# An Improved Model of Virtual Classroom using Information Fusion and Ns-Dbscan

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## Abstract

Virtual classroom is a latest concept of learning platform. It provides an environment by incorporating internet technology where teachers, students, researchers and interested people can interact, collaborate, communicate and explain their thoughts and views in well organized, technical and pedagogical procedure. Regarding present global context, the virtual classrooms is a popular technology. Very reknown e-learning platforms are Blackboard, Schoology, Moodle (Modular Object-Oriented Dynamic Learning Environment), Canvas and google classroom. In this thesis, we propose an efficient model of virtual classroom to enhance the facility of current e-learning system. To develop the model of virtual classroom, the thesis integrates the policy of cloud computing with information fusion (IF) technique for providing a ubiquitous learning capacity from an e-learning platform. In our proposed model, Density Based Spatial Clustering of Application with Noise (DBSCAN) algorithm is used for separating different layers of data to reduce time complexity and enhance data security. Here we also demonstrate the complete architecture of cloud based e-learning process through our proposed virtual classroom.

***Index terms—***

## 1 Introduction

irtual classroom (VC) is a computer mediated system covered by internet technology. It is mainly formulated for online education, distance learning and synchronous type of education through web. The phenomenal growth and subsequent increasing use of Information and Communication Technology (ICT) initiate an Opportunity of borderless E-Learning system based on VC [1][2][3][4][5].VC offers many services for both the teachers and the students e.g. including live video streaming application, files and desktop sharing. Instructors can view each student's session, public and private text chat.

Our main contribution of this work is to develop an efficient virtual classroom integrating cloud computing with information fusion (IF) technology [10]. Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources, e.g. networks, servers, storage, applications and services that can be rapidly provisioned and released with minimal managerial effort or interaction of service provider [2]. But fusion of information of multi-sources makes a contribution to saving network resources, getting accurate information and improving the efficiency of information transmission in the cloud computing in a secured way. Though the IF technology is rapidly used in sensor networks but in this work IF technology is considered for conventional cloud network [11][12][13]. That involvement has enriched our thesis.

We used fused information on our DBSCAN algorithm. We fuse the data set using K-Means, Fuzzy C-Means and DBSCAN clustering at feature-level. We discern that DBSCAN to improve the detection ability up to 10%. With the increasing of the size of clusters, the parallel DBSCAN algorithm is widely used in image processing, data mining, machine learning and other fields [14][15]. We proposed DBSCAN algorithm for data portioning and merging information on cloud platform.

Finally, we give distinct weight for different level of academic users (Ph.D, M.Phil, M.Sc, B.Sc etc.) for priority scheduling to access of VC. The weights are used to give preference from the sense of research output. The number

of users is in different slots having distinctive weights to access VC. Our priority scheduling algorithm makes sure the access of VC as their necessity.

In this thesis, firstly we deploy the cloud network and then introduce information fusion method along with cloud architecture which can provide the ubiquitous elearning capability of proposed VC. Then we configure DBSCAN algorithm for IF technique to channelize data among different layers in cloud network [18].

# 2 II.

# 3 Existing Virtual Classroom as E-Learning Platform

Existing virtual classroom provides different types of learning environments for students and teachers with dynamic, interactive, easy access for different resources (text, graphics, and animation) as V well as to self-learning in online communication as elearning platform. It is an educational approach that combines types of multimedia and information technologies to ensure better learning experiences for both students and teachers. A Learning Platform is set of interactive online based facilities which provide to the teachers, students, and others in education system and enhance the educational management system. The elearning platforms promote student learning, consequently, they are fundamental in any education system. Following fig. 1 shows the different types of E-Learning platforms such as Blackboard, Moodle and Canvas which has described in this section. Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g. networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. Cloud Computing is a technology that uses the internet and central remote servers to maintain data and applications [20-27].

There are five essential characteristics of cloud computing: on-demand self-service, broad network access, resource pooling, rapid elasticity or expansion, and measured service.

# 4 b) Information Fusion on Cloud Platform

Cloud providers offer data management, integration, and collaboration tasks in cloud computing environments. In particular, outsourcing data-intensive and compute intensive information fusion tasks to cloud service is a natural solution for applications in which either on-site computing power is insufficient or decision making requires integrated analysis of data collected by distributed sensors or monitors. For example, many research efforts have been reported to relieve the burden of information fusion for wireless sensor networks (WSNs) to cloud service platforms.

# 5 c) DBSCAN Algorithm for Network Space

DBSCAN algorithm is used in network space for visualizing the density distribution and indicating the intrinsic clustering structure. The Network Space DBSCAN (NS-DBSCAN) algorithm was compared with the classical hierarchical clustering algorithm and the recently proposed density-based clustering algorithm with network-constraint Delaunay triangulation (NC_DT) in terms of their effectiveness [18].

The Network Space DBSCAN algorithm is essentially the extended DBSCAN algorithm for networkconstraint events. The algorithm consists of two core steps:

Step 1: Generating density ordering: In this step, the density ordering table and graph were obtained with one parameter eps. The step included two substeps: the first one involved obtaining eps-neighbors, where the LSPD algorithm is introduced. The second substep involved generating the density ordering table and graph with the densities of event points.

Step 2: Forming clusters: In this step, the second parameter MinPts was set according to the density ordering graph and clusters were formed by categorizing spatially adjacent and dense event points into the same cluster.

# 6 d) Priority Scheduling

Priority Scheduling is a method of scheduling processes that is based on priority. In this algorithm, the scheduler selects the tasks to work as per the priority. The processes with higher priority should be carried out first, whereas jobs with equal priorities are carried out on a round-robin or FCFS basis. Priority depends upon memory requirements, time requirements, etc.

# 7 e) Review of Virtual Classroom Research Activities

In this section we explain some system of virtual classroom which is enabling to use for E-Learning. Cloud computing based virtual classroom is proposed by Chao-Tung Yang et al [1]. This work presents a complete solution through the integration of e-learning, cloud computing, open source software, and external cloud resources to provide deployment method for more learners and educators. In the end, the work proposed through a combination of e-learning, cloud computing and open source spirit, to indicate the key elements of a complete e-learning cloud, and to help expanding elearning education throughout the world. But the high computing cost which consumes high finance and physical memory usage is the main disadvantage of this method.

# 8 Figure 2: Interior Components of e-learning cloud

Web based virtual classroom was introduced by [4]. For real-time participation, the VC is enhanced with a quiz system, group system and communication framework. To make VC more effective the location of the SMEs and the learner is stored in a database, SME is allocated a class of nearby students so, that if any face to face meeting is required it can be easily arranged. But the e-learning content which is previously used is mostly static and mostly depends on HTML5. This is less inspiration and students confront low concentration level. Participant and educator are not colocated that make it troublesome for the teacher to give brief ideas. Because of the low level of interest from the student, their abilities can't be improved as it could have been in the customary classroom.

Charles, A. O et al proposed a system of virtual classroom which was developed and hosted on the web using Moodle, Elluminate, WAMP Server, Java Script, MySQL, PHP and Dreamweaver.This virtual classroom consists of Client-Tier, (CT), Web-Tier (WT) and Enterprise Information System-Tier (EIST). The CT application is put in place to provide a Graphic User Interface (GUI) to the end users via a web browser, such as Internet Explorer, Opera or Firefox. HTML and PHP with Java applet is used to build the client-side GUI page. A web server, Apache or Internet Information Server (IIS) which is bundled with Microsoft Office server reference implementation, is used to serve the GUI page at the web-tier, and to provide dynamic content HTML/PHP pages. The web-tier holds data model of the business data and presents it to the client through HTML/PHP pages, accepts and analyzes the user's inputs, passes the user's request to the Enterprise tier for processing, and forward response back to the client. f) Problem Statement 1. Virtual classroom

# 9 Proposed Method

To construct a virtual classroom by the proposed method is mainly segmented into organization of cloud network, information fusion, NS-DBSACN and priority scheduling. Educational source and required elements is to be formalized a carefully planned conversion known as "Cloudify", which are import numbers of cloud computing technology and software, then divided into the local components of the provisioning hardware/software environments as well as a fully developed free external service for related software, refer to previous background information. The scheme segments the cloud data by information fusion based data processing method. The proposed NS-DBSCAN based clustering method then fuse the data at different channel. At the final phase, the priority based scheduling technique is used for user classification on the basis of necessity. Figure 3 presents the flowchart and the details of the proposed model. NS-DBSCAN has the following basic concepts: Eps: radius of NS-DBSCAN Algorithm Analysis neighborhood. It is used to determine core points and noise points. MinPts: minimum point sets. As a core point, the number of points in its neighborhood must exceed MinPts. Core points: the points, of which the number exceed that of MinPts within the neighborhood. Direct arrived density: there are pointsp and q. If point q is in the Eps neighborhood of point p and point p is the core point, it will be called direct arrived density between point p and point q. Arrived density: if there are a series of points Pi (i=1, 2, 3, 4... n) in a region, let P=P1, Pn=Q and the average density from Pi to Pi-1 can be reached, then P and Q is thought as arrived density. DBSCAN is based on the fact that a cluster can be determined by its core points. Accordingly, the algorithm can be expressed as follows: (1) For any given core point p, there is always a collection{ 0 | 0 Ñ?" Eps (P)}, which is constituted by the object o of density p in the region D. The collection forms a complete cluster C, and there will be. ( **??**) For a given cluster C and its arbitrary core point p, C is equivalent to the collection {0 | 0 Ñ?" Eps (P)}. In order to determine clusters, DBSCAN arbitrarily takes a point p from region D, and then search all the points in region D which can satisfy Eps, MinPts and reach density p. If p is a core point, the points in the Eps neighborhood of point p is more than that of MinPts. If p is a boundary point, the points in the Eps neighborhood of point p is less than that of MinPts. Namely no object can reach the density from p, p is temporarily marked as a noise point and the algorithm continues to handle the next optional point in region D. During the execution of the algorithm, all arrived density objects of a core point need to be achieved by repeatedly regional query.

# 10 i. Data Partitioning Strategies

In this method, we use the Binary Space Partitioning strategy in data partitioning. BSP is a kind of space partition method based on binary tree. It is based on the fact that any plane can divide space into two halfspaces. Repeating this process can build a binary tree, and each leaf node is the divided space. The space partitioning strategy of this approach is very casual, basically adopting the typical dichotomy. In the process of partitioning data sets, it is likely to make the space partitioning and the distribution of data sets not completely corresponding to each other, reducing efficiency of parallelization. In addition, the algorithm in this method needs an independent regional query (Get Neighbors) operation. Although it uses R tree to reduce the complexity of the process and is independently processed in the divided partition, it still consumes a lot of time. To solve these problems, this paper builds KD tree in the regional query [10], partitioning according to the division of KD tree. KD tree is a data structure of data points divided in K dimension space. In essence, KD tree is a balanced binary tree and a special case of binary system space partition tree. In two-dimensional space, as shown in figure **??**, the dotted lines in the figure are parting lines. The domain Split current dimension point is an odd number.

Hyper plane segmentation data sets determined by Node. All data points which are smaller than Node should be regarded as left sub tree of KD tree, while all data points which are larger than Node should be regarded as right sub tree of KD tree.

Continuing steps ( **??**) -( **??**) in the left and right sub tree of KD tree until meeting the suspensive conditions of partition. The suspensive conditions of partition should be associated with properties of DBSCAN and data sets. Because it is necessary to ensure that each divided partition can be independently operated on DBSCAN.

IV.

# 11 Results and Discussion

# 12 a) Simulation and Observation

Here we prepare an experimental arrangement for our proposed method. Our experiment is divided in three steps:

1. Clustering of data (Using DBSCAN).

# 13 Channelize the cluster data 3. Fusion of channelize data

For this experiment, we use video stream of a VC of '.avi' format and simulation is performed on MATLAB 2014b.

# 14 b) Clustering

Here we apply DBSCAN algorithm for spatial clustering and separate Noise channel.

We

# 15 d) Fusion of Channelize Data

Finally, we fuse all of the separated data and frames by using information fusion technique. We retrieve the entire video stream using this process. To fuse the separated data from different data channel, we apply information fusion technique and get fusion grid. This fusion grid determines the perfection of fusion.

# 16 Conclusion

In this thesis work, a conceptual model of virtual classroom is developed for enhancement to E-Learning system. Here, we incorporate some new ideas and algorithm to this virtual classroom where those ideas and algorithms were performing for different evidential computing issues and system. To develop this model of virtual classroom, we consider all types of networking and software implementation issues from algorithm design through deployment stage. Integration of cloud computing to Information fusion technology comprises the indication of new dimension of ubiquitous computing in E-Learning platform. It is significant that our model can channelize data at different layer by handling the proper implication of DBSCAN. The efficiency measurement of our model of virtual classroom gets Perfection in the sense of data transmission and reliability factor. Almost in all cases, the proposed model gives better performance than that of the existing process for cloud based E-Learning system. The combined performance of cloud network and Information fusion by using reliable infrastructure make our method robust and efficient. [1] [2]

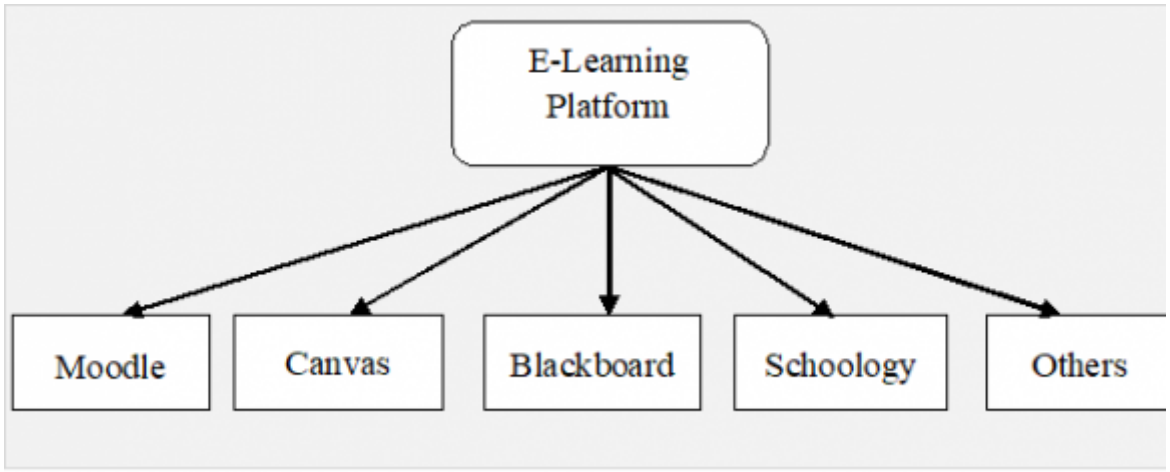


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Figure 1: Figure 1 :

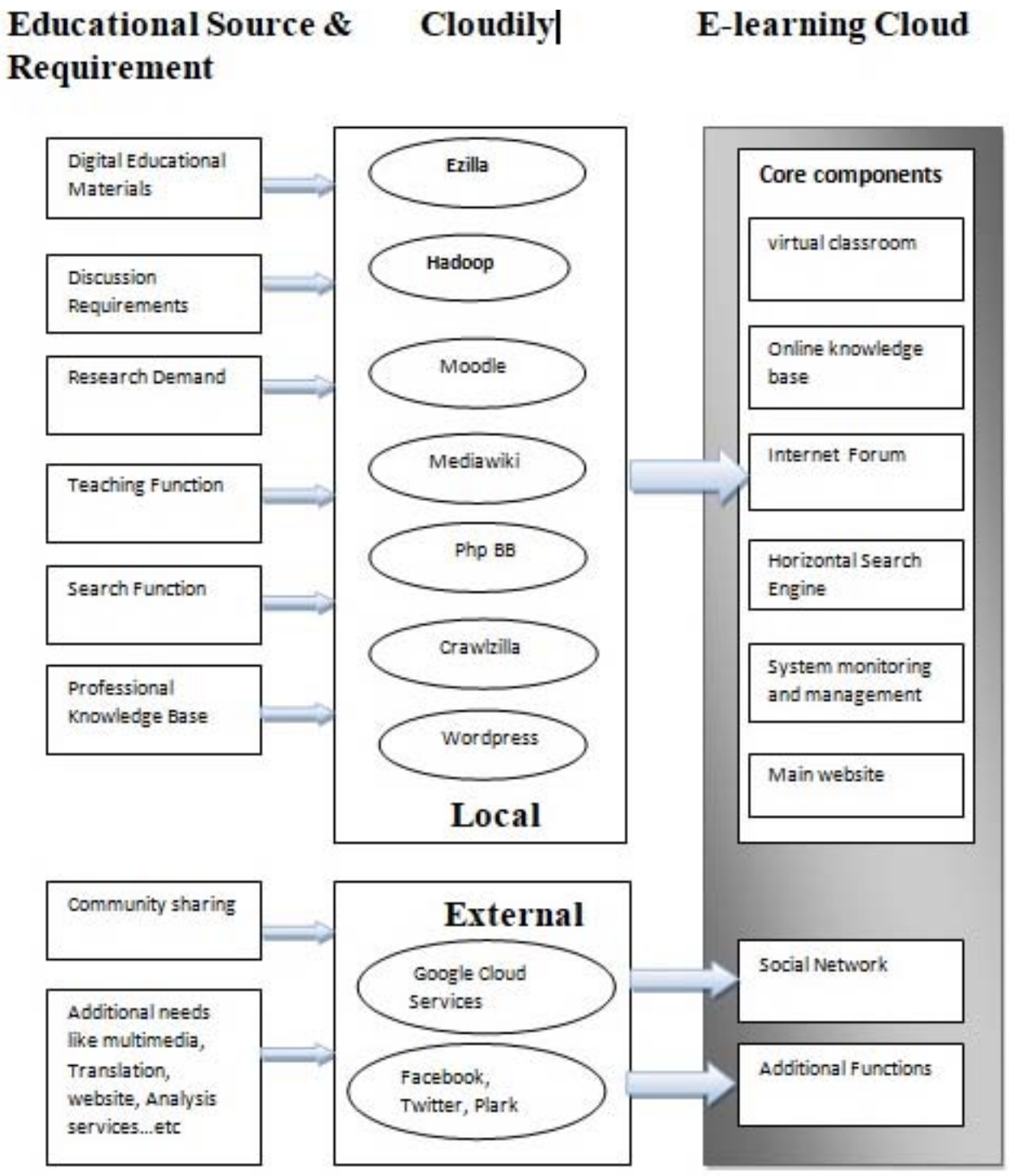


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Figure 2: Figure 3 :

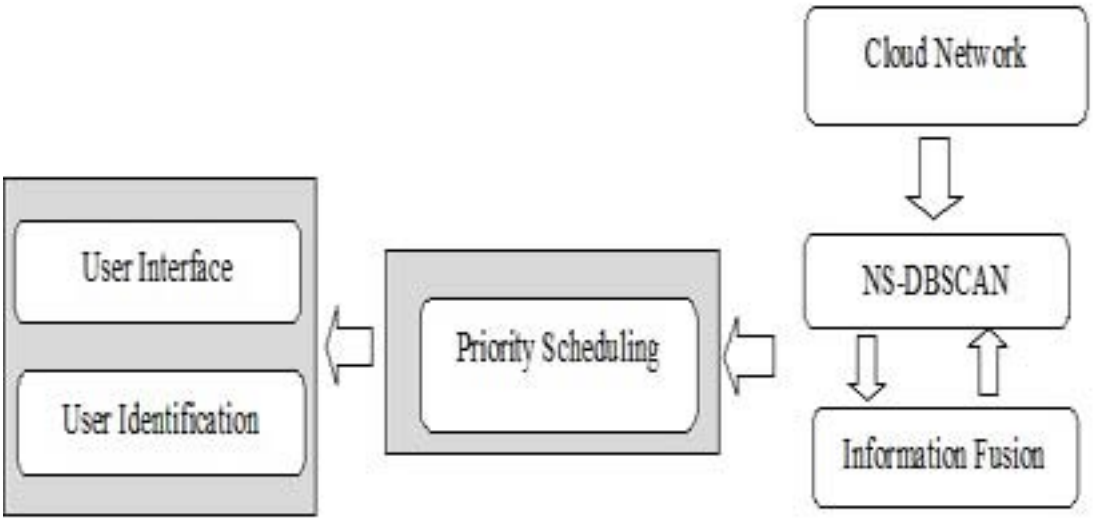


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Figure 3: Figure 4 : 3 .

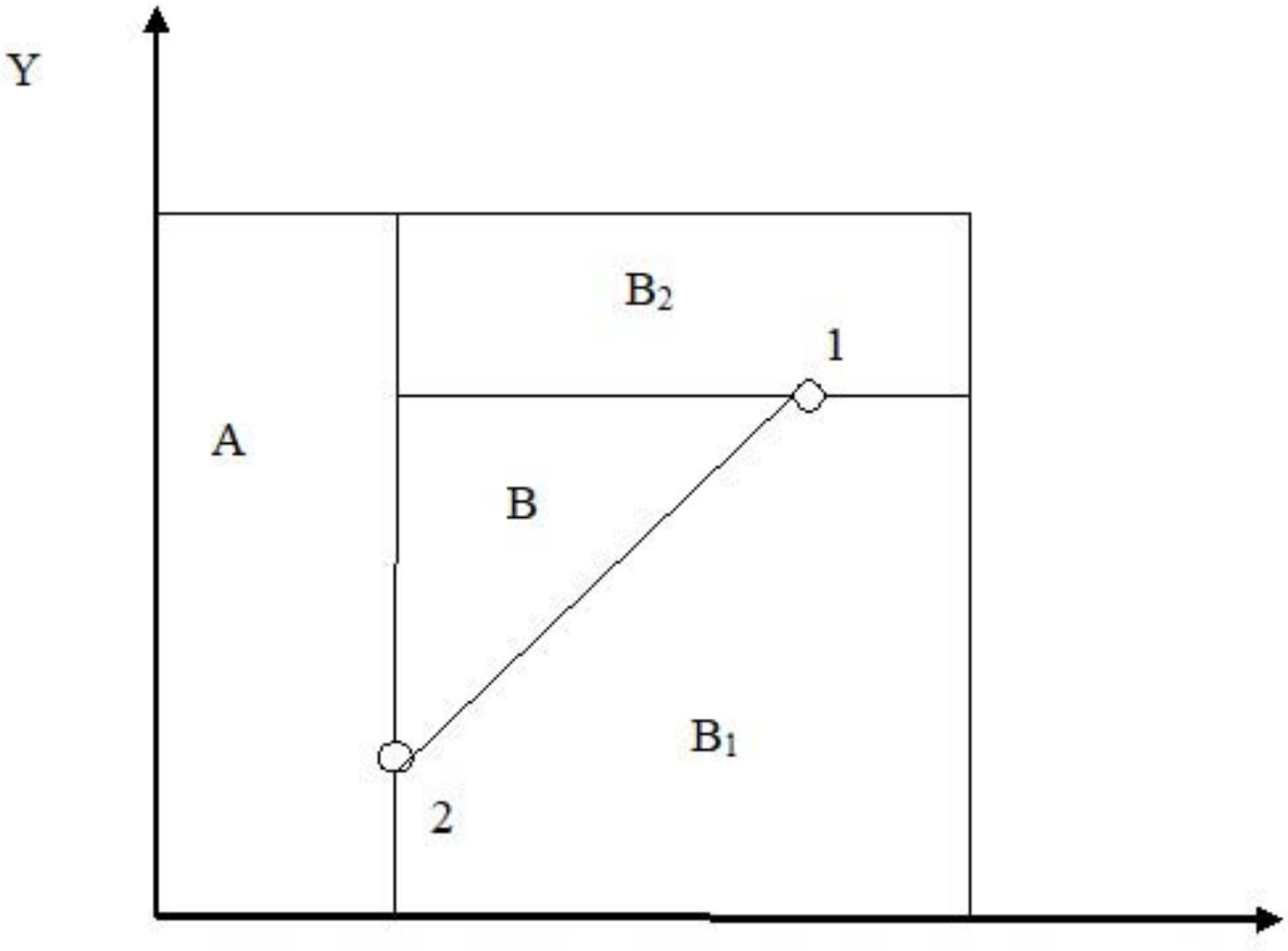


Figure 4:

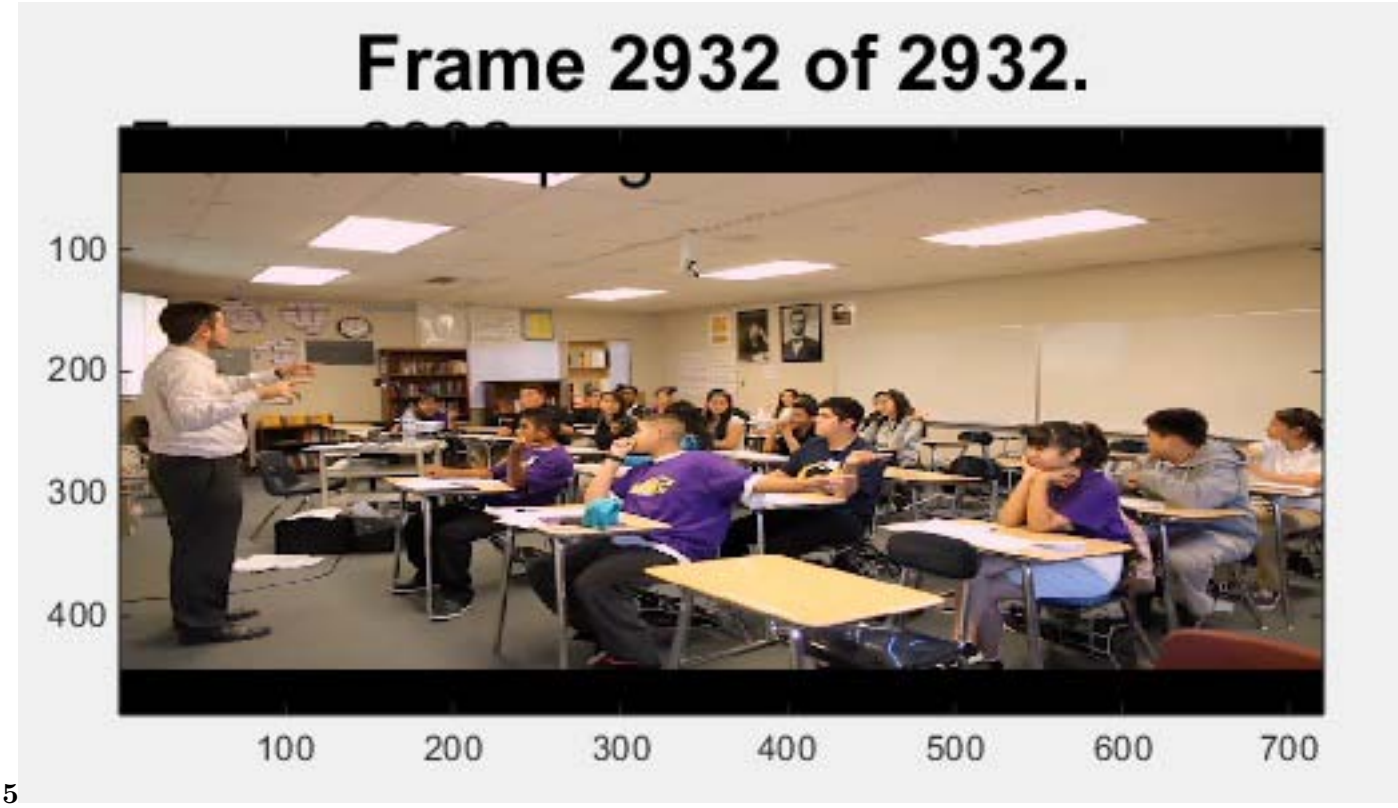


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Figure 5: Figure 5 :


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Figure 6: Figure 6 :


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Figure 7: Figure 7 :

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Figure 8: Figure 8 :

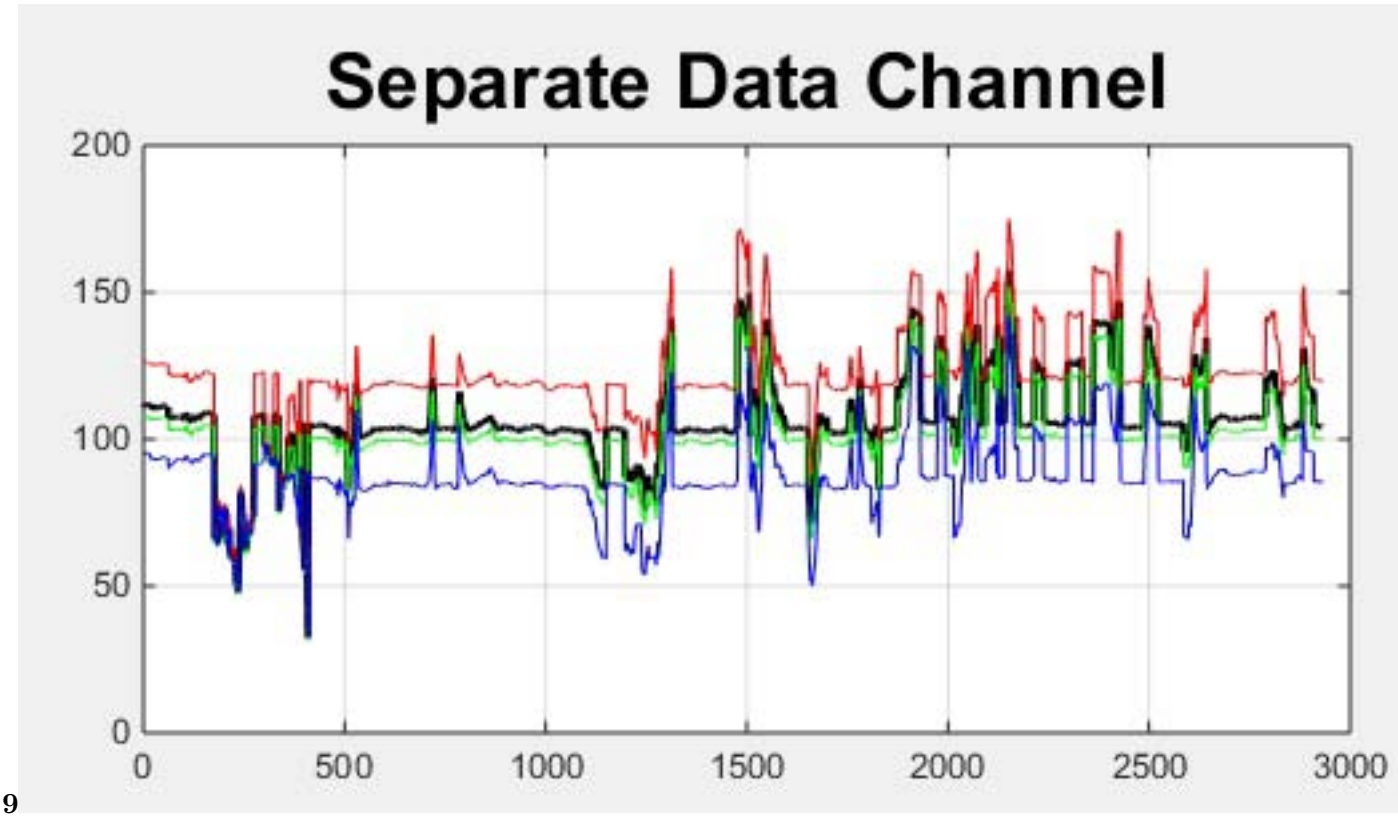


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Figure 9: Figure 9 :

[1]An Improved Model of Virtual Classroom using Information Fusion and Ns-Dbscan © 2020 Global Journals
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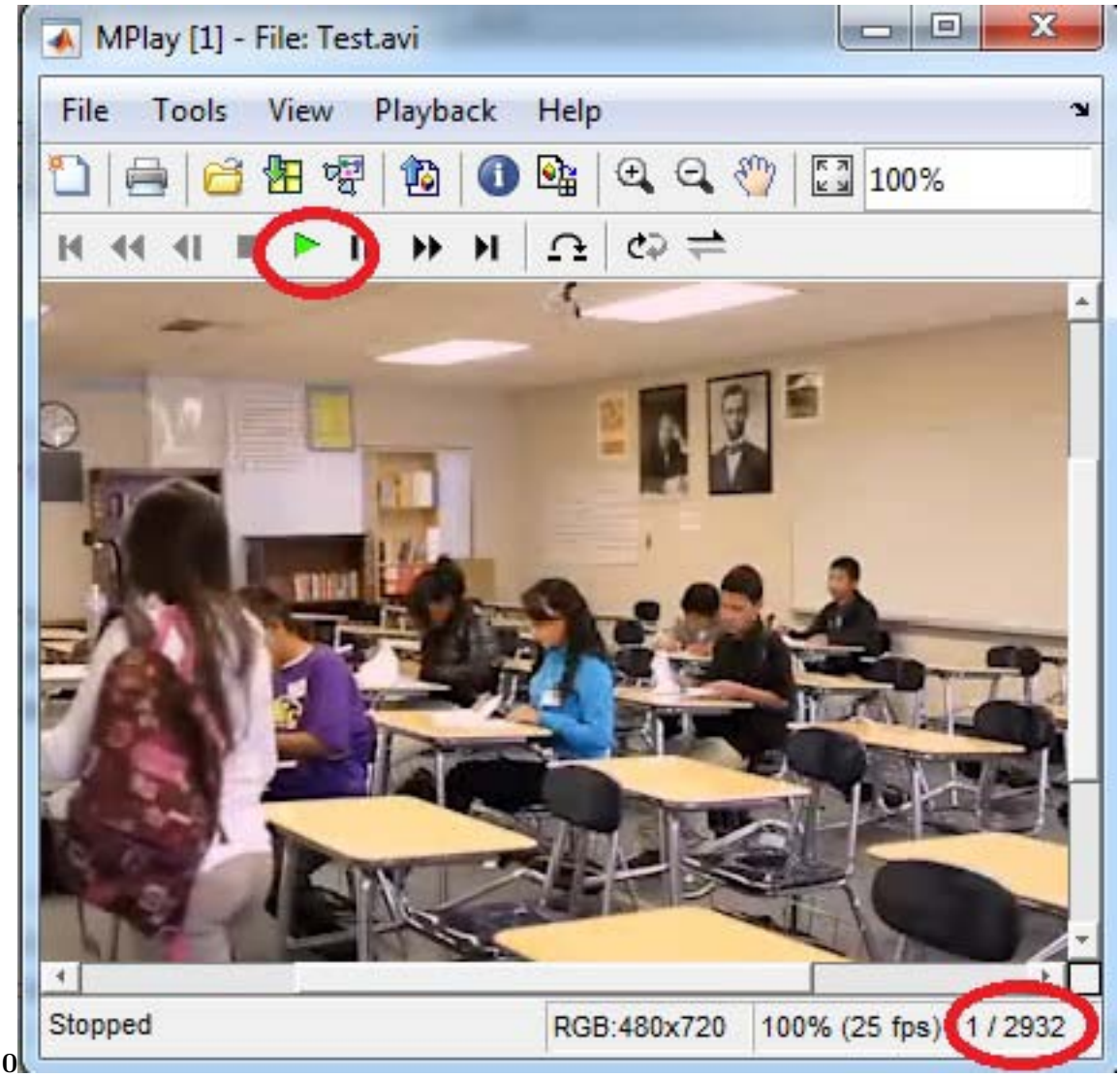


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Figure 10: Figure 10 :

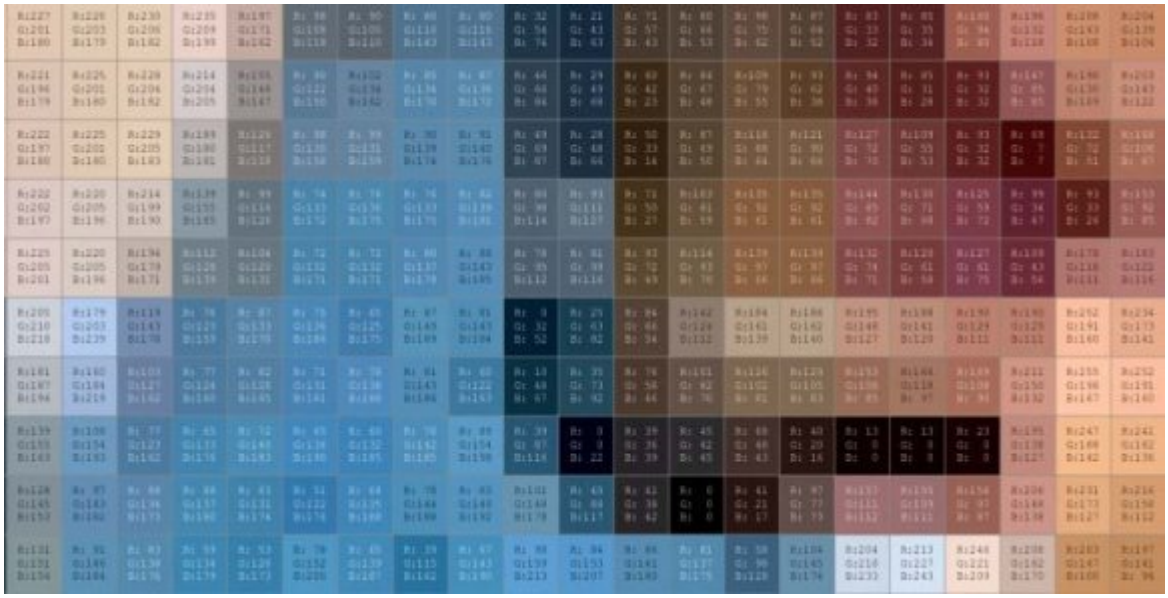

Figure 11:

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