



Internet of Things (IOT) based Irrigation System with and without Internet and Pump Set Control

By Chandanita Thakur, Shaguftha Taskeen, Pavithra S, Monisha S, Namratha KS
& Minnie Peter

Abstract- Agriculture is assumed to be a fundamental job in the improvement of a farming nation. In India about 70% of population rely on cultivation and 33% of the country's capital mainly originates from cultivation. Problems concerning agricultural business have been neutralizing the improvement of the nation. The main solution for this issue is by rationalizing the current conventional techniques for agribusiness. Thus, the propound goes for making agriculture ingenious by utilizing computerization and IOT advances.

For agricultural purposes, it is important that the information about field requirements, for instance, air and soil conditions, amount of underground water, wind speed and other appropriate conditions, rapid and powerfully available for use by agribusiness management systems, by experts, or the farmer itself in deciding processes. This system aims at making irrigation advanced using IOT and automation technologies.

Keywords: cultivation, agricultural business, water pump, GSM/GPRS, efficiency, dry run, pump-set theft.

GJCST-H Classification: C.2.m



Strictly as per the compliance and regulations of:



RESEARCH | DIVERSITY | ETHICS

Internet of Things (IOT) based Irrigation System with and without Internet and Pump Set Control

Chandanita Thakur^α, Shaguftha Taskeen^σ, Pavithra S^ρ, Monisha S^ω, Namratha KS[¥] & Minnie Peter[§]

Abstract- Agriculture is assumed to be a fundamental job in the improvement of a farming nation. In India about 70% of population rely on cultivation and 33% of the country's capital mainly originates from cultivation. Problems concerning agricultural business have been neutralizing the improvement of the nation. The main solution for this issue is by rationalizing the current conventional techniques for agribusiness. Thus, the propound goes for making agriculture ingenious by utilizing computerization and IOT advances.

For agricultural purposes, it is important that the information about field requirements, for instance, air and soil conditions, amount of underground water, wind speed and other appropriate conditions, rapid and powerfully available for use by agribusiness management systems, by experts, or the farmer itself in deciding processes. This system aims at making irrigation advanced using IOT and automation technologies.

The highlighting features of this project include controlling of water pump with/without internet through GPRS/GSM and status notification of the water pump. It also detects dry run condition i.e, Usually pump set is used for ground water levels, when the pump is on and the ground water levels is very low or if the pressure of the water decreases, there are chances for motor damages which is known as dry run, and pump set theft control of water pump i.e, An obstacle sensor is placed below the soil so when the pump-set is moved the sensor automatically sends the alert message to the farmer through android app.

Keywords: cultivation, agricultural business, water pump, GSM/GPRS, efficiency, dry run, pump-set theft.

I. INTRODUCTION

Agriculture is treated as the foundation of life for the living species as it is the only source of food granule and other organic materials, as it plays crucial role in the growth of country's wealth.

In this case, new technologies emerge bringing computerized, continuous and intuitive features for communication through messaging applications [1].

It also provides large ample employment opportunities to the people. Growth in agricultural sector is necessary for the development of economic condition of the country [2]. Sadly, most of the farmers are still following the orthodox methods in irrigation which leads to low yielding of food grains and other agricultural products [2]. By implementing computerized method in irrigation and also using advanced automatic machines

the yield has been improved compared to the manual methods [3].

In this project we can control water pump with/without internet through GPRS/GSM and status notification of the water pump.

A lot of embedded systems have unique designs according to their functions and behaviour. This system is composed of a microcontroller, LCD, GPRS, Dry run sensors (dryness detection of soil) and water pump.

The microcontroller which is located at the middle of the block diagram controls the entire project.

The same microcontroller is embedded as a program which takes required actions based on the inputs given.

Microcontroller will detect the current status of the water pump and it will automatically update on the cloud server. As and when farmers enter the login ID and password in android application, it will direct to the new window in the current status of the water pump. Water pump can be controlled using IOT or GSM.

Dry run sensor in microcontroller is usually placed at end of the pump. When motor is running and there is less water runs through pipe of the pump, we use dry run sensor for monitoring purpose. After getting signal from dry run sensor, microcontroller will send the alert to the farmer through GSM and parallely Android Application will update on Cloud Server through GPRS

II. LITERATURE SURVEY

a) Existing System

At present there is emerging global water calamity where Managing shortage of water has become a unexciting job and there are dispute between users of water. This is a period where human consumption and contamination of water resources have crossed the levels which lead to scarcity in food production and has low down the ecosystem. The vital cause for these constraints is the speedy increase in population than the production of food and after years this population may rise up to 3-4 billion [2].

This extension can be seen in countries which have scarcity of water resources and are economically backward. Because of increase in population there is a huge pressure to raise food production by 50% in the next half century to maintain the capital. Many farmers still use the long-established discipline of farming, being unaware whether the water pump is ON or OFF [4].

Author p: Department of Information Science and Engineering HKBK College of Engineering, Bengaluru, India.
e-mail: pavitra10003@gmail.com

The farmers lack knowledge about dry run sensors, the only remedy to this problem is smart agriculture by rationalizing the long-established methods of agriculture. The present summary of water levels, staling of rivers, streams and tanks, uncertain environment avail a sore necessity for proper utilization of water. To subsist with this, temperature and dampness sensors are placed at suitable locations for observing the crops [1].

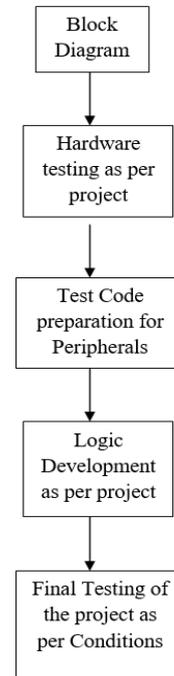
A microcontroller-based entryway is progressed with a calculation of specific estimations of temperature and soil clamminess to check water levels. The framework can be actuated by solar-oriented boards and has a duplex correspondence connect dependent on a portable Internet interface that permits information examination and water system intend to be customized into a web screen. The headway in Wireless Sensor Networks made it suitable to use in watching and limit of greenhouse parameter in precision agriculture [2]. After the examination of the agricultural land, researchers conclude that the yield is reducing day by day. Nevertheless, use of technology in the field of agriculture assumes a vital role in expanding the production as well as minimizing the human efforts [3]. Some of the scientific experiments are done for furtherance of farmers which provides the systems that use technologies beneficent for expanding the agribusiness.

b) Proposed System

The proposed system aims at making irrigation advanced using IOT and automation technologies. The highlighting features of this project include controlling of water pump with/without internet through GPRS/GSM and status notification of the water pump. It also detects dry run condition and pump set theft control of water pump and send alert to the farmer.

The control of the water pump can be implemented using Amazon Web Server (AWS) with Internet or through mobile device by using a GSM without Internet. The water pump is operated either by Auto mode or Manual mode. In Auto mode or sensor mode by predicting the land the sensor motors on and off automatically. The device can be configured into manual mode when there is unpredictable weather conditions, it basically sends an alert message when the land is dry.

c) Methodology



In this project design, the hardware system mainly consists of a Renesas 64 pin microcontroller, Dry run sensor, LCD, water pump, GSM/GPRS, transformer and voltage.

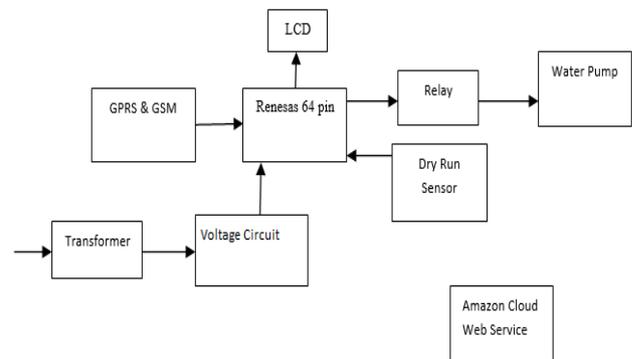


Figure 1: Block Diagram of proposed system

A single Renesas microcontroller is placed at the middle of the hardware system that monitors the entire hardware. An embedded c program is written that helps the Renesas microcontroller to work based on the given inputs. Microcontroller will observe the status of the water pump and it will update on the cloud server i.e., Amazon Web Server (AWS).

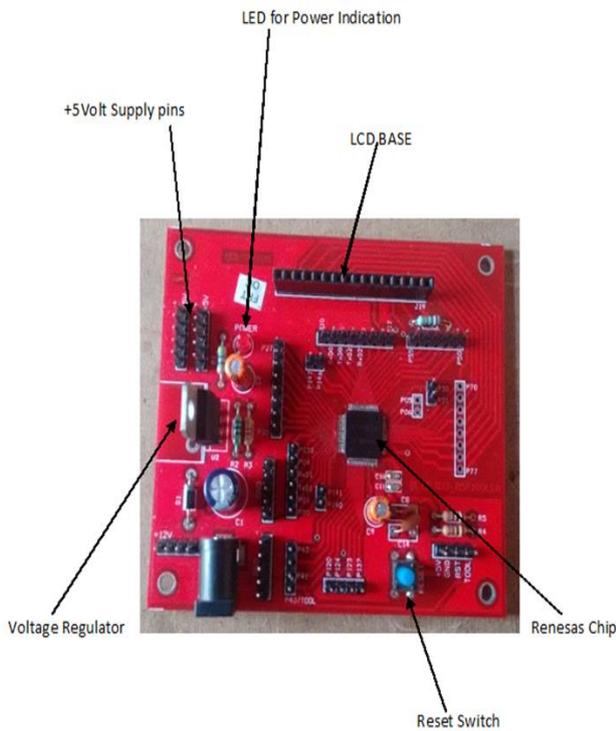


Figure 2: 64 pin Renesas Microcontroller Board

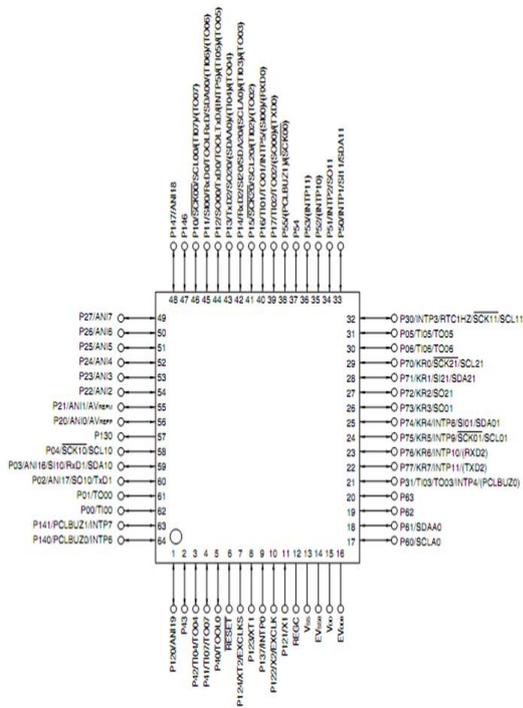


Figure 3: Pin Diagram of Renesas RL78 Microcontroller

A DC Water pump is used for the purpose of water flow and an Alpha Numeric LCD JHD162A is used as LCD. Alpha Numeric LCD display forms the fundamental part of the Embedded hardware Systems. The Data displayed in LCD is controlled by the Renesas Microcontroller.

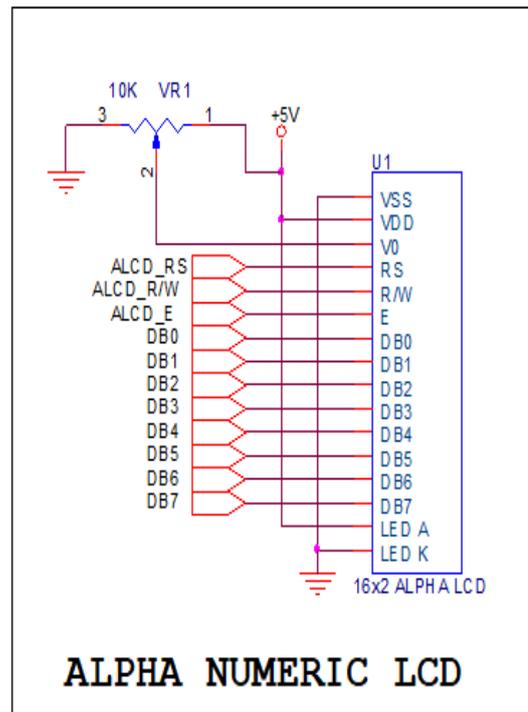


Figure 4: Circuit Diagram of Alpha Numeric LCD - JHD162A

The 5Volts and GND lines should be properly connected. For backlight in LCD connect p15 to 5Volts and p16 to GND. Adjust 10k resistor and connect p3 to 0Volts. If connections are proper the LCD looks as shown below.

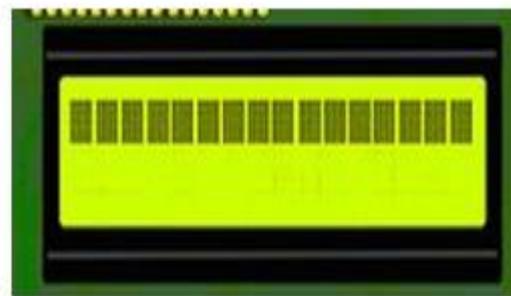


Figure 5: LCD (Liquid Crystal display)

A Transformer and a voltage circuit is embedded to estimate the power consumption, checks if there is presence of current and monitors if the power is on/off. LM317 Adjustable Regulator is used for this purpose.

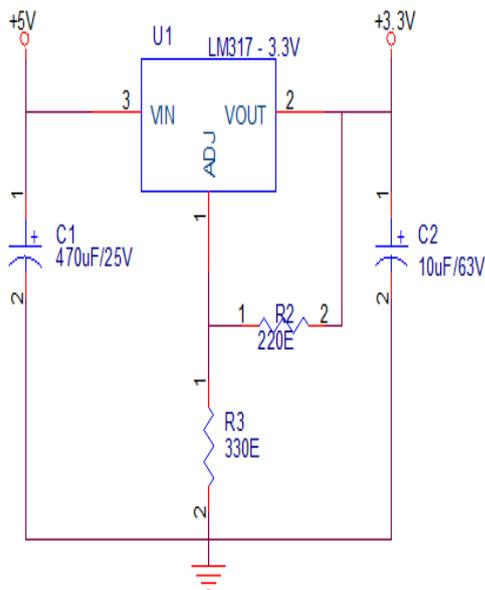


Figure 6: Circuit Diagram of LM317 voltage Regulator

Usually pump set is used for ground water levels, when the pump is on and the ground water levels is very low or if the pressure of the water decreases, there are chances for motor damages which is known as dry run. A Dry Run check sensor is placed at the water pump outlet once the pump is on, it takes some seconds for the water to flow in the outlet. If the water is not flowing through the outlet, the motor turns off automatically.

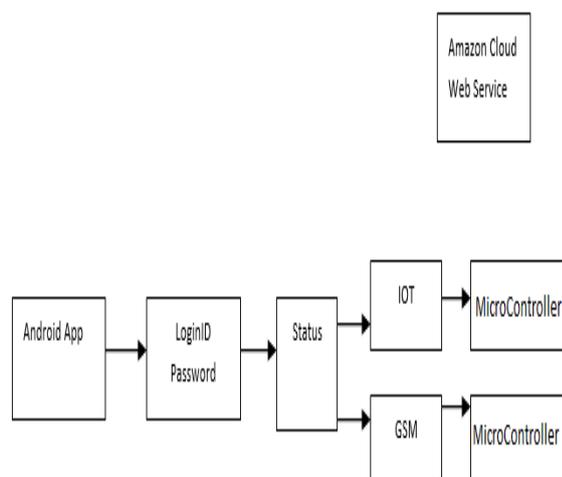


Figure 7: Block Diagram of Android Application

In android app when the farmer once logs in using login ID and password a new window will open that directs to status of the water pump. Water pump is controlled using IOT or GSM. When dry run is detected,

sensor will send signal to the microcontroller and then microcontroller will send alert to farmer through GSM also it will update on server through GPRS.

Pump-set theft control- An obstacle sensor is placed below the soil to control pump-set theft, so when the pump-set is moved the sensor automatically sends the alert message through android app.

III. CONCLUSION

The project is designed using structured modelling and is able to provide the desired results. It can be successfully implemented as a Real Time system with certain modifications.

As technology keeps changing from time to time, many discoveries led to the revolution and innovation in various fields. Further, most of the units can be fabricated on a single hardware along with microcontroller thus making the system immensely packed to make the existing system more productive. To make the system applicable for real time purposes components with greater range needs to be implemented.

REFERENCES RÉFÉRENCES REFERENCIAS

1. Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra Nieto-Garibay, and Miguel Ángel Porta-Gándara, "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module", IEEE TRANSACTIONS ON INSTRUMENTATION AND MEASUREMENT, 0018-9456, 2013
2. Dr. V .Vidya Devi, G. Meena Kumari, "Real- Time Automation and Monitoring System for Modernized Agriculture", International Journal of Review and Research in Applied Sciences and Engineering (IJRRASE) Vol3 No.1. PP 7-12, 2013
3. Y. Kim, R. Evans and W. Iversen, "Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network", IEEE Transactions on Instrumentation and Measurement, pp. 1379–1387, 2008.
4. S. R. Nandurkar, V. R. Thool, R. C. Thool, "Design and Development of Precision Agriculture System Using Wireless Sensor Network", IEEE International Conference on Automation, Control, Energy and Systems (ACES), 2014
5. Q. Wang, A. Terzis and A. Szalay, "A Novel Soil Measuring Wireless Sensor Network", IEEE Transactions on Instrumentation and Measurement, pp. 412–415, 2010
6. Arampatzis, T.; Lygeros, J.; Manesis, S. A survey of applications of wireless sensors and Wireless Sensor Networks. In 2005 IEEE International Symposium on Intelligent Control & 13th Mediterranean Conference on Control and Automation. Limassol, Cyprus, 2005, 1-2, 719-724.