coding avoids this by encoding a zero, which directly follows a one with two half bits with no pause.

In the Manchester coding the situation is nearly the same, but instead of having a pause in the first or second half bit, the whole half bit is either a pause or modulated.

Besides the coding scheme also the strength of the modulation depends on the baudrate. For 106 kBaud 100% modulation is used. This means that in a pause the RF signal is actually zero. No RF signal is sent in a pause. For baudrates greater than 106 kBaud 10% modulation ratio is used. According to the definition of this modulation ratio [1], this means that in a pause the RF signal is not zero, but it is about 82% of the level of a non paused signal. This difference in the modulation strength is very important from a security point of view as we will describe later on in the security analysis.

In passive mode the data is sent using a weak load modulation. The data is always encoded using Manchester coding with a modulation of 10%. For 106 kBaud a subcarrier frequency is used for the modulation, for baudrates greater than 106 kBaud the base RF signal at 13.56 MHz is modulated.

Additionally to the active and passive mode, there are two different roles a device can play in NFC communication. NFC is based on a message and reply concept. This means one device A sends a message to another device B and device B sends back a reply. It is not possible for device B to send any data to device A without first receiving some message from device A, to which it could reply. The role of the device A which starts the data exchange is called initiator, the role of the other device is called target. Furthermore it should be mentioned that NFC communication is not limited to a pair of two devices. In fact one initiator device can talk to multiple target devices. In this case all target devices are enabled at the same time, but before sending a message, the initiator device must select a receiving device. The message must then be ignored by all non selected target devices. Only the selected target device is allowed to answer to the received data. Therefore, it is not possible to send data to more than one device at the same time (i.e. broadcasting messages are not possible).

Typical communication procedure between the initiator and target can be highlighted as shown in figure 1.

- *Handshake:*
  - The interrogator sends a command to start communication with transponder in the interrogator field and also to power it (passive transponders).
  - Once the tag has received sufficient energy and command from the reader, it reply's with its ID for acknowledgment.
  - The reader now knows which tag is in the field and sends a command to the identified tag for instructions either for processing (read or write) or Sleep.
- Data exchange:
  - If the tag receives processing and reading commands, it transmits a specified block data and waits for the next command.
  - If the tag receives processing and writing commands along with block data, it writes the block data into the specified memory block, and transmits the written block data for verification.

III. NFC Applications Threats

Although contactless token systems may emerge as one of the most pervasive computing technologies, there are still a vast number of problems that need to be solved before their massive deployment. One of the fundamental issues still to be addressed is privacy. Products labeled with tags reveal sensitive information when queried by readers, and they do it indiscriminately.

A problem closely related to privacy is tracking, or violations of location privacy. This is possible because the answers provided by tags are usually predictable: in fact, most of the times, tags provide always the same identifier, which will allow a third party to easily establish an association between a given tag and its holder or owner. Even in the case in which tags try not to reveal any kind of valuable information that could be used to identify themselves or their holder, there are many situations where, by using an assembly of tags (constellation), this tracking will still be possible. Although the two aforementioned problems are the most important security questions that arise from NFC technology, there are some others worth to mention:

1) *Eavesdropping Threats*

In this type of attacks, unintended recipients are able to intercept and read messages.

The NFC communication is usually done between two devices in close proximity. This means they are not more than 10 cm (typically less) away from each other. The main question is how close an attacker needs to be to be able to retrieve a usable RF signal. Unfortunately, there is no correct answer to this question. The reason for that is the huge number of parameters which determine the distance depends on the following parameters,

- RF filed characteristic of the given sender device (i.e. antenna geometry, shielding effect of the case, the PCB, the environment)
- Characteristic of the attacker's antenna (i.e. antenna geometry, possibility to change the position in all 3 dimensions)
- Quality of the attacker's receiver
- Quality of the attacker's RF signal decoder Power sent out by the NFC device

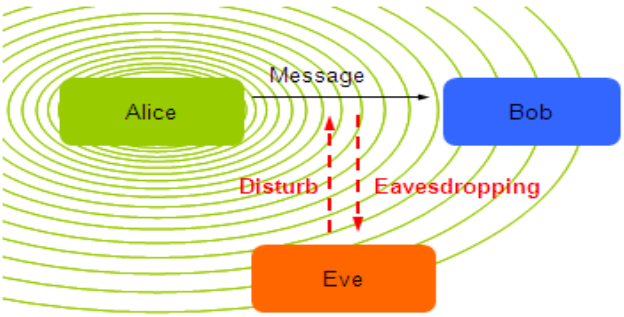

Figure 3 Eavesdropping and Data Modification Threats

- Setup of the location where the attack is performed (e.g. barriers like walls or metal, noise floor level)

Furthermore, eavesdropping is extremely affected by the communication mode. That's because, based on the active or passive mode, the transferred data is coded and modulated differently. If data is transferred with stronger modulation it can be attacked easier. Thus, a passive device, which does not generate its own RF field, is much harder to attack, than an active device.

Therefore any exact number given would only be valid for a certain set of the above given parameters and cannot be used to derive general security guidelines.

Avoiding eavesdropping can be done by establishing a secure channel as outlined in section 4.1. This requires the establishment of a session secret key, which is not always an easy task considering the very limited devices' capacities.

2) *Data Modification Threats*

As shown in figure 3, instead of just listening, an attacker can also try to modify the data which is transmitted via the NFC interface. In the simplest case the attacker just wants to disturb the communication such that the receiver is not able to understand the data sent by the other device.

In data modification, the attacker wants the receiving device to actually receive some valid, but manipulated data. This is very different from just data corruption.

The feasibility of this attack highly depends on the applied strength of the amplitude modulation. This is because the decoding of the signal is different for 100% in modified Miller coding modulation and 10% in Manchester coding modulation.

In 100% modulation the decoder checks the two half bits for RF signal on (no pause) or RF signal off (pause). In order to make the decoder understand a one as a zero or vice versa, the attacker must do two things. First, a pause in the modulation must be filled up with the carrier frequency. This is feasible. But, secondly, the attacker must generate a pause of the RF signal, which is received by the legitimate receiver. This means the attacker must send out some RF signal such that this signal perfectly overlaps with the original signal at the receiver's antenna to give a zero signal at the receiver. This is practically impossible. However, due to the modified Miller coding in the case of two subsequent ones, the attacker can change the second one into a zero, by filling the pause, which encodes the second one. The decoder would then see no pause in the second bit and would decode this as a correct zero, because a one precedes it. In 100% modulation an attacker can therefore never change a bit of value 0 to a bit of value 1, but an attacker can change a bit of value 1

to a bit of value 0, in case this bit is preceded by a bit of value 1 (i.e. with a probability of 0.5). In 10% modulation the decoder measures both signal levels (82% and Full) and compares them. In case they are in the correct range the signal is valid and gets decoded. An attacker could try to add a signal to the 82% signal, such that the 82% signal appears as the Full signal and the actual Full signal becomes the 82% signal. This way the decode would decode a valid bit of the opposite value of the bit sent by the correct sender. Whether the attack is feasible depends a lot on the dynamic input range of the receiver. It is very likely that the much higher signal level of the modified signal would exceed the possible input range, but for certain situations this cannot be ruled out completely. The conclusion is that for the modified Miller encoding with 100% ASK this attack is feasible for certain bits and impossible for other bits, but for Manchester coding with 10% ASK this attack is feasible on all bits.

Protection against data modification can be achieved in various ways. By using 106k Baud in active mode it gets impossible for an attacker to modify all the data transmitted via the RF link as described above. This means that for both directions active mode would be needed to protect against data modification. While this is possible, this has the major drawback, that this mode is most vulnerable to eavesdropping. In addition, the protection against modification is not perfect, as even at 106k Baud some bits can be modified. The two other protection options might therefore be preferred. NFC devices can check the RF field while sending. This means the sending device could continuously check for such an attack and could stop the data transmission when an attack is detected. The third and probably best solution would be a secure channel as described in section 4.1.

3) *Man-in-the-Middle Threats*

In Man-in-the-Middle Attack, two parties want to talk to each other, called Alice and Bob, are tricked into a three party conversation by an attacker Eve. This is shown in Figure 3. Assuming that Alice uses active mode and Bob would be in passive mode, we have the following situation. Alice generates the RF field and sends data to Bob. In case Eve is close enough, she can eavesdrop the data sent by Alice. Additionally she must actively disturb the transmission of Alice to make sure that Bob doesn't receive the data. This is possible for Eve, but this can also be detected by Alice. In case Alice detects the disturbance, Alice can stop the key agreement protocol. Let's assume Alice does not check for active disturbance and so the protocol can continue. In the next step Eve needs to send data to Bob. That's already a problem, because the RF field generated by Alice is still there, so Eve has to generate a second RF field. This however, causes two RF fields to be active at the same time. It is practically impossible to perfectly align these two RF fields. Thus, it is practically impossible for Bob to understand data sent by Eve. Because of this and the possibility of Alice to detect the attack much earlier we conclude that in this setup a Man-in-the-Middle attacks is practically impossible.

The only other possible setup is that Alice uses active mode and Bob uses active mode, too. In this case Alice sends some data to Bob. Eve can list and Eve again must disturb the transmission of Alice to make sure that Bob does not receive the data. At this point Alice could already detect the disturbance done by Eve and stop the protocol. Again, let us assume that Alice does not do this check and the protocol continues. In the next step Eve would need to send data to Bob. At first sight this looks better now, because of the active-active communication Alice has turned off the RF field. Now Eve turns on the RF field and can send the data. The problem here now is that also Alice is listening as she is expecting an answer from Bob. Instead she will receive the data sent by Eve and can again detect a problem in the protocol and stop the protocol. It is impossible in this setup for Eve to send data either to Alice or Bob and making sure that this data is not received by Bob or Alice, respectively.

We claim that due to the above given reasons it is practically infeasible to mount a Man-in-the-Middle attack in a real-world scenario. It is practically impossible to do a Man-in-the-Middle-Attack on an NFC link. Therefore, setup a secure channel with an active-passive communication mode as outlined in section 4.1 can be used to improve privacy and prevent tracking against Man-in-the-Middle-Attacks Additionally, the active party should listen to the RF filed while sending data to be able to detect any disturbances caused by a potential attacker.

IV. Solutions and Recommendations

In this section we present the best solutions proposed so far to solve the security problems and threats associated with the use of NFC systems. Our objective is not to give a detailed explanation of each solution, but to provide the fundamental principles and a critical review of every proposal.

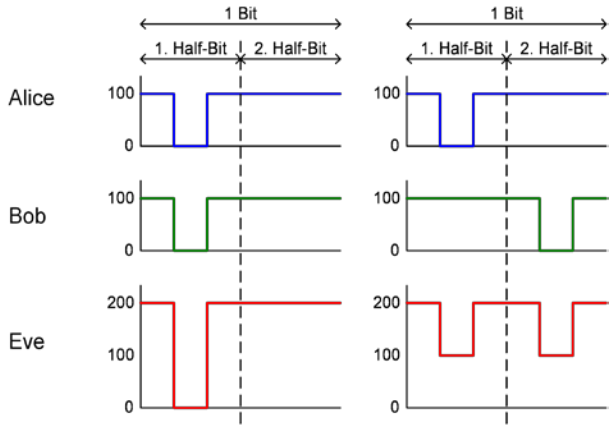

Figure4 NFC specific Key Agreement

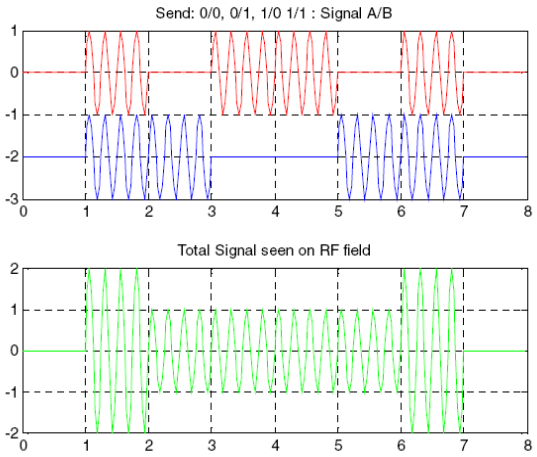

Figure5- Total signal seen on RF Field

Most of classical solution approach protecting the privacy of NFC communication is done by isolating them from any kind of electromagnetic waves. This can be made using what is known as a Faraday Cage (FC), a container made of metal mesh or foil that is impenetrable by radio signals (of certain frequencies). There are currently a number of companies that sell this type of solution [13]. Other solution is active jamming approach that disturbing the radio channel, RF signals. This disturbance may be done with a device that actively broadcasts radio signals, so as to completely disrupt the radio channel, thus preventing the normal operation of RFID readers.

1) *Secure Channel for NFC*

Establishing a secure channel between two NFC devices is clearly the best approach to protect against eavesdropping, data modification attack, and enhance the inherent protection of NFC against Man-in-the-Middle-Attacks. A standard key agreement protocol like Diffie-Hellmann based on RSA [4] or Elliptic Curves could be applied to establish a shared secret between two devices. The shared secret can then be used to derive a symmetric key like 3DES or AES, which is then used for the secure channel providing confidentiality, integrity, and authenticity of the transmitted data. Various modes of operation for 3DES and AES could be used for such a secure channel and can be found in literature [3].

2) *Proposed NFC Key Agreement*

The proposed NFC specific key agreement does not require any asymmetric cryptography and therefore reduces the computational requirements significantly. The scheme works with 100% ASK only where, both devices say Device A and Device B, send random data at the same time. In a setup phase the two devices synchronize on the exact timing of the bits and also on the amplitudes and phases of the RF signal. This is possible as devices can send and receive at the same time. After that synchronization, A and B are able to send at exactly the same time with exactly the same amplitudes and phases. While sending random bits of 0 or 1, each device also listens to the RF field. When both devices send a zero, the sum signal is zero and an attacker, who is listening, would know that both devices sent a zero. This does not help. The same thing happens when both, A and B, send a one. The sum is the double RF signal and an attacker knows that both devices sent a one. It gets interesting once A sends a zero and B sends a one or vice versa. In this case both devices know what the other device has sent, because the devices know what they themselves have sent. However, an attacker only sees the sum RF signal and he cannot figure out which device sent the zero and which device sent the one. This idea is illustrated in Figure 4.

In figure 5, the top figure shows the signals produced by A and by B. A sends the four bits: 0, 0, 1, and 1. B sends the four bits: 0, 1, 0, and 1. The lower graph shows the sum signal as seen by an attacker. It shows that for the bit combinations (A sends 0, B sends 1) and (A sends 1, B sends 0) the result for the attacker is absolutely the same and the attacker cannot distinguish these two cases. The two devices now discard all bits, where both devices sent the same value and collect all bits, where the two devices sent different values. They can either collect the bits sent by A or by B. This must be agreed on start-up, but it doesn't matter. This way A and B can agree on an arbitrary long shared secret. A new bit is generated with a probability of 50%. Thus, the generation of a 128 bit shared secret would need approximately 256 bits to be transferred. At a baud rate of 106 k Baud this takes about 2.4 ms, and is therefore fast enough for all applications. The security of this protocol in practice depends on the quality of the synchronization which is achieved between the two devices. Obviously, if an eavesdropper can distinguish data sent by A from data sent by B, the protocol is broken. The data must match in amplitude and in phase. Once the differences between A and B are significantly below the noise level received by the eavesdropper the protocol is secure. The level of security therefore also

depends on the signal quality at the receiver. The signal quality however again depends on many parameters (e.g. distance) of the eavesdropper. In practice the two devices A and B must aim at perfect synchronization. This can only be achieved if at least one of A or B is an active device to perform this synchronization.

V. Conclusion

We presented typical use cases for NFC interfaces. A list of threats has been derived and addressed. NFC by itself cannot provide protection against eavesdropping or data modifications. The only solution to achieve this is the establishment of a secure channel over NFC. This can be done very easily, because the NFC link is not susceptible to the Man-in-the-Middle attack. Therefore, well known and easy to apply key agreement techniques without authentication can be used to provide a standard secure channel. This resistance against Man-in-the-Middle attacks makes NFC an ideal method for secure pairing of devices. Additionally, we introduced an NFC specific key agreement mechanism, which provides cheap and fast secure key agreement.

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A Hybrid Image Compression Technique Using Wavelet Transformation - MFOCPN and Interpolation

By Anna Saro Vijendran, Vidhya.B

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Keywords: *Wavelets; MFOCPN; Nearest Neighborhood Interpolation; Cosine Interpolation*

Classification: *GJCST Classification: G.1.2, G.1.1*

Strictly as per the compliance and regulations of:

A Hybrid Image Compression Technique Using Wavelet Transformation - MFOCPN and Interpolation

Dr.Anna Saro Vijendran[1], Vidhya.B[2]

Abstract- In this paper an interpolation method is proposed for compression technique. The method used is the localizing of spatial and frequency correlation from wavelets. Modified Forward Only Counter Propagation Neural Network (MFOCPN) is used for the classification and functional task. The wavelet based technique decomposes the lower sub band consisting of non significant coefficients and are eliminated. The significant smooth and sharp coefficients are found using interpolation methods. Here a new technique is proposed called the cosine interpolation, which is an alternative to the nearest neighborhood interpolation method. This methodology of interpolation proved to be an efficient approach for mapping all significant coefficients and thus resulting in improved quality. Hence the comparison is made between nearest neighborhood interpolation and cosine interpolation. The experimental results are tested on various standard images, where these results yield a better PSNR value compared with the existing nearest neighbor interpolation method.

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I. Introduction

Digital Image Processing is defined as analyzing and manipulating images. Image Compression has become the most recent emerging trend throughout the world. Some of the common advantages image compressions over the internet are reduction in time of webpage uploading and downloading and lesser storage space in terms of bandwidth. Compressed images also make it possible to view more images in a shorter period of time [1].Image compression is essential where images need to be stored, transmitted or viewed quickly and efficiently. The benefits can be classified under two ways as follows: First, even uncompressed raw images can be stored and transmitted easily. Secondly, compression provides better resources for transmission and storage.

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Image compression is the representation of image in a digitized form with a few bits maintenance only allowing acceptable level of image quality. Compression addresses the problem of reducing the amount of data required to represent a digital image. A good compression scheme is always composed of many compression methods namely wavelet transformation, predicative coding, and vector quantization and so on.

Wavelet transformation is an essential coding technique for both spatial and frequency domains, where it is used to divide the information of an image into approximation and detail sub signals [2].

Artificial Neural Networks (ANN) is also used for image compression. It is a system where many algorithms are used. The ANN is viewed as a graph with various nodes namely source, sink and internal [3].

The input node exists in the input layer and output node exists in the output layer whereas hidden nodes exist in one or more hidden layers. In ANN various learning method are used namely Unsupervised, Reinforcement learning and Back propagation.

Counter Propagation Neural Network (CPN) has become popular since it converges faster. A level of advancement in CPN is forward only Counter Propagation (FOCPN), where correlation based technique is used [4], [5],[6]. Modified forward only Counter Propagation (MFOCPN) is proposed where distance metrics are used to find the winner among the hidden layers neurons [7].

Some of the recent works have the combination of Artificial Neural Network and classical wavelet based approach which yields better compression ratio [8]. In this paper a new method is proposed using wavelet decomposition coefficients in MFOCPN by an interpolation. Two different interpolation methods are applied in MFOCPN and the results are compared. The Organization of this paper is as follows: Section II describes the existing methodology. Section III explains the proposed method with architecture. In Section IV the experimental results are compared and Suggestions are made In Section V.

II. Overview of Methodologies Used

1) *Wavelet Transforms*

A Wavelet is a foundation for representing images in various degrees of resolution. Wavelet transforms is just the representation of functions by a wavelet, which is a mathematical function, dividing the function into various frequency component matching the resolution. Wavelet transformation methodology has been used because of the disadvantages in Fourier Transformation [12]. A wavelet transformation has been classified as discrete wavelet transforms (DWTs) and continuous wavelet transforms (CWTs). A wavelet is represented as multi resolution level where each analysis is implemented through high pass and low pass filters, where each high pass filter is passed on wavelets and low pass filters is based on scaling functions. The wavelet transform function is based on the conversion of one dimensional function into two dimensional space involving translation and dilation parameters related to time and scale factors. Both the high and low frequency supports well for wavelet transform hence are well suited for image compression.

2) *Modified Forward Only Counterpropagation Neural Network (Mfocpn)*

The counter propagation network is a hybrid network, and called to be a self organizing loop, having the characteristic of both self organizing map (SOM) and feed forward neural network. The variants of CPN are of two types forward counter propagation and full counter propagation. The CPN has three layers namely input, instar and outstar is given in Fig (1).

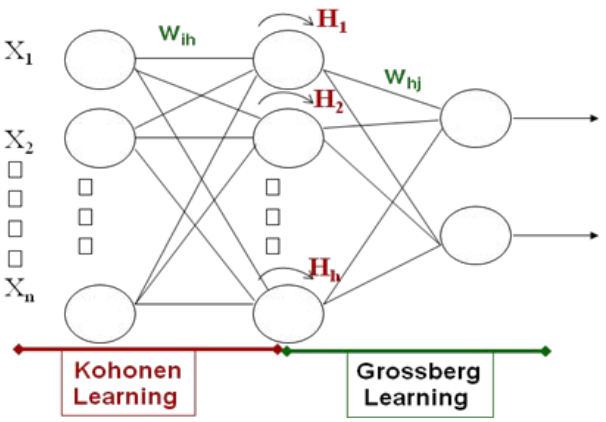

Fig.1 CPN Architecture

The input and the instar layer is said to have a competitive connection where only one neuron is considered as winner. The instar and outstar are connected by as feed forward networks. Thus in CPN each layer is considered and trained separately enabling the network as a good classification model. The learning in CPN is classified as the learning Process is given in two phases. The Kohonen learning (unsupervised) phase and the Grossberg learning (supervised) phase [7], [8].

3) *Thresolding*

The combination of both wavelets along with MFO-CPN provides a better compression. In Fig (2) a classical wavelet based compression is shown where the DWT is used then it is passed to Quantizer where the pixels are only reduced, where as in Fig (3) a wavelet along with CPN model is used to obtain a significant pixels [13]. Discrete wavelet transform (DWT) is done to reduce the inter pixel redundancy.

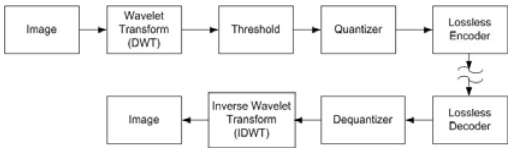

Fig.2 Block Diagram for Classic Wavelet based Image Compression

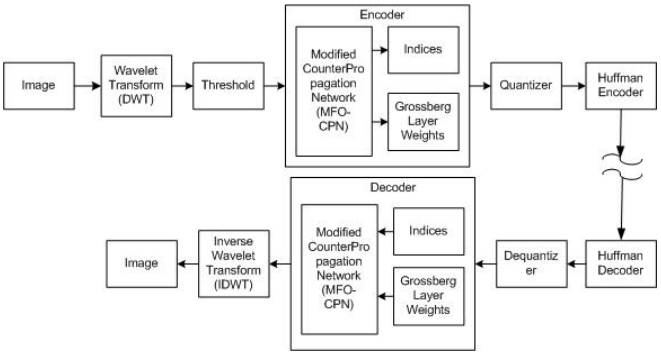

Fig.3 Block Diagram for Wavelet–CPN based Image Compression

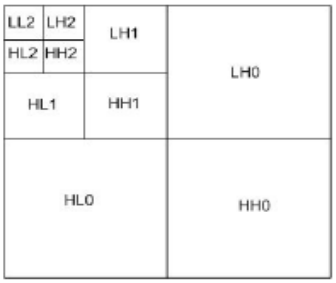

Fig.4a Multi-resolution wavelet representation

Fig(4 b) Boat image

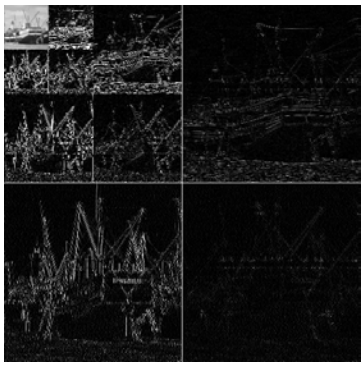

Fig.4c WT in 3 levels

The DWT provides multi resolution system, where the coefficients are quantized along with MFO-CPN where each wavelet level and sub band is trained on the basis of thresolding. An image decomposed with wavelet transformation can be reconstructed with desired resolution. A three level wavelet decomposition allows to transform coefficients. The wavelet sub band decomposition has the non-significant values at the lower level. In the Fig(4 a) the notation L and H represents low pass and high pass filters respectively and the LLi, LHi, HLi,HHi, are the filters where first letter denotes the vertical order (i.e.) the filter applied to rows and second letter denotes the horizontal order (i.e.) the filter applied to columns. The advantage of high pass component is that it reduces the computational time. The levels of decomposition make the compression efficient. Quantizer reduces the number of bits needed to store the transformed coefficients. It is considered as many to one mapping.

The thresolding parameter is chosen based on experimentation or based on visual effect of reconstructed image. The universal thresolding parameter is λ [13],[10] which has the number of total coefficients and standard deviation of coefficients. The Fig(4 b) and Fig(4 c) show an boat image with its wavelet transformation having three levels.

In this approach it is experimented to find the direction of significant coefficients across various sub bands of decomposition. Here an adaptive hard thresolding approach is applied for finding the significant wavelet coefficients. The thresolding parameter has been tuned for each level of image after several experimentations based on the quality of the reconstructed image.

III. Proposed Methodology

The proposed methodology is explored with the MFO-CPN networks along with cosine interpolation to obtain the wavelet coefficients for image compression. Discrete Cosine Transform (DCT) was widely used in image compression, but due to various disadvantages as mean weighting defect and noise weighting so on a DWT method is only used. Hence wavelet based transforms are better compared to DCT. The classical wavelet based coding along with MFO-CPN is used where only significant wavelet coefficients are passed after wavelet transformation is applied, instead of passing the whole pixel value.

1) *Interpolation For Spatial Location Of Siginificant Wavelet Coefficient*

The quantization methods help in significant mapping of coefficient along with the positional information to reconstruct the image. The interpolation is a method of adding or removing a pixel while resizing or compressing an image. An interpolation is of different kinds but basically it is divide into two groups namely adaptive and non adaptive. Adaptive methods are used to interpolate among sharp edges and smooth texture whereas nonadaptive methods treat all pixels equally [14]. Various interpolation methods are nearest neighborhood, bilinear, bicubic, spline, and cosine and so on. In our proposed method a nearest neighborhood interpolation is already taken and cosine interpolation method is newly constructed and a comparison is made. Nearest neighbor is the common approach method that requires only least processing time because it considers only the one pixel that is nearby to the interpolated. In other interpolation method it takes four pixels or eight pixels that are surrounded for the interpolated point.

Thus in Fig.(5) a nearest neighborhood interpolation curve is given, which shows a sharp edges are only taken for the interpolated point, hence the considerations for nearest neighbor is less computational technology.

The disadvantage of using linear interpolation is it results in discontinuities. A cosine interpolation is the other simplest methods and tends to provide a smooth transition between adjacent segments. In Fig (6) the curve gives a clear view of cosine interpolation graph where cosine gives a smooth transition curve. Hence both the methods are taken into account and compared on the same metric.

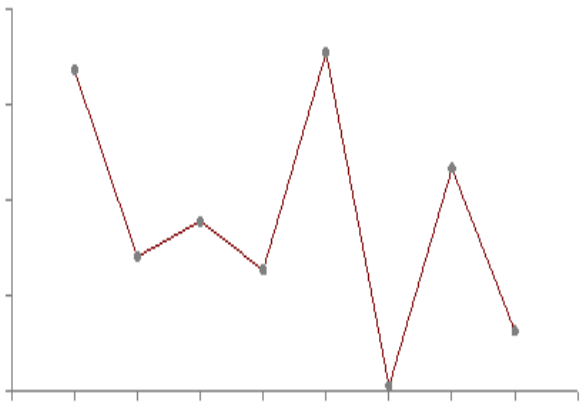

Fig.5 nearest Neighborhood Curve

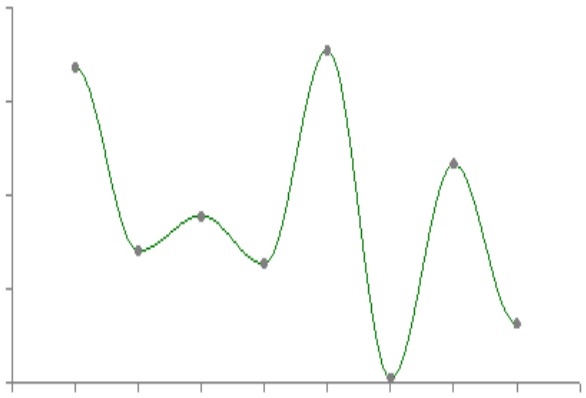

Fig.6 Cosine Interpolation Curve

Initially an image is taken of size M X N, where an wavelet decomposition is done at any level, then thresolding is used along with the MFOCPN by applying VQ to obtain the significant values, where the Cosine Interpolation is used to obtain smooth coefficients, and then decoder along with the inverse wavelet transform is used to obtain the reconstructed image. Algorithm coding explains the process.

Algorithm-coding

Step 1. Wavelet decomposition of image for level k, and assign count c = k.

Step 2. Single level wavelet decomposition of $LL_{(c-1)}$I and apply thresholding on obtained three subbands HL, HH, LH.Find significant coefficient (after thresholding on three subbands) and apply VQ using MFOCPN for coding.

Step 3. Cosine Interpolate the reconstructed LL_c to the size $(M/2^{c-1})$ x $(N/2^{c-1})$ to get $LL_{(c-1)}$I .

Step 4. Decode HL, HH, LH using MFOCPN decoder.

Step 5. Take LL_c and HL, HH, LH from Step 3 and apply inverse wavelet transform (IDWT) with these four subbands and obtain image I of size $(M/2_{c-1})$ x $(N/2_{c-1})$.

Step 6. Change c = k-1 and LL_c = I (from Step 5) and if c = 0 go to Step 6 else go to Step 3.

Step 7. Stop.

IV. Results and Discussions

The simulation results are given in the table. This gives a comparison between the Nearest neighbor and cosine interpolation methods.

Simulations are done as follows:

a) Standard image is taken.
b) Wavelet decomposition and thresolding is taken.
c) Along with the thresolding quantization table is constructed.
d) Wavelet decomposition with the two variants of interpolation method is done using Algorithm-coding in the place of MFO-CPN.
e) Comparison results are displayed in the table.

The interpolation method used is the cosine and nearest neighbor method. Wavelet decomposition is also done; codebook is done using MFO-CPN. Here the results are compared for various standard images and the output of the Lena image is displayed. in the table(1) a comparison result of Lena, cameraman and mandrill image of various sizes namely 128, 256, 512 are taken in all those the PSNR value for the Cosine Interpolation yields a higher value compared with the nearest neighborhood interpolation. From the below table it is seen for the gray scale image using Lena of size 128 X 128 the PSNR value by the Nearest Neighbor is 15.9025 (i.e.) it is 5 times greater increase with the previous value and with Cosine is 20.0200 that Cosine Interpolation PSNR is increased from 5% to 10% than the Nearest Neighborhood Interpolation.

Table (1) Comparison results of various standard images.

Name of the picture	Method	PSNR	CR	MSE	Elapsed time in sec
Lena 128	Nearest neighbor	15.9025	3.78643	639.2694	91.375000
	Cosine	20.0200	3.8925	647.2577	84.546000
Lena 256	Nearest neighbor	19.0147	4.9368	299.4961	495.000000
	Cosine	23.0640	4.9309	321.1307	959.750000
Lena 512	Nearest neighbor	21.7657	4.6669	152.8454	1764.766000
	Cosine	25.5205	4.6642	182.4042	3505.953000
Cameraman128	Nearest neighbor	12.1849	3.9196	685.8150	91.922000
	Cosine	19.6627	4.3505	702.7516	60.453000
Cameraman256	Nearest neighbor	11.9751	5.3142	534.2036	481.844000
	Cosine	20.9323	5.4073	544.6225	572.640000
Cameraman512	Nearest neighbor	13.6512	5.6194	426.0196	4685.750000
	Cosine	24.3799	5.5758	430.1840	2008.76000
Mandrill 128	Nearest neighbor	10.0539	3.5295	758.3493	99.906000
	Cosine	19.2166	3.4406	778.7846	57.016000
Mandrill 256	Nearest neighbor	12.0395	3.4549	428.1329	287.31300
	Cosine	21.8586	3.4438	439.8592	384.875000
Mandrill 512	Nearest neighbor	15.2378	3.6857	611.2921	2973.797000
	Cosine	20.1747	3.4024	624.6178	2135.484000

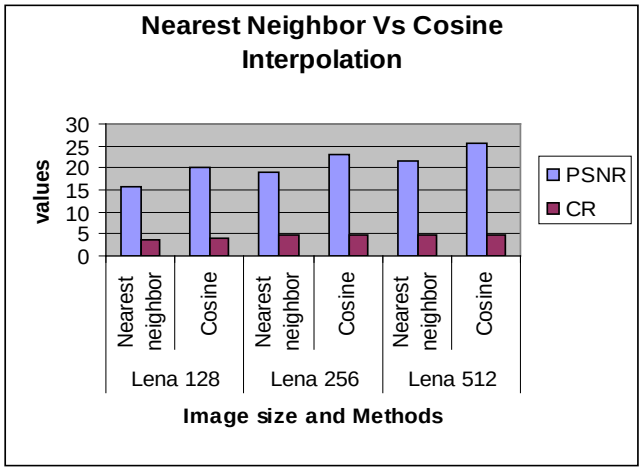

Fig.6 Comparison Graph of nearest neighbor and Cosine Interpolation

Fig.7 (a) Original image

Fig.7 (b) Wavelet decomposition

Fig.7(c) Distorted image

Fig.7 (d) Restored image

The output of the Lena image is given in Fig7 (a) to Fig7 (d), which clearly shows that the visual quality is subjectively good and the clarity is higher than the nearest neighbor interpolation method The graph of the Fig(6) gives a comparison of Lena image of various sizes with the Nearest neighbor and Cosine Interpolation where the cosine method PSNR is higher is all the image sizes.

V. Conclusion

The methodology of using various interpolations proved to be an efficient approach for mapping all the significant coefficients yielding an acceptable compression ratio. The proposed method gives a new approach for various new interpolation methods, in this paper a vector quantization along with MFO-CPN is used instead of conventional VQ which gives better results. This method can be applied for the color

images, where it is transformed to YCbCr color space. The Y component inversion is done using interpolation method .The interpolation method in Y-Component maps the coefficient from CbCr component. As a future works other interpolation methods such as bilinear, bicubic, spline interpolation methods can be explored to produce a significant map. MFOCPN, part for VQ, can further be extended with other similarity measures apart from higher order distance metrics for more efficient code book design.

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Melaka Tourism Location Based Service

By Luqman Ibnu Purnomo
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Abstract- This paper presents a Location Based Service framework application deployed in Melaka urban area. The Melaka Tourism Location Base Service is delivered to support tourist activity to find any nearby venue around their current location. The program is specifically designed for mobile phone which supports MIDP 2.0 profile and CLDC 1.1 configuration to run JSR 179 Java Micro Edition Location API due to its capability handling networking activity in handled device.

Keywords: *Wavelets; MFOCPN; Nearest Neighborhood Interpolation; Cosine Interpolation*

Classification: *GJCST Classification: J.m*

Strictly as per the compliance and regulations of:

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I. Introduction

1) *Background and Related Work*

Melaka is world known for its long history, historical sites, cultures and cuisines where it has charmed millions of visitors since its founding in the 15th century. This historical city received the popular recognition of World Heritage Site by UNESCO in 2008.

The Development of mobile technology has made a significant impact on services and other human related activity more reliable. The comprehension of tourism market opportunity and the increasing of demands toward mobile activity create new phenomenon of localization technique. The prevalence of mobile devices with personally identifiable location-based information is top concerns for 2011, say experts from Proof point, Inc.

The basic idea of location based service is to answer Where am I? What is around me? Where is it?. When individual find themselves in new environment they are not familiar with, their needs and behavior are easily predicted. People need to find somewhere to stay, where to eat, or to withdraw money from ATM. As the tourism sector is heterogeneous, the diversity of information services for mobile users is clearly a usability issue. How can information be delivered based on their needs?

LBS technology is served in between of some major technology. It is intersection between three technologies. It is created from New Information and Communication Technologies (NICT) such as mobile telecommunication system and hand-held devices from Internet and Geographic Information System (GIS) with spatial database.

About- *Faculty of Information Science and Technology Multimedia University Melaka, Malaysia*

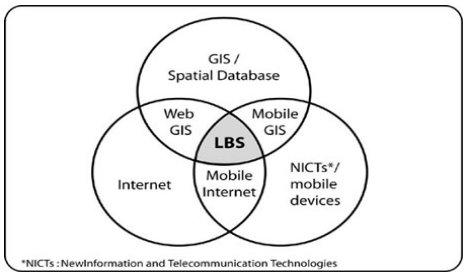

Figure1 LBS as an intersection of Technologies (Brimicombe 2001)

Despite of its popularity of the technology, it is not being efficiency utilized especially for tourism industry. Theoretically tourism world can intrinsically benefit from the use of mobile technology which provides services to travelers on the move since tourism is always identical with location.

Melaka Tourism Location Based Service is deployed using a client server environment in projection of the whole system. The client act as system component who requests service and data provided by server, who has resources to be utilized. As the system architecture can be represented as below.

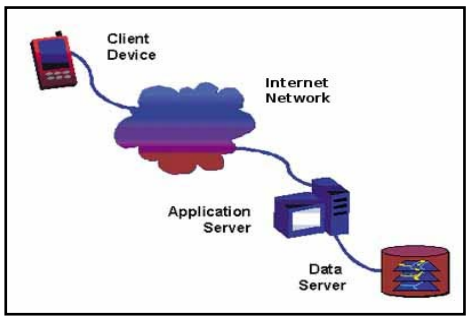

Figure2 LBS System Architecture

Several frameworks has been successfully developed such as The Location Based Mobile Tour Guide Services Towards Digital Dunhuang, LBS application implemented for Dunhuang Mogao Grottoes a world cultural heritage by the Chinese Academy Sciences of Beijing China. The system is deployed for a specific urban area having the same characteristic with the system this project is developed for. Both system similarities happens in the system architecture for using J2ME technology as multi threading mechanism, MIDP network programming, and JSR 179 Location API. University New South Wales also has developed the same framework deployed in university campus usage

enabling the 3D rendering capability for indoor navigation.

2) *Paper Organization*

This whole paper is consisted of 3 sections and organized as follows: Section 1 gives a brief explanation about the LBS technology and its implementation towards Melaka Tourism. Section 2 listing any research frame methods using in developing the system. Section 3 detailing the various features available in the system while the last section summarize the whole paper.

II. Research Frame

1) *JSR 179 Location API*

The Location API is compact and generic Java Micro Edition API producing information about the device present location to Java applications. It was developed under Java Community Process as JSR 179. The Location API for J2ME (Java Micro Edition) specifications defines an optional package, javax.microedition.location which enables developers to write wireless location based application for limited devices like mobile phone (Mahmoud, Q.2004).

JSR 179 requires the Connected Device Configuration (CDC) or version 1.1 of the Connected Limited Device Configuration (CLDC) since the CLDC version 1.0 is not capable enough to support floating point numbers, which API uses to represents coordinates. Meanwhile MIDP (Mobile Information Device Profile) version 2 is required to let writing a downloadable applications and service for network connectible mobile devices. The MIDP 2.0 delivers an enhanced user interface, greater connectivity, over the air provisioning, and end to end security to mobile information devices (Sun Developer Network). According to the Motorola Developer Network, there are three main features provide by JSR 179 Location API described as follow:

- Obtaining information of device location.
- Possibility to create, edit, store, and retrieve landmarks.
- Capability to obtain the device orientation

Below are some main classes available in JSR 179 Location API:

Class	Description	Usage notes
LocationProvider	Represents a source of the location information, starting point of location request.	
Criteria	Used for the selection of the location provider.	
Location	Represents the standard set of basic location information. This includes the time-stamped coordinates, accuracy, speed, course, etc.	The implementation has a limit for the maximum number of location read requests that can be sent simultaneously.
Coordinates	Represents coordinates as latitude-longitude-altitude values.	
LocationListener	Listener that receives update events associated with a particular LocationProvider.	
ProximityListener	Receives updates based on terminal crossing into a defined radius around a coordinate.	The implementation has a limit for the maximum number of proximity listeners that can be added simultaneously.
Landmark	The Landmark class represents a landmark, such as a known location with a name (such as a monument).	The implementation has limitations such as maximum number of landmark store categories, landmarks in landmark store, etc.
LandmarkStore	The LandmarkStore class provides methods to store, delete and retrieve landmarks from a persistent landmark store.	The implementation may only support default landmark store and not support creating and deleting LandmarkStore methods.

Figure 3 JSR 179 Location API Main Classes (Motorola Developer Network)

The Location API supports the conversion of string representation of coordinates into double representation and vice versa and the calculation of distances. Furthermore, an application can make use of so-called landmark stores for storing, deleting, and retrieving landmarks from a persistent database inside the mobile devices. A landmark can be used to represent points of interest and it contains fields for specifying coordinates, address information, a name, and a description[1].

2) *Haversine Formula*

Calculating the distance between points locations is often an important component of many forms of spatial analysis in business and research. The haversine formula is preferred to be used in GIS application for common case to minimize rounding errors. It assumes a spherical earth and ignores ellipsoidal effects.

In order to calculate distance between two earth coordinates as demonstrated in figure 4, the following algorithm is used:

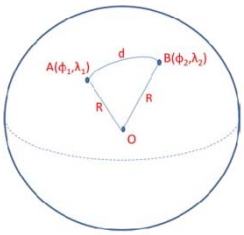

Figure4 Distance between two coordinates on sphere

Given: two coordinates A (φ1, λ1) and B (φ2, λ2), sphere radius R, and distance (between A and B) d,

$$haversin\left(\frac{d}{R}\right) = haversin(\Delta\varphi) + \cos\varphi_1 \cos\varphi_2 haversin(\Delta\lambda)$$

φ1 is the latitude of A, λ1 is the longitude of A, φ2 is the latitude of B, λ2 is the longitude of B,$\Delta\varphi = \varphi 2 - \varphi 1$, $\Delta\lambda = \lambda 2 - \lambda 1$, and haversin(θ) = sin2(θ/2).
So, d can be obtained by:

$$d = 2R \times \arcsin\left(\sqrt{haversin(\Delta\varphi) + \cos\varphi_1 \cos\varphi_2 haversin(\Delta\lambda)}\right)$$

Finally

$$d = 2R \times \arcsin\left(\sqrt{sin^2\left(\frac{\varphi_2 - \varphi_1}{2}\right) + \cos\varphi_1 \cos\varphi_2 sin^2\left(\frac{\lambda_2 - \lambda_1}{2}\right)}\right)$$

3) *Connection String*

Tourism Location Based Service use HttpConnectiom string to provide communication link between client and server since j2me programming language have not support JDBC connection to access the database server, the behavior HttpConnection is one that combines InputStream and an OutputStream and exactly one InputStream. The order in which the streams

are used as important as well. The OutputStream, if used, must be used before the InputStream. Once the streams have been used the connection should be closed and new HttpConnection should be opened to continue communication if necessary. This follows the HTTP request-response paradigm (David Hemphill, Using HttpConnection). Mainly there are three states to do a HttpConnection:

1. Setup Connection
2. Connected
3. Closed Connection

4) *Map Retrieval and Reverse Geocoding*

Google Static Maps API is an easy way to provide a map when user doesn't have Javascript available. It is not as powerful as the full Google Maps API but still, it can provide a basic map containing both markers and paths. The basic concept is to generate image by adding URL parameters to the querystring of the URL. The Google API Maps parameters are certain value separated using ampersand (&) character. The basic Google Static Map URL must be in the following form to complete the API request:

"http/maps.google.com/maps/api/staticmap?
parameters"

There are several parameters available to be used on the API to customize the map item:

- Location Parameters (centre, zoom)
- Map Parameters (size, format, map type, `language)
- Feature Parameters (markers, path, visible, type)
- Reporting Parameters (sensor)

Figure5 Google Static Map Image

Other Google service implemented in the system is Google Reverse Geocoding API via HTTP request. Reverse Geocoding is a method to convert geographic coordinates into an address. The Geocoding API supports reverse geocoding directly using the latlang parameter.

"http://maps.googleapis.com/maps/api/geocode/json?latlng=x,y&sensor=true_or_false"

Where x is latitude coordinate, and y is longitude coordinate. The query will result a JSON (Javascript Object Notation which later will be parsed into php file to return a specific address of current location.

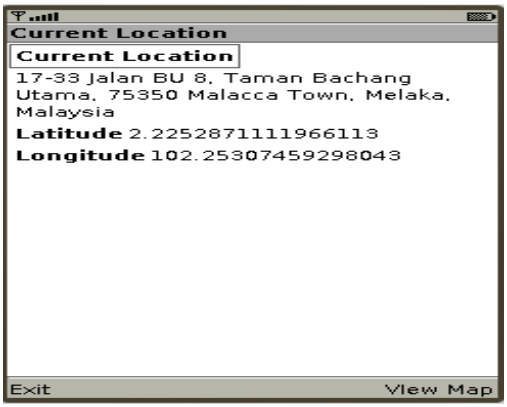

Figure6 Google Reverse Geocoding

5) *Routing Direction*

One of features implemented in Melaka Tourism Location Based Service is routing capability to a specific point of interest from current detected location. The routing functionalityis applied using Bing Map REST Services Application Programming Interface (API) provides rrepresentational State Transfer (REST) interface to preform task such as creating map with puhpins, geocoding an address, retrieving imagery data, or creating route.

In order to display a static map route the following URL format must be sent.

"http://dev.virtualearth.net/REST/v1/Imagery/Map/Road/Routes&wp.0=a,b&wp.1=c,d&key=bingmapkey"

wp.0 is the current coordinates, wp.1 is the destined coordinates, and bingmapkey is the api map registered on the bing service.

Figure 7 Routing Direction

III. Variegated Melaka Tourism Location Based Service

The Melaka Tourism Location Based Service consists of various forms of service available to the user interacting with the system. The use case diagram below describing set of services available in the system

both Client and Admin. The Client service covered services such as retrieve current location using Global Positioning System, view location map, finding nearby point of interest, view its detail, and retrieve walking direction from the current coordinate. While the admin side able to add, edit, and delete the existing POI in the database.

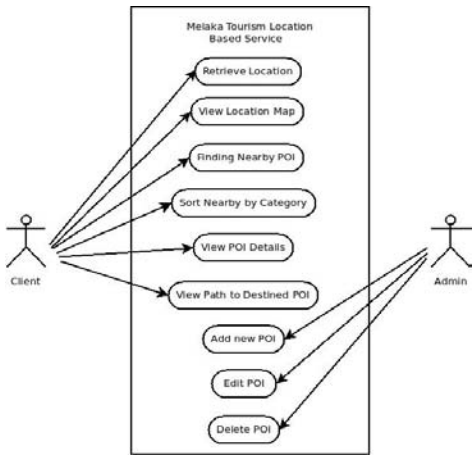

Figure 8 System Use Case Diagram

IV. Conclusion

Melaka Tourism Location Based Service paper proposed a system integrating tourism information service with location based technology. It is easy to implement and require low operation overhead. The identification of location is using the JSR 179 Location API technology. It is discussed the implementation plan and design to overcome the current problem occurs in tourism world by providing a comprehensive information and services to the traveler. The system ables to show user location in coordinates, geographical address as well as map view. Any nearby point of interest is listed based on its category within the radius coverage.

The objectives of the project is successfully achieved to design a reliable model of Melaka tourism location based service by converting user information into information services. At the end, may this project become a door to open another advance research regarding tourism location based service.

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Design of Requirement Engineering Model during Reengineering

By Ashok Kumar, Anil Kumar
Kurukshetra University

Abstract- Requirement Engineering[1,2,3] is the most effective phase of software development. Its aims is to collect required requirement from stakeholders in the right way. It is very important of every organization to develop quality of software product, that can satisfy the users needs. It will focus number of viewpoints, roles, responsibility and objectives. Therefore it becomes necessary to apply requirement engineering in every phase of reengineering modules.
Requirement engineering depends on customers request and planner knowledge.
Requirement engineering model help in conceptual design and implementation design, also referred to as planning stage and implementation planning.
Requirement engineering provides an incremental approach for reengineering. It concerned with the requirement elicitation, analysis, specification, validation and requirement management.
Systematic requirements analysis is also known as requirements engineering. It is sometimes referred to loosely by names such as requirements gathering, requirements capture, or requirements specification.

Keywords: Reengineering, Requirement Engineering, Architectural Design, Review and Analysis

Classification: GJCST Classification: D.2.2

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I. Introduction

As we know that reengineering[4,5,6,7] is the revolution in software industry, it will reduces almost more than 60 percent cost as compared to maintenance of any software modules.

And we already know that maintenance is one of the critical activity of any software modules, but continue maintenance of software modules is not a good choice to increase the quality of the software. Because while continue maintenance takes place it will result increases the complexity of software modules.

Therefore, Reengineering is good choice than maintenance. The fundamental goal of reengineering was to minimize the impact of implementation expected system changes to the system.

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The purpose of this paper is to revisit the existing design methodology and develop a **requirement engineering model**, that will help to determine actual requirement of stakeholders before reengineering of software projects takes place. This data strongly suggests that, reengineering through new methodology significantly reduce full life cycle costs, schedules and risk.

II. Literature Review

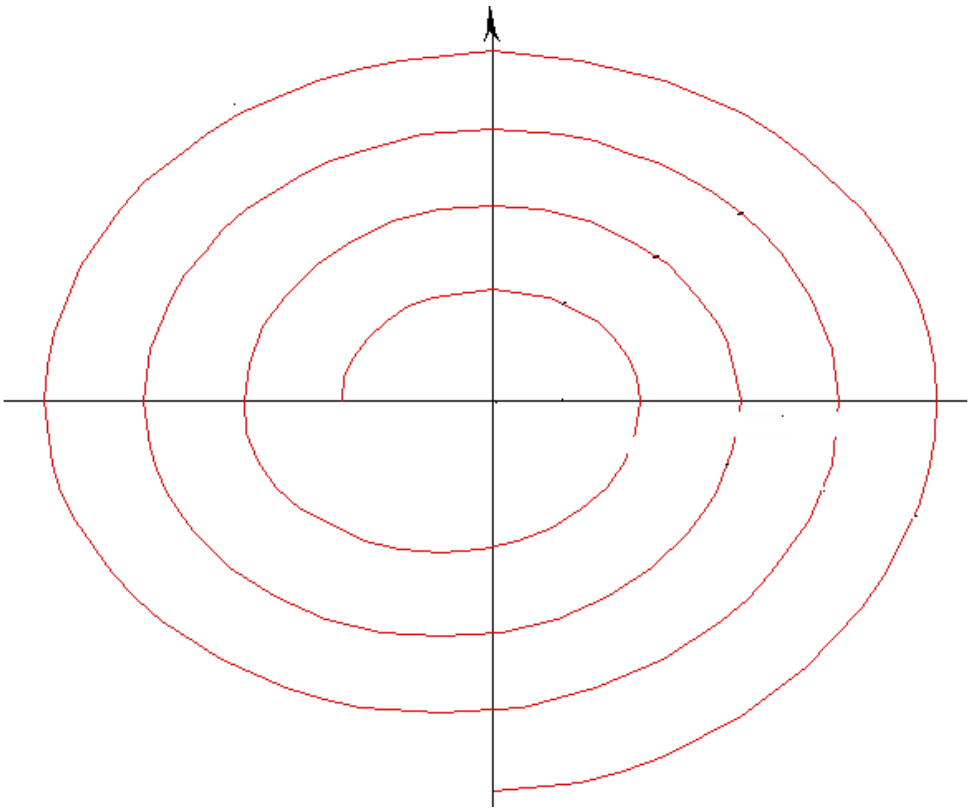
The research is based on the process models found in[8,9,10,11] as these are the models that have been designed keeping in view the GSD context for streamlining the phase of RE. The process models given in sideline of any case study as in[12,13] are excluded because such processes are only for specific case study and situation. Moreover, the generic process models for RE that are not designed specifically for GSD(Global Software Deevelopment) context such as that proposed in[14] have also been excluded because they are not suitable to this research

In evolutionary model[8] , requirements elicitation, requirements analysis and negotiation, requirements specification, and requirements validation are covered but this model addresses only few of the major GSD issues including a cultural issue which covers cultural diversity. Knowledge management issues cover knowledge sharing with users and knowledge acquisition techniques whereas technical issues over artifact sharing. Communication issues, time-zone difference, communication media and strategic issues are not covered in this model. Though this model is proposed to support the management of telecommunication network topologies but the reason for including this model is that it is documented process for DSD and is a good candidate for the GSD as well and can be applicable to other projects and domains as well.

In requirement traceability model[9] , requirement traceability and requirements management are covered. Though this model does not cover all RE activities but the reason for including this model in this paper is that it can be very helpful in elicitation of correct requirements in GSD and the other reason for including this model is the level of importance attached to the requirements traceability and how this model can assist for better understanding of requirements in GSD

environment is also illustrated in this model. Requirement traceability helps in collecting rationale behind the requirements and this model also helps in indicating Value attached to the requirement. The GSD issues covered by this model are knowledge management, which includes knowledge sharing, and knowledge acquisition techniques. Technical issues (documentation sharing) and communication mode (asynchronous) are also covered. Other important issues like cultural issues, communication issues, strategic issues and time-zone difference are not addressed in this model.

In [10], though all activities of RE are not covered but major issues of GSD and three important activities of RE are covered. The other reason for including this process model is that it is documented process and it is in the context of GSD. The important RE activities which are covered by this model include requirements analysis and negotiation, requirements specification and requirements validation. This process model does not address the problems related to geographically distributed specification team. For example if some of the specification team members are in country A and some are in country B then, requirement speciation is quite a hectic tasks as team members at both sites need to validate SRS. This model address important GSD issues including cultural, technical, knowledge management and communication issues (poorly defined).



'Requirement Engineering Model'

In the above model, there is four phase that play very crucial role during reengineering of software module before actual process takes place, because if we know each and every requirement of customers before actual process takes place then we can reduce overall complexity of module in later phase.
The phases of requirement engineering model given below:

1. *Concept of formulation / Problem Understanding*

This phase generally proposed by people outside the system. E.g Senior manager in the organization, politician, chairman, or other member of the organization who want to get benefit directly or indirectly.

Here we will try to know, why reengineering takes place and the impact that the proposed concept is likely to have. This process should involves primarily domain experts rather than the system engineers. Although some system engineering input is essential.
The above activity is iterative process

- all stakeholders involved are identified together with their goals (called win conditions);
- Conflicts between these goals are captured together with their associated risks and uncertainties;
- Goals are reconciled through negotiation to reach a mutually agreed set of goals,

constraints, and alternatives for the next iteration.

2. *Requirement Engineering*

Requirement engineering[1,2,3] play very important role in identification of need:

- Identify need, want or desire
- New or improve capability
- Based on perceive or real deficiency
- Statement of need
    - New system requirement may be defined
    - Date when new capability introduced or used
    - Estimate need resources
    - Specific quantitative qualitative terms with enough detail to proceed to next step
- Evaluate approaches in terms of performance, effectiveness, maintenance, logistic support and economics
    - Type and technological maturity
    - Stability and growth potential
    - Technology life time
    - Number of suppliers
- Recommend likely course of action such as
    - Feasibility study, determine objective, investigate in depth, possible way of implementing
        - Technology Assessment: hardware and software needed to implement
        - Solution of proposal
        - Cost/benefit analysis: estimate cost of developing, determine benefit
            - On completion of it, a decision is made on a preferred solution
    - Result of feasibility analysis should include life cycle consideration
- Need should derive technology

3. *Architectural Design*

Evolve through a series of stages and each stages is evaluated, before proceeding to next stage

Here one of very important activity takes place that to determine information need, determine different sources from where information will be obtained.

Here two types of design takes place

- Logical Design: is a more detail design, which includes all major components and entities plus their relationship. The data flow and connection are detailed in this stage
- Physical Design: has all major components and entities are identified within specific physical servers and location or specific software services, objects or solution, include all known detail such as OS, Ver. No. etc.

4. *Review and Analysis*

Review is one very important activity, in the requirement engineering model, it is essential to cross verification of functionality. Once anywhere requirement changes it is very important to review it according to change requirement.

Review and analysis is again a iterative process in the requirement engineering model, it help in

- Conceptual Design (Preliminary Requirement Review)
- System Design Review (Preliminary Design Review)
- Equipment / software Design Review
- Critical Design review (Detail Design and development)
- Risk analysis is vital activities of analysis

Again evaluation function play important role, for day to day project coordination and data review, formal design review

III. Result & Discussion

There is no doubt that requirement engineering is first activity of software development life cycle which play very important role in successes or failure of software projects, however there are some problem that we will face during requirement engineering during software development.

The purpose this paper is design requirement engineering model during reengineer that will solve the inconsistency of management for requirements engineering that will suffers these problems during software development:

- The specific kind of inconsistency being considered is not always clear. In fact, there is no common agreement on what a conflict between requirements does really mean. The lack of precise definition is a frequent source of confusion. Moreover, most techniques consider binary conflicts only, that is, conflicts among pairs of requirements. As we will see, there may be conflicts among three requirements, say, that are non conflicting pair wise.

- There is no systematic support for detecting conflicts among non operational specifications of goals or requirements— if one excepts theorem proving techniques for logically inconsistent specifications. Current conflict management techniques take it for granted that conflicts have been identified in some way or another.
- There is a lack of systematic techniques for resolving inconsistencies through goal/requirement transformations— one notable exception is[15] , which proposes a set of operators for restructuring objects involved in conflicting goals.

The above requirement engineering model solve above problem that we will face during software development, as well as it play important role during reengineering of module.

IV. Conclusion

This model play very important role in reengineering, it not only reduces the risk to meet specification, but it also ensure to avoid immediately assuming you know what the problem and solution are, Going directly to try to solve the problem before thinking about it.

It provides systematic and organized approach that allows us to focus on achievable goal and to attain the best possible results from available resources. Therefore it will set the system objective, where reengineering takes place in the organization, so that management and employees agree to the objective and understand what they are in the organization.

This model play very important role in reengineering because it play very important part in testing of reengineered modules according to new requirement as well as existing functionality

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Performance Evaluation of Varying Contention Window Size for Bandwidth Constrained Routing in Adhoc Networks

By N.Sumathi, Dr. Antony Selvadoss Thanamani

Abstract- Providing bandwidth efficient routing in ad hoc networks is a challenging task. Available bandwidth of nodes is accurately evaluated before finding route from source to destination. Accuracy of available bandwidth is mainly affected by collision and overhead due to the execution of backoff scheme. Existing bandwidth constrained routing uses binary exponential backoff which follows serial transmission and causes unfair channel access. To overcome these, implicit pipelined backoff procedure is proposed to improve the available bandwidth and reduce the overhead associated with the backoff scheme employed in medium access control layer. In this, when two nodes are sharing the channel, the remaining nodes start the channel contention procedure in parallel to transmit next packet. Thus the channel waiting time is reduced. Each node maintains separate contention window for each phase in pipelined backoff. Proper choice of contention window size has great effect on performance of the network. This proposed algorithm is combined with a reactive link disjoint multipath routing protocol called AOMDV (Adhoc Ondemand Multipath Distance Vector) to find the best path based on bandwidth. Experimental results show that this algorithm outperforms existing approach in terms of QoS metrics such as delay, throughput, packet delivery ratio and energy consumption for different contention window sizes.

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I. Introduction

Mobile ad hoc networks (MANET) consist of a collection of wireless mobile nodes which dynamically exchange data among themselves without any base station or infrastructure. Each node acts as a router to forward traffic and is free to move over a certain area. The wireless mobile nodes may enter as well as leave the network dynamically. MANETS are suitable for emergency situations like natural disasters, military conflicts, medical situations etc. MAC layer protocols use a single channel which is shared by many contending nodes. MAC layer standard called IEEE 802.11 DCF (Distributed Coordinate Function [1] is based on CSMA/CA (Carrier Sense Multiple Access with Collision Avoidance) protocol in which nodes listen to the channel before transmission to avoid collision. DCF does not have a central control and known for its asynchronous data transfer. It is used for contention based service. A mobile node uses the virtual carrier sensing mechanism, which utilizes Request-To-Send (RTS) and Clear-To-Send (CTS) exchanges with a Short InterFrame Space (SIFS) for channel reservation. Channel can be viewed in discrete time slots and all nodes are synchronized in time slots. Virtual carrier sensing reduces the probability when two nodes are trying to transmitting simultaneously.

Once the node detects that the channel has been free for duration of DCF InterFrame Space (DIFS), it starts a Binary Exponential Backoff (BEB) procedure, i.e., decrementing its back-off counter as long as the channel is idle. If the backoff counter has reduced to zero and the channel is still free, the node begins to transmit. If the channel becomes busy in the middle of the decrement, the node freezes its backoff counter, and resumes the countdown after deferring for a period of time, which is indicated by the Network Allocation Vector (NAV) stored in the transmitted node's packet header [2]. It is possible that two or more nodes begin to transmit at the same time. In such a case, collision occurs. Collisions are detected when there is no CTS or acknowledgement (ACK) from the receiver. After collision, all the involved nodes double their CWs (up to a maximum value-CWmax) and compete to gain control of the channel next time. If a node succeeds in channel access, the node resets its CW to CWmin.

Due to the limited transmission range of wireless nodes, multi hops are usually needed for a node to exchange information with any other node in the network. For this purpose, a routing protocol is needed that quickly adapts to dynamic topology [3]. It is essential to perform routing with maximal throughput and with minimal control overhead. Network layer discovers QoS routes based on MAC layer results.

In this paper QoS based routes are traced with bandwidth as a main metric. If the available bandwidth is

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not estimated accurately, nodes will accept the extra QoS requests and network will be overloaded. To improve the accuracy of available bandwidth, bandwidth loss due to collision probability, back off procedure, idle period synchronization and utilized bandwidth are taken into account in available bandwidth calculation [4]. Existing approach uses BEB as the backoff procedure and AODV as the routing protocol. BEB follows serial transmission. Channel idle time and contention overhead is more because of this serial transmission. Nodes go through a channel contention and packet transmission stages sequentially [5]. Channel contention stage consumes channel bandwidth. Thus time spent on channel contention is reduced when probability of collision is small. But it is difficult to achieve. Because channel contention cannot be started until the current transmission finishes. Also access to a slot is not uniform. Only the winners repeatedly get the chance to access the channel. This leads to channel capture effect. In a heavily contended network, the collision probability increases which degrades the performance. Hence the main objective is to apply pipelining technique to DCF backoff algorithm to reduce the collision overhead and improve the available bandwidth.
In case of AODV, link failure causes the execution route discovery procedure to find alternate route for transmission which leads to packet loss and delay. To overcome, enhanced AOMDV is used to find the routes based on available bandwidth from source to destination.

This paper is organized as follows. Section II summarizes related work on backoff algorithms. Section III discusses the pipelined backoff algorithm used in available bandwidth measurement and routing protocol. Section IV shows simulation results and Section V concludes the paper.

II. Related work

Backoff algorithm is used to reduce collisions when more than one node tries to access the common channel at a time. In MILD (Multiple Increase and Linear Decrease) [6], CW (Contention Window) size is multiplied by 1.5 on collision and decreased by 1 on a successful transmission. It cannot adjust its contention window fast enough because of its linear decrease mechanism. It performs well when the network load is heavy. In [7], authors discussed to enhance the performance of DCF in the presence of noisy channels. Exponential Increase Exponential Decrease (EIED) algorithm discussed in [8] increases or decreases CW exponentially by backoff factors r_1, r_d respectively. Performance is good when $r_1=2$ and $r_d=2^{1/8}$. EIED outperforms BEB and MILD. FCR (Fast Collision Resolution) discussed in [9] solves collision more quickly than BEB. When the number of active nodes changes from high to low, LMILD scheme (Linear/Multiplicative Increase Linear Decrease) [10] outperforms the BEB and MILD algorithms for a wide range of network sizes. Authors discussed that the CW resetting scheme causes a very large variation of the CW size and degrades the performance of a network when it is heavily loaded since each new packet starts with minimum CW which is too small for heavy network load.
GDCF(Gentle DCF) discussed in [11] is flexible for supporting priority access for different traffic types and is very easy to implement it, as it does not require any changes in control message structure and access procedures . Compared to FCR, GDCF achieves better throughput and fairness. GDCF with smaller number of retransmissions achieves higher throughput for small n and unfair channel access. Throughput drops dramatically when number of nodes (n) increases. P-DCF (Predictive DCF) [12] enables mobile nodes to choose their next backoff times in the collision-free backoff range from the past history of successful transmissions. In DIDD [13], backoff algorithm (Double Increment Double Decrement) CW decreases smoothly after a successful packet transmission. Its throughput is better for CWmin=32 but the delay is high. It achieves better performance than BEB. In NBA [14], large bandwidth is wasted due to collisions. Optimum value of minimum CW depends on number of contending nodes and traffic. Optimum value of CWmin=8.5N-5 ie $\alpha N+\beta$.
In BEB [15, 16], even when number of nodes increase to a large value, nodes will use the same CW size. So lot of collisions occurs and throughput is reduced. At the beginning of each slot a node transmits, if its backoff timer has expired. Otherwise depending on the channel state (idle or busy), the node will count down the backoff counter by 1 or will be frozen at a value. Such an algorithm is embedded in IEEE 802.11 DCF. Delay performance of BEB suffers from collisions which causes more number of retransmissions. It has the problem of channel capture effect which results in channel domination by successful nodes. Adaptive BEB++ [16] is designed to consider packet error rate and probability of failed transmission due to noisy channels. After a successful transmission, CW size is set to an optimal value. It adjusts minimum CW size according to active number of nodes. Log based backoff algorithm introduced in [17] uses logarithm of current backoff time to calculate next backoff. The difference between two backoff timers is small. So the chance of losing the channel access is less, which improves the throughput performance.

Multi Chain Backoff (MCB) algorithm discussed in [18] allows nodes to adapt to different congestion levels by using more than one backoff chain together with collision events. MCB can achieve a higher throughput by still maintaining fair channel access than

the existing backoff algorithms. Each station maintains a transition diagram to determine its current CW with c chains. When a collision is encountered nodes move to a chain with a larger CWmin and if no collision is detected. It is moved to a chain with smaller CWmin. Conclusion MCB uses multiple backoff chains with minimum CW. Based on collision, it chooses a proper chain. So it offers higher throughput than others. The k-EC (k-round Elimination Contention) scheme exhibits high efficiency and robustness during the collision resolution [19]. It is insensitive to the number of active nodes. All the above algorithms follow serial packet transmission which introduces more channel idle time and collision overhead. Most of the bandwidth is wasted due to collision overhead. Hence to reduce the channel idle time and overhead associated with collision, implicit pipelined backoff algorithm is proposed.

III. Pipelined backoff mechanism

a. Pipelined Available Bandwidth Measurement (Pipelined ABM)

Available bandwidth of a node can be improved by considering channel utilization ratio, idle period synchronization and bandwidth loss due to the collision probability. The existing procedure uses BEB to reduce collision [4].

1. Evaluate the capacity of a node and estimate the available bandwidth.
2. Estimate the link's available bandwidth. It depends on channel utilization ratio and idle period synchronization. Let it be E(b(s,r)). It is calculated based on the probability that the channel is free simultaneously at the sender and receiver side.
3. Estimate collision probability Pm for m bits.
4. Collision leads to retransmission of same frames. When collision occurs, implicit pipelined backoff algorithm (IPBA) is executed. This algorithm helps to reduce collisions when more than one node tries to access the common channel. This algorithm is explained in section C.

Usually backoff algorithm leads to additional overhead which affects the available bandwidth. Bandwidth lost due to this additional overhead is evaluated. Let it be K.

$$K=(DIFS+\overline{backoff}) / T(m) \quad (1)$$

where DIFS is DCF Inter Frame Spacing, T(m) is time between two consecutive frames and backoff is the average number of slots decremented for a frame. The above facts are considered and combined to estimate the available bandwidth which is given below.

$$E_{final}(b(s,r)) = (1-K).(1- Pm).E(b(s,r)) \quad (2)$$

where $E_{final}(b(s,r))$ is the available bandwidth on link by monitoring node and link capacities, Pm is collision probability and K is bandwidth lost due to pipelined backoff scheme. This new available bandwidth is stored in nodes and exchanged with neighbors with the help of Hello messages. Then the routing protocol called AOMDV (Ad hoc Ondemand Multipath Distance Vector) finds the route based on this available bandwidth.

b) Pipelined Backoff Mechanism

The concept of pipelining is to divide the total task into many sub-tasks and executing these sub-tasks in parallel [20]. This concept is applied to channel contention procedure of MAC (Channel Access Control) protocol. When two nodes are sharing the channel, the remaining nodes start the channel contention procedure in parallel for the next packet transmission [21]. Pipelined backoff hides channel idle time and reduces collision probability. It is also used to control number of contending nodes.

When there are few contending nodes in the network, a smaller CW will reduce the channel idle time and channel bandwidth is utilized better. When number of contending nodes is more, CW size is increased to reduce the collision probability and to achieve better throughput. The collision cost is much higher in wireless networks because a node cannot detect collision immediately [22]. This pipelined channel contention procedure consumes little bandwidth but improves the performance. Thus Implicit Pipelined Backoff Algorithm (IPBA) is proposed.

c) Implicit Pipelined Backoff Mechanism

In implicit pipelining there is no separate control channel. It implicitly pipelines the contention resolution stages as phase1 and phase2. Phase1 functions as a filter to select few nodes to contend for channel in Phase2 [22] as shown in fig. 3.1. The channel contention can be solved effectively because the number of nodes in phase2 is small. This reduces collision probability and improves channel utilization.

1) Phase1

Let FCW be the contention window (First Contention Window) for phase1, bt1 be the backoff timer value. It has FCWmin and FCWmax. The initial value of FCW is FCWmin. The value of bt1 is randomly selected from the interval [0, FCW]. If bt1 is less than or equal to zero the node becomes the pipelined node and enters phase2. After a successful packet transmission bt1 value is reduced by F. The value of F depends on number of successfully transmitted packets (tp) heard by contending nodes in phase1 i.e. $F=2^{tp} - 1$. If the value of F is larger, then the probability of node becoming a pipelined is more. Bandwidth is wasted when the channel is idle and no nodes are ready to transmit packets. To avoid this loss, bt1 is also linearly decreased by 1 for each idle slot. When bt1 reaches zero it enters into phase2. If any pipelined node wins the channel in

phase2, it transmits its packets successfully then set FCW to max [FCW / 2, FCWmin+1], tp to 1 and recalculates bt1 from the interval [0, FCW] and return to phase1. If it looses the channel in phase2, its FCW is set as min [2*FCW+1, FCWmax+1], then recalculates bt1 from [0, FCW], resets tp to 1 and returns to phase1.

2) Phase2

Let SCW be the contention window (Second Contention Window) of phase2, bt2 be the backoff timer, SCWmin be the minimum value of contention window and SCWmax be the maximum value of contention window. Initial value of SCW is SCWmin for all nodes entering into phase2. Backoff timer bt2 is calculated from the interval [0, SCW]. As in phase1 bt2 value is also reduced by 1 after each idle slot. Whenever bt2 reaches zero, transmission is allowed. The pipelined node has to wait for the channel to be idle for DIFS duration before backoff procedure starts. If bt2 reaches zero and channel is idle then it begins its transmission. Otherwise bt2 is decremented by 1 after each idle slot. Before bt2 reaches zero if a frame is sent by other nodes then this pipelined node looses channel access and returns to phase1. When collision occurs SCW is doubled and new bt2 is calculated from the interval [0, SCW]. Colliding nodes and pipelined nodes stay in phase2 and repeat the same procedure. If a pipelined node wins the channel, it transmits the packets successfully, then resets FCW to max[FCW / 2, FCWmin+1], SCW to max[SCW / 2, SCWmin+1], tp to 1, calculates bt1 from interval [0, FCW] and go back to phase1. When a pipelined node looses the channel, it doubles FCW and resets SCW, tp to 1, then calculates bt1 and go back to phase1. Thus a node has two ways of reducing bt1. One way is through overheard successful transmission and the other way is after each channel idle slot. The pseudo code for implicit pipelined backoff algorithm is given below.

In this algorithm, Contention Window (FCW) size is halved after every successful transmission for a winning node. Due to this channel capture effect is reduced. CW sizes are doubled on collision. Phase1 reduces both channel idle time and collision overhead. Phase2 transmits packets and consumes channel bandwidth. IPBA controls the number of pipelined nodes in phase2 effectively. Now bandwidth loss due this pipelined backoff (K) is estimated and the final available bandwidth is calculated using the formula (2). This method is called as pipelined ABM. This bandwidth is stored in nodes with the help of *hello* messages. Then the routing protocol finds the route based on bandwidth stored in each node.

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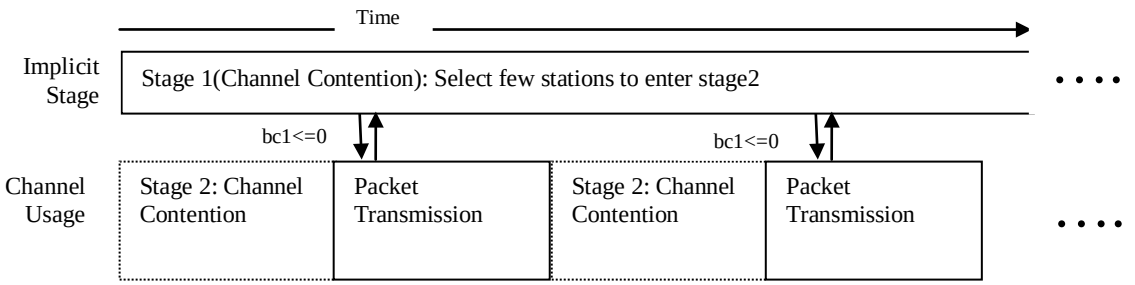

Fig 3.1. Implicit Pipelined Backoff Process

Implicit Pipelined Backoff Algorithm: *Pseudo code*

Phase 1:

1. For all nodes that want to transmit data packets, do
   a. Initialize FCW sizes(min,max) and number of packets transmitted (tp).
   b. Calculate bt1 (backoff timer) randomly from [0,FCW]
2. When a node overhears a successful transmission, increase tp by 1 and decrease bt1 by 2^{tp}-1.
3. If bt1 is less than 0, node becomes pipelined and enters into Phase2.
4. Else bt1 is reduced by 1 for each idle slot. If it is 0 go to Phase 2.

Phase 2:

1.For each pipelined node do the following

a) Initialize SCW sizes (min ,max), calculate bt2 (backoff timer) randomly from [0,SCW].

b) For each idle slot
   bt2 is decremented by 1,
   if bt2 is 0 , transmit a packet, halve FCW,
   reset tp, go to phase1.

c) If pipelined node looses the channel, double FCW upto its maximum, reset SCW, calculate bt1 and initialize tp, go to phase 1.

d) If collision occurs SCW is doubled upto its maximum and calculate bt2.

d) Discussion on Multipath QoS routing protocol

Adding QoS to routing protocols help to optimize the performance of traffic on the network. This pipelined backoff algorithm is integrated into a routing protocol called enhanced link disjoint multipath AODV (AOMDV) [23] to find the routes from given source to destination based on available bandwidth. Usually

frequent route breaks make intermediate nodes to drop packets when there is no immediate alternate path available to the destination. This affects throughput, packet delivery ratio and increases delay. But multipath routing protocol finds multiple paths for a destination during single route discovery process. In case of link failure, source may switch to an alternate path instead of initiating another route discovery. Enhanced AOMDV modifies the base AODV protocol's route discovery mechanism, to enable discovery of multiple link-disjoint paths for a particular source node. To discover link-disjoint paths [24], each node forwards only one route request towards the destination during the route discovery process; however, it maintains a queue of the previous hop nodes for each RREQ received from a unique neighbor of the source. When a link failure occurs, the node upstream of the link detects the failure, invalidates its routing table entry for that destination and unicasts an RERR message towards the source. Once the source node receives the RERR, it switches its primary path to the next best alternate link-disjoint path. It is designed mainly for highly dynamic ad hoc networks when route breaks and link failures occur frequently. This protocol introduces extra control traffic to monitor alternate paths.

IV. Simulation results

Performance analysis of pipelined ABM is carried out by varying contention window sizes in phase1. Goal of any QoS is to provide guarantees to the application in terms of throughput, bandwidth, delay, packet delivery ratio (PDR) etc. The proposed algorithm is implemented using NS2 simulator tool [25]. The duration of simulation is set to 200s with a grid size of 1000×1000 m. It selects random way point mobility model with CBR (Constant Bit Rate) traffic. This algorithm is tested with 50 nodes. Simulation results present throughput, delay, energy, PDR for different values of CW parameters. Graph helps us to decide the optimal value of CW as [31-1023].

The parameters used to measure the performance are throughput, average end to end delay, energy consumption and packet delivery ratio. To achieve optimum result, system parameters must be selected according to traffic condition. Throughput is calculated as dividing the number of bits transmitted by the time used to transmit these bits. Transmission time includes queuing time, transmission time, interframe space times (SIFS, DIFS etc), control message overhead time and retransmission time. The packet delivery ratio is calculated as the ratio of the data packets delivered to the destination to those transmitted by the CBR traffic. The ability to deliver a high percentage of packets to a destination increases the overall utility of the system. Because the amount of traffic transmitted by the traffic sources varies based on the admission decisions during the simulation. Average end-end delay is calculated based on the average time required to transmit packet from the source to destination. This end-end delay includes delays caused by buffering during route discovery latency, queuing, retransmission delays, propagation and transfer times. Table I shows simulation parameters. The performance metrics are compared by varying contention window sizes in phase1. Contention window size for phase2 is 15-1023.

Table I. Parameters for Simulation

Parameter	Value
Transmission range	250 m
Carrier Sensing range	550 m
Packet Size	512 bytes
Channel Capacity	2 Mbps
Grid Size	1000×1000 m
No. of nodes	50
FCWmin - FCWmax sizes	31-1023,127-1023, 511-4095
SCWmin-SCWmax	15-1023
Mobility Speed	20 s
Simulation Time	200 s

This algorithm is tested by varying contention window sizes such as 31-1023,127-1023 and 511-4093 and keeping window size for phase2 as 15-1023. This is because number of contending nodes is more in phase1 than number of pipelined nodes in phase2. The performance metrics with respect to number of nodes, speed and pause time are shown in Fig 4.1 – 4.5 for three sets of contention window sizes. Fig 4.1 shows that the throughput for 31-1023 window size is better. When load increases, 511- 4093 window size has closer to previous one.

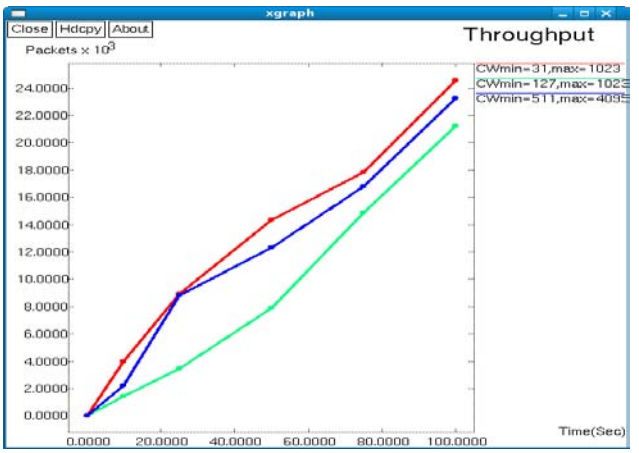

Fig. 4.1 Throughput

Average end to end delay for FCWmin =31 is almost 35% higher than other two window sizes which is shown in fig 4.2.

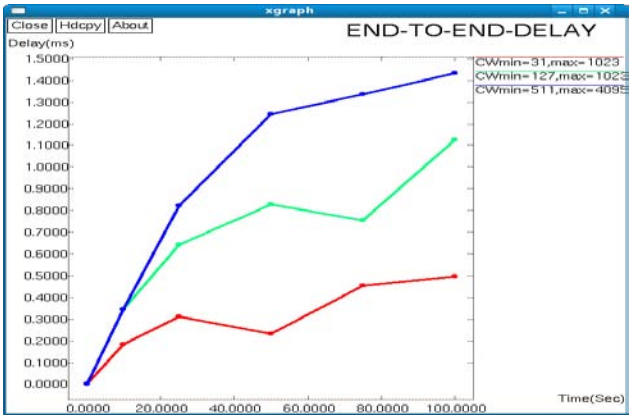

Fig.4.2 End to end delay

Number of packets delivered by the first category is more than the other two as shown in fig 4.3. Energy consumed by the nodes is less when the traffic is low for FCWmin=31. When traffic increases, energy consumption increases than FCWmin=511 as shown in fig 4.4.

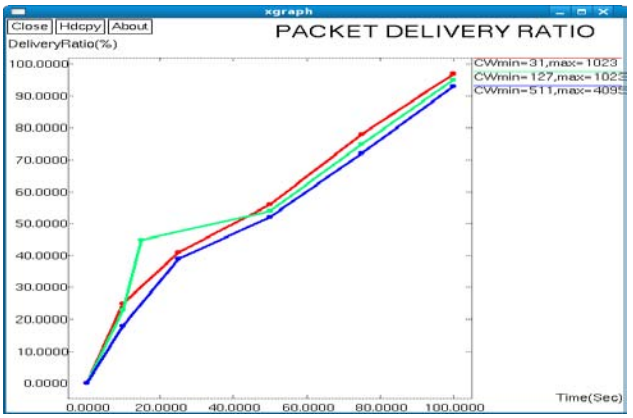

Fig. 4.3 Packet Delivery Ratio

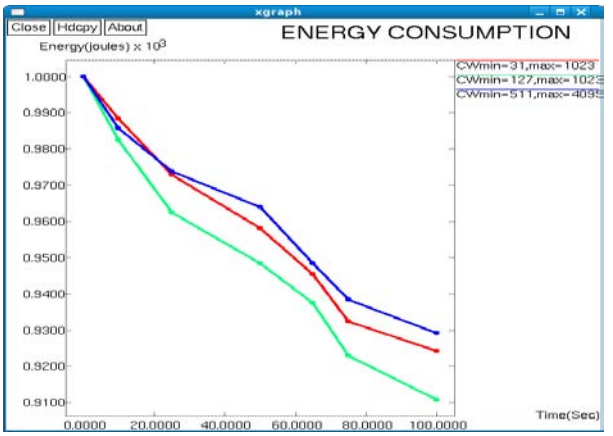

Fig. 4.4 Energy Consumption

When the number of contending nodes are less, small FCWmin will not waste channel bandwidth whereas FCWmin=511 occupies more channel bandwidth as shown in fig. 4.5. On the average, CW size 31-1023 shows better performance.

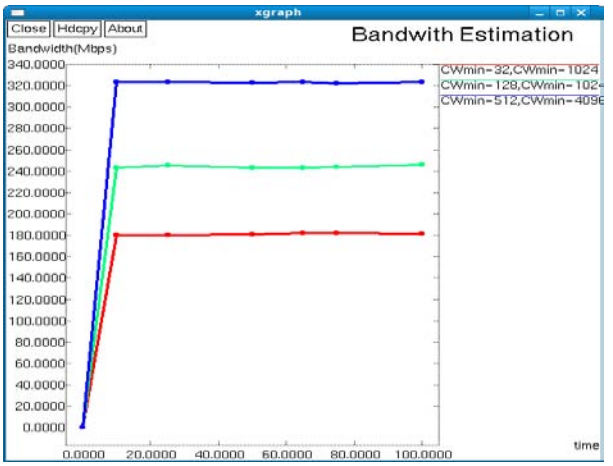

Fig. 4.5 Bandwidth Estimation

V. Conclusion

Performance of QoS routing is evaluated based on the bandwidth information obtained from the MAC layer. This paper discusses Implicit Pipelined Backoff Algorithm to reduce the overhead associated with collision and to improve the accuracy of available bandwidth. After estimating the available bandwidth, this algorithm uses AOMDV to find the best path between source and destination with bandwidth as an additional constraint. Pipelined backoff stages consume less bandwidth which is negligible. Pipelined ABM makes the utilization of resources more efficient by minimizing the unnecessary control messages and stopping the transmissions that cannot meet the given QoS

requirements. When the number of contending nodes is less with large value of CWmin but no one is sending the data wastes a lot of bandwidth. The choice of CWmax parameter on the network performance is little. But it cannot be reduced to a low value. Simulation results present throughput, delay, energy, PDR for different values of CW parameters. Results show that there is a better performance for FCWmin=31 and FCWmax=1023.

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7. Use right software: Always use good quality software packages. If you are not capable to judge good software then you can lose quality of your paper unknowingly. There are various software programs available to help you, which you can get through Internet.

8. Use the Internet for help: An excellent start for your paper can be by using the Google. It is an excellent search engine, where you can have your doubts resolved. You may also read some answers for the frequent question how to write my research paper or find model research paper. From the internet library you can download books. If you have all required books make important reading selecting and analyzing the specified information. Then put together research paper sketch out.

9. Use and get big pictures: Always use encyclopedias, Wikipedia to get pictures so that you can go into the depth.

10. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right! It is a good habit, which helps to not to lose your continuity. You should always use bookmarks while searching on Internet also, which will make your search easier.

11. Revise what you wrote: When you write anything, always read it, summarize it and then finalize it.

12. Make all efforts: Make all efforts to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in introduction, that what is the need of a particular research paper. Polish your work by good skill of writing and always give an evaluator, what he wants.

13. Have backups: When you are going to do any important thing like making research paper, you should always have backup copies of it either in your computer or in paper. This will help you to not to lose any of your important.

14. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several and unnecessary diagrams will degrade the quality of your paper by creating "hotchpotch." So always, try to make and include those diagrams, which are made by your own to improve readability and understandability of your paper.

15. Use of direct quotes: When you do research relevant to literature, history or current affairs then use of quotes become essential but if study is relevant to science then use of quotes is not preferable.

16. Use proper verb tense: Use proper verb tenses in your paper. Use past tense, to present those events that happened. Use present tense to indicate events that are going on. Use future tense to indicate future happening events. Use of improper and wrong tenses will confuse the evaluator. Avoid the sentences that are incomplete.

17. Never use online paper: If you are getting any paper on Internet, then never use it as your research paper because it might be possible that evaluator has already seen it or maybe it is outdated version.

18. **Pick a good study spot:** To do your research studies always try to pick a spot, which is quiet. Every spot is not for studies. Spot that suits you choose it and proceed further.

19. Know what you know: Always try to know, what you know by making objectives. Else, you will be confused and cannot achieve your target.

20. Use good quality grammar: Always use a good quality grammar and use words that will throw positive impact on evaluator. Use of good quality grammar does not mean to use tough words, that for each word the evaluator has to go through dictionary. Do not start sentence with a conjunction. Do not fragment sentences. Eliminate one-word sentences. Ignore passive voice. Do not ever use a big word when a diminutive one would suffice. Verbs have to be in agreement with their subjects. Prepositions are not expressions to finish sentences with. It is incorrect to ever divide an infinitive. Avoid clichés like the disease. Also, always shun irritating alliteration. Use language that is simple and straight forward. put together a neat summary.

21. Arrangement of information: Each section of the main body should start with an opening sentence and there should be a changeover at the end of the section. Give only valid and powerful arguments to your topic. You may also maintain your arguments with records.

22. Never start in last minute: Always start at right time and give enough time to research work. Leaving everything to the last minute will degrade your paper and spoil your work.

23. Multitasking in research is not good: Doing several things at the same time proves bad habit in case of research activity. Research is an area, where everything has a particular time slot. Divide your research work in parts and do particular part in particular time slot.

24. Never copy others' work: Never copy others' work and give it your name because if evaluator has seen it anywhere you will be in trouble.

25. Take proper rest and food: No matter how many hours you spend for your research activity, if you are not taking care of your health then all your efforts will be in vain. For a quality research, study is must, and this can be done by taking proper rest and food.

26. Go for seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

27. Refresh your mind after intervals: Try to give rest to your mind by listening to soft music or by sleeping in intervals. This will also improve your memory.

28. Make colleagues: Always try to make colleagues. No matter how sharper or intelligent you are, if you make colleagues you can have several ideas, which will be helpful for your research.

29. **Think technically:** Always think technically. If anything happens, then search its reasons, its benefits, and demerits.

30. Think and then print: When you will go to print your paper, notice that tables are not be split, headings are not detached from their descriptions, and page sequence is maintained.

31. Adding unnecessary information: Do not add unnecessary information, like, I have used MS Excel to draw graph. Do not add irrelevant and inappropriate material. These all will create superfluous. Foreign terminology and phrases are not apropos. One should NEVER take a broad view. Analogy in script is like feathers on a snake. Not at all use a large word when a very small one would be

sufficient. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Amplification is a billion times of inferior quality than sarcasm.

32. Never oversimplify everything: To add material in your research paper, never go for oversimplification. This will definitely irritate the evaluator. Be more or less specific. Also too, by no means, ever use rhythmic redundancies. Contractions aren't essential and shouldn't be there used. Comparisons are as terrible as clichés. Give up ampersands and abbreviations, and so on. Remove commas, that are, not necessary. Parenthetical words however should be together with this in commas. Understatement is all the time the complete best way to put onward earth-shaking thoughts. Give a detailed literary review.

33. Report concluded results: Use concluded results. From raw data, filter the results and then conclude your studies based on measurements and observations taken. Significant figures and appropriate number of decimal places should be used. Parenthetical remarks are prohibitive. Proofread carefully at final stage. In the end give outline to your arguments. Spot out perspectives of further study of this subject. Justify your conclusion by at the bottom of them with sufficient justifications and examples.

34. After conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print to the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects in your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form, which is presented in the guidelines using the template.
- Please note the criterion for grading the final paper by peer-reviewers.

Final Points:

A purpose of organizing a research paper is to let people to interpret your effort selectively. The journal requires the following sections, submitted in the order listed, each section to start on a new page.

The introduction will be compiled from reference matter and will reflect the design processes or outline of basis that direct you to make study. As you will carry out the process of study, the method and process section will be constructed as like that. The result segment will show related statistics in nearly sequential order and will direct the reviewers next to the similar intellectual paths throughout the data that you took to carry out your study. The discussion section will provide understanding of the data and projections as to the implication of the results. The use of good quality references all through the paper will give the effort trustworthiness by representing an alertness of prior workings.

Writing a research paper is not an easy job no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record keeping are the only means to make straightforward the progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear

· Adhere to recommended page limits

Mistakes to evade

- Insertion a title at the foot of a page with the subsequent text on the next page

- Separating a table/chart or figure - impound each figure/table to a single page
- Submitting a manuscript with pages out of sequence

In every sections of your document

· Use standard writing style including articles ("a", "the," etc.)

· Keep on paying attention on the research topic of the paper

· Use paragraphs to split each significant point (excluding for the abstract)

· Align the primary line of each section

· Present your points in sound order

· Use present tense to report well accepted

· Use past tense to describe specific results

· Shun familiar wording, don't address the reviewer directly, and don't use slang, slang language, or superlatives

· Shun use of extra pictures - include only those figures essential to presenting results

Title Page:

Choose a revealing title. It should be short. It should not have non-standard acronyms or abbreviations. It should not exceed two printed lines. It should include the name(s) and address (es) of all authors.

Abstract:

The summary should be two hundred words or less. It should briefly and clearly explain the key findings reported in the manuscript--must have precise statistics. It should not have abnormal acronyms or abbreviations. It should be logical in itself. Shun citing references at this point.

An abstract is a brief distinct paragraph summary of finished work or work in development. In a minute or less a reviewer can be taught the foundation behind the study, common approach to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Yet, use comprehensive sentences and do not let go readability for briefness. You can maintain it succinct by phrasing sentences so that they provide more than lone rationale. The author can at this moment go straight to

shortening the outcome. Sum up the study, with the subsequent elements in any summary. Try to maintain the initial two items to no more than one ruling each.

- Reason of the study - theory, overall issue, purpose
- Fundamental goal
- To the point depiction of the research
- Consequences, including definite statistics - if the consequences are quantitative in nature, account quantitative data; results of any numerical analysis should be reported
- Significant conclusions or questions that track from the research(es)

Approach:

- Single section, and succinct
- As a outline of job done, it is always written in past tense
- A conceptual should situate on its own, and not submit to any other part of the paper such as a form or table
- Center on shortening results - bound background information to a verdict or two, if completely necessary
- What you account in an conceptual must be regular with what you reported in the manuscript
- Exact spelling, clearness of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else

Introduction:

The **Introduction** should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable to comprehend and calculate the purpose of your study without having to submit to other works. The basis for the study should be offered. Give most important references but shun difficult to make a comprehensive appraisal of the topic. In the introduction, describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will have no attention in your result. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here. Following approach can create a valuable beginning:

- Explain the value (significance) of the study
- Shield the model - why did you employ this particular system or method? What is its compensation? You strength remark on its appropriateness from a abstract point of vision as well as point out sensible reasons for using it.
- Present a justification. Status your particular theory (es) or aim(s), and describe the logic that led you to choose them.
- Very for a short time explain the tentative propose and how it skilled the declared objectives.

Approach:

- Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done.
- Sort out your thoughts; manufacture one key point with every section. If you make the four points listed above, you will need a least of four paragraphs.
- Present surroundings information only as desirable in order hold up a situation. The reviewer does not desire to read the whole thing you know about a topic.
- Shape the theory/purpose specifically - do not take a broad view.
- As always, give awareness to spelling, simplicity and correctness of sentences and phrases.

Procedures (Methods and Materials):

This part is supposed to be the easiest to carve if you have good skills. A sound written Procedures segment allows a capable scientist to replacement your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt for the least amount of information that would permit another capable scientist to spare your outcome but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section. When a technique is used that has been well described in another object, mention the specific item describing a way but draw the basic

principle while stating the situation. The purpose is to text all particular resources and broad procedures, so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step by step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

- Explain materials individually only if the study is so complex that it saves liberty this way.
- Embrace particular materials, and any tools or provisions that are not frequently found in laboratories.
- Do not take in frequently found.
- If use of a definite type of tools.
- Materials may be reported in a part section or else they may be recognized along with your measures.

Methods:

- Report the method (not particulars of each process that engaged the same methodology)
- Describe the method entirely
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures
- Simplify - details how procedures were completed not how they were exclusively performed on a particular day.
- If well known procedures were used, account the procedure by name, possibly with reference, and that's all.

Approach:

- It is embarrassed or not possible to use vigorous voice when documenting methods with no using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result when script up the methods most authors use third person passive voice.
- Use standard style in this and in every other part of the paper - avoid familiar lists, and use full sentences.

What to keep away from

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings - save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part a entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Carry on to be to the point, by means of statistics and tables, if suitable, to present consequences most efficiently.You must obviously differentiate material that would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matter should not be submitted at all except requested by the instructor.

Content

- Sum up your conclusion in text and demonstrate them, if suitable, with figures and tables.
- In manuscript, explain each of your consequences, point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation an exacting study.
- Explain results of control experiments and comprise remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or in manuscript form.

What to stay away from

- Do not discuss or infer your outcome, report surroundings information, or try to explain anything.
- Not at all, take in raw data or intermediate calculations in a research manuscript.

- Do not present the similar data more than once.
- Manuscript should complement any figures or tables, not duplicate the identical information.
- Never confuse figures with tables - there is a difference.

Approach

- As forever, use past tense when you submit to your results, and put the whole thing in a reasonable order.
- Put figures and tables, appropriately numbered, in order at the end of the report
- If you desire, you may place your figures and tables properly within the text of your results part.

Figures and tables

- If you put figures and tables at the end of the details, make certain that they are visibly distinguished from any attach appendix materials, such as raw facts
- Despite of position, each figure must be numbered one after the other and complete with subtitle
- In spite of position, each table must be titled, numbered one after the other and complete with heading
- All figure and table must be adequately complete that it could situate on its own, divide from text

Discussion:

The Discussion is expected the trickiest segment to write and describe. A lot of papers submitted for journal are discarded based on problems with the Discussion. There is no head of state for how long a argument should be. Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implication of the study. The purpose here is to offer an understanding of your results and hold up for all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of result should be visibly described. Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved with prospect, and let it drop at that.

- Make a decision if each premise is supported, discarded, or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."
- Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work
- You may propose future guidelines, such as how the experiment might be personalized to accomplish a new idea.
- Give details all of your remarks as much as possible, focus on mechanisms.
- Make a decision if the tentative design sufficiently addressed the theory, and whether or not it was correctly restricted.
- Try to present substitute explanations if sensible alternatives be present.
- One research will not counter an overall question, so maintain the large picture in mind, where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

- When you refer to information, differentiate data generated by your own studies from available information
- Submit to work done by specific persons (including you) in past tense.
- Submit to generally acknowledged facts and main beliefs in present tense.

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Please carefully note down following rules and regulation before submitting your Research Paper to Global Journals Inc. (US):

Segment Draft and Final Research Paper: You have to strictly follow the template of research paper. If it is not done your paper may get rejected.

- The **major constraint** is that you must independently make all content, tables, graphs, and facts that are offered in the paper. You must write each part of the paper wholly on your own. The Peer-reviewers need to identify your own perceptive of the concepts in your own terms. NEVER extract straight from any foundation, and never rephrase someone else's analysis.

- Do not give permission to anyone else to "PROOFREAD" your manuscript.

- Methods to avoid Plagiarism is applied by us on every paper, if found guilty, you will be blacklisted by all of our collaborated research groups, your institution will be informed for this and strict legal actions will be taken immediately.)
- To guard yourself and others from possible illegal use please do not permit anyone right to use to your paper and files.

Criterion for Grading a Research Paper (Compilation)
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Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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