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[K.T.* *et al.*, 6(6): June, 2017]
IC™ Value: 3.00

ISSN: 2277-9655
Impact Factor: 4.116
CODEN: IJESS7

IJESRT
INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY

PRECISION IRRIGATION USING INTEGRATED INTELLIGENT SYSTEMS

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DOI: 10.5281/zenodo.817952

ABSTRACT
Agriculture, the backbone of Indian economy, contributes to the overall economic growth of the country and determines the standard of life for more than 50% of the Indian population. Irrigation consumes more than 80% of the total water use in the country thereby requiring systems to build decision support systems (DSS) to overcome the problem of water wastage and deficit. In general, this paper presents an Intelligent System as an alternative and efficient way to solve the farming resources optimization and decision making. Precision agriculture systems based on the Internet of Things (IOT) technology is explained in detail especially on the hardware and network architecture and software process control of the precision irrigation system. The system collect, analyse and monitors data from the sensors in a feedback loop which activates the control devices based on pre-calculated threshold value.

KEYWORDS: Precision Agriculture (PA), Decision Support Systems (DSS), Precision Irrigation, Internet of Things (IoT).

I. INTRODUCTION
In prior-art automatic irrigation systems, an agricultural area is irrigated, for example, once a week for a predetermined time interval. Operating in an open-loop mode does not insure that an exact quantity of water has been delivered to the agricultural area. The same would be true for the distribution of chemicals to the agricultural area in an open loop system. Other automatic irrigation systems have sensed the moisture level in the soil of the agricultural area and irrigated whenever necessary to maintain a predetermined moisture level in the soil. However, these systems have no way of determining or adequately controlling the quantity of water delivered to the agricultural area and therefore cannot provide the capability of conserving limited water resources. In addition, such a system may fail to provide an adequate amount of water since the moisture level of the soil may be sampled at a place that is not representative of the entire agricultural area. In short, the prior-art automatic irrigation systems do not provide an accounting of the exact amount of water and chemicals that have been distributed. Without the aforementioned accounting, there is no way to determine the history of the irrigation system, or to factor in the availability of water resources. For the foregoing and other shortcomings and problems, there has been a long felt need for an improved computer-controlled irrigation system. An IS is a sensor network to monitor physical or environmental conditions, such as temperature, humidity, Ph level, light, salinization and moisture to cooperatively pass their data through the network to a main location. PA is an ICT-based agricultural system, designed to improve the agricultural processes by precisely monitoring each step to ensure maximum agricultural production with minimized environmental impact. PA is precise in both the size of the crop area it monitors as well as in the delivery amounts of water. Precision irrigation involves the accurate and precise application of water to meet the specific requirements of individual plants or crops and minimize adverse environmental impact. Widely accepted definition of precision irrigation is sustainable management of water resources which involves application of water to the crop at the right time and amount, right place and right method. This will help to manage the field variability of water in turn increasing the crop productivity and water use efficiency along with reduction in energy cost on irrigation. Water savings of around 25% are possible through improvements in application efficiency obtained by spatially varied irrigation applications. The advent of precision irrigation methods has played a major role in reducing the quantity of water required in agricultural and horticultural crops. In early stage, the high initial investment in the form of electronic equipment for sensors and communication networks meant that only large farms could afford it. Nowadays, the advancement of technology and price reduction in electronic equipment allows many farmers to adopt PA.

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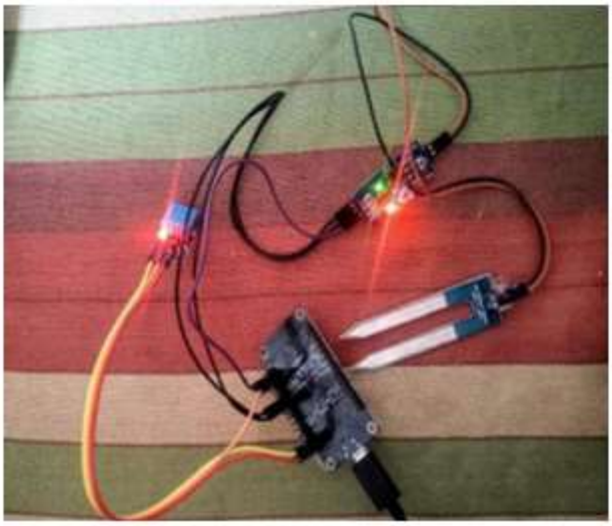
II. MATERIALS AND METHODS

The module performs the following functions :

1. Reads sensor data from Soil moisture sensor (SMS)
2. Sends data from SMS to LM393 comparator
3. ·Reads data from LM939 to Arduino LoLin NodeMCU
4. Reads sensor data from humidity and temperature sensor (DHT11)
5. Reads complete sensor data through Arduino board by connecting to PC
6. Programming the Arduino LoLin using Embedded C
7. Uploads sensor data to cloud
8. Shows graphical representation of sensor data on cloud ·8 Allows functionality to monitor real-time sensor data
9. Allows functionality to turn off/ turn on motor in the remote field

Ubidots

Ubidots is a platform for connecting people, processes and things. It allows companies and cities to become more efficient by capitalizing on information from interconnected assets and processes. Ubidots is a cloud service to store and analyse sensor data in realtime, it is free with 30,000 dots/month data-points usage, features as follow: push data from internet enabled device, display sensor data through widgets, data is updated in real time and no need to refresh the browser, trigger alerts when a sensor data hits a value and it has a powerful and flexible API. A dashboard was created on the Ubidots website to provide widgets for monitoring and plotting real time graphs and data of the sensors which are being implemented in the project. It was also used to trigger alarm when a variable exceeds its optimum value



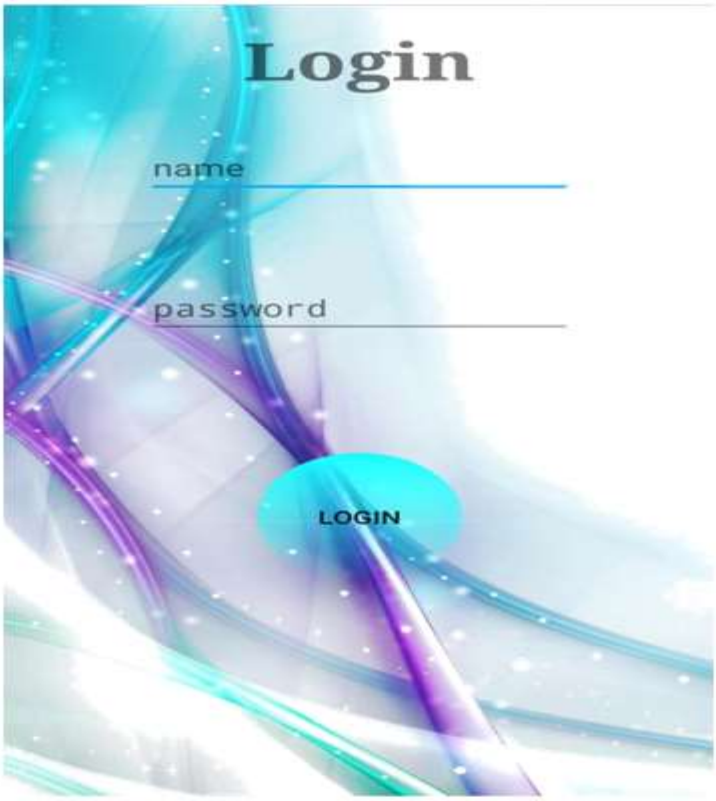
Project components

Android Application

Android application

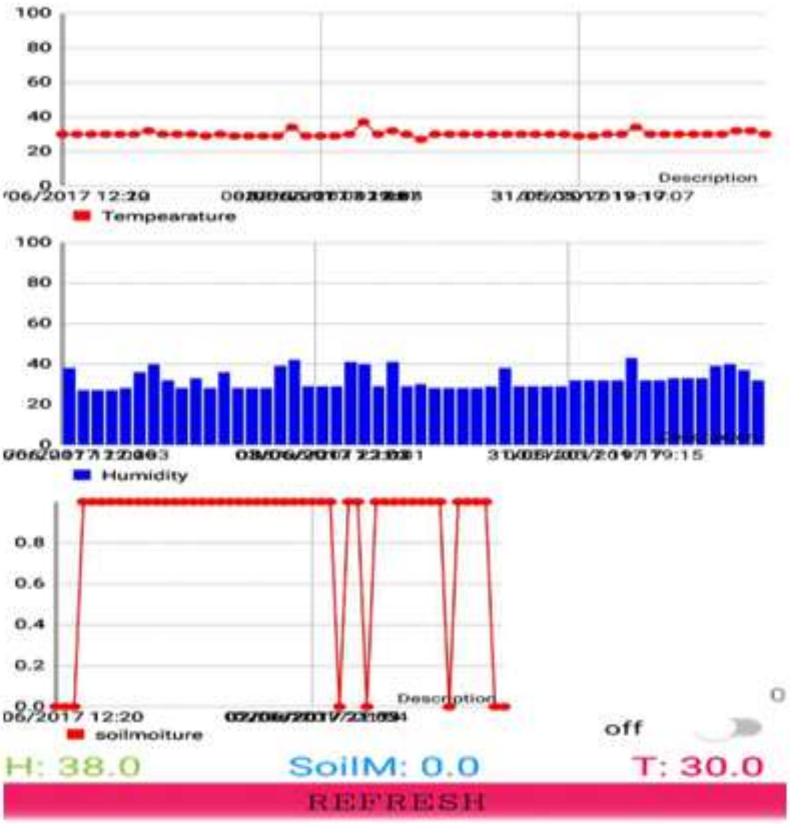
This application will get the data from the cloud ubidots and display it on the screen. There is a option of turning on the motor in the application. When the soil moisture goes down that means the soil contains some water, so by clicking on the toggle the motor will turn on and water will spread throughout the soil.

III. RESULTS AND DISCUSSION



Login Page

The following figure displays the graphical representation of the sensor data on the Andriod application that is available:



IV. CONCLUSION

Precision agriculture is a comprehensive system designed to optimize agriculture production. Using the key elements of information, technology, and management, precision agriculture can be used to increase production efficiency, improve product quality, improve the efficiency of crop chemical use, conserve energy, and protect the environment. In a greenhouse environment using WSN, our test shows clearly that automatic irrigation is more efficient compared to scheduled irrigation. Automatic irrigation will optimize the usage of water and fertilizer and furthermore maintain the moisture level and healthiness of the plant.

V. ACKNOWLEDGEMENTS

It gives us immense pleasure to thank Dr. Manjunath T. N, Head of the Department for his constant support and encouragement. We would also like to thank the Project Coordinator Dr. Pushpa S. K. Associate professor, Department of Information Science & Engineering and all other teaching and non-teaching staff of Department of Information Science & Engineering Department who has directly or indirectly helped us in the completion of this paper. Also, we would like to express our deepest sense of gratitude to our seminar guide-Mr. Chandrashekhara K.T, Assistant professor, Department of Information Science & Engineering for his constant support and guidance

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T, C. K., M, T., Dr, Mathur, A., Basavaraju, H., Ansari, F., & Mahendra, S. (2017). PRECISION IRRIGATION USING INTEGRATED INTELLIGENT SYSTEMS. *INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY*, *6*(6), 562-566. doi:10.5281/zenodo.817952