Agrisense : Smart Farming using Arduino and MQTT Protocol.

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Abstract –The current scenario in India depicts a steady decrease of agriculture contribution to the Indian GDP. The reasons for this condition are mainly – the current erratic weather condition and crop loss. New technologies and advanced fertilizers have not penetrated through the corners of India where majority of farmers reside. Through this paper, we introduce a concept of smart farming which utilizes wireless sensor web technology for moisture detection in the soil in conjunction with a smart phone application which plays a vital role in helping farmers. We introduce arduino based automatic plant watering system and android application which will help to control Arduino via internet. Also, this android application provides farmers with agricultural related information such as cost of seeds, moisture level required, type of soil needed, weather forecast, fertilizers and pesticides to be used.

Keywords-Agriculture; Arduino; Hygrometer; Autometic watering system; Smartphone-application

NOMENCLATURE
Apps- Application, GDP- Gross domestic product

I. INTRODUCTION

Agriculture and its allied sectors are the pillars of Indian economy as they are principle means of livelihood in rural areas of India.GDP is defined as the monetary value of all the finished goods and services produced in the country in a specific time period. Agriculture is been contributing largely to Indian GDP over the years. In 2012-13 agriculture contributed to 13.9% of the total GDP,and employed 47% of the total workforce population. The combined efforts of Central Government, State Government and the community have succeeded in achieving a record production of 264 MT of food grains during 2013-14.

It is been observed that contribution of agriculture to GDP is non-liner from 1951 to 2014. There are various reasons that are associated for steady decline such as diversification and growth of Indian economy, environmental factors such as erratic weather conditions leading to crop loss, farmer's ignorance in embracing newer technologies that can be used for enhancement of gross profit from agriculture and its allied sectors. In spite of all such problems, agriculture is cardinal source of employment and plays a key role in socio-economic development of India.

In order to improve the above condition, we can make use of technology in smarter way. In recent years, mobile telephony has been penetrated trough various of India and it is been used almost by everybody irrespective of the age group. Android phones which use android as an operating system are becoming popular because of easy of use and features such as internet browsing through handset and 3G, wireless LAN connectivity, hardware like GPS, accelerometers.

The ministry of Agriculture, Government of India,has started various schemes in the interests of farmers. The mKisan portal inaugurated in july'13 by Honorable President of India has received as of 1,85,40,07,285 messages, 5,74,40,63,746 and 237,777 advises of 8yh April 2015. The weekly/daily stock availability with dealers of seeds and fertilizers was made available at RS. 5/month/dealer.

Applications like krishi ville, Kissan Kerala are an attempt to provide such information to farmers over internet. The current condition of farmers in India is not so good. Varios socio-economic aspects such as high cost of life(education, helth),poor management can be associated to their dismaying conditions. It is estimated that more than a quarter of a million Indian formers have committed suicide in the last 16 years. Thus it is necessary to improve the lifestyle of farmers with the help of technological advancements.The proposed mobile application acts farmer's assistant in the field. It provides essential agriculture related information about crops such as cost of seed, fertilizersand pesticides to be used, respective soil

type required, moisture level required to the former. Therefore, this mobile application will serve to be handy as farmers will be able to seek information with just few clicks.

Additionally, application will reduce the amount of field work by providing the control to water the plants. We shall now present the proposed SMART FARMING system using Android and MQTT Protocol, which will play an indispensible role in effective farming in India.

II. LITERATURE SURVEY

In "Intelligent Automatic Plant Irrigation System"(as cited by Shaikh Gauhar Zareen, Khan Sanna Zarrin, Ansari Rabsha Ali, Prof. S.D.Pingle), the system supports water management decision, which determines the controlling time for the process and monitoring the whole system through GSM module and checks the temperature, humidity and dew point so as to forecast the weather condition. Low cost and effective with less power consumption using sensors for remote monitoring and controlling devices which are controlled via SMS using a GSM using android mobile.

In our proposed system, farmers will be notified about amount of water used and soil moisture through an android app. We make use of MQTT protocol which uses "Publish-Subscribe communication architecture" to notify farmer and water the plants. The usage of MQTT protocol decreases the network traffic and computational overhead for arduino.We are using servo motor with 9v power supply. And allow farmers to register with the system and use the functionalities provided.

III. PROBLEM STATEMENT

Two major problems faced by Indian farmers are:
1) *Farmers are unaware about various technologies that will be beneficial for effective farming.*
2) *As monsoon is intermittent in India and water resources are limited, there is a critical need of using water efficiently.*
A. Objectives
1) In this system, we are introducing information hub on which farmers will get information about new technology in agriculture terrain and farmers will be updated with new innovations in agricultural field.
2) The automated watering system will lessen the burden of farmers and it will stem excessive water supply.
3) Farmers will get news related to agriculture, can view weather and temperature details of any location, see the soil moisture value and amount of water use.

IV. COMPONENTS

A. Soil Hygrometer Sensor

It is a type of sensor which is used to detect moisture content in threshold level, then the soil hygrometer detection module outputs a high level and the soil hygrometer detection module outputs a high level and vice versa outputs a low level. Integrating this senor with the proposed Arduino based module forms automatic plant watering system, so that the crops can be watered without human supervision.

B. Arduino UNO

Arduino is an open-source prototyping platform based on user friendly hardware and software which can be customized as per the needs of the user . Arduino uno board consisting of microcontroller ATmega328P is used to control motors. The arduino board is programmed in such a way that it sense the moisture level in the soil and notifies the farmer.

C. Ethernet Shield

The arduino Ethernet Shield allows you to easily connect your Arduino to the internet. This shield enables your Arduno to send and receive data from anywhere in the world with an internet connection which can be used for real time application.

D. Motor Shield v2

The Arduno Motor Shield allows to control motor direction and speed using an Arduino and also allows an additional motor with an external power supply up to 12V.

E. Serve Motor

It is a motor which is when integrated with a sensor allows for precise control of angular position. The mechanism involved in servo motor rectifies the error in the system using negative feedback and hence enhances the performance of the system.

F. An application running on android phone

Android is an open source mobile operating system which is widely used in smart-phones now-a-days. In India, almost 60% of mobile phone users are using android. Android apps are designed and developed using android. Android apps are designed and developed using tolls like android studio, Eclipse, Visual studio etc. these applications are easy to download and user friendly. Developers can easily use internet connectivity of mobile phones and enhance usability of their apps.

V. METHODOLOGY

Two major functional units are soil hygrometer sensor and the servo motor (motor/water pump). The function of the soil hygrometer sensor is to sense the level of moisture in the soil and to send a signal to the Arduino UNO if watering

is required. The hardware representation of the system is shown in the figure No. 1. This project uses Arduino UNO to control the motor. Arduino and android application will communicate with each other via internet.

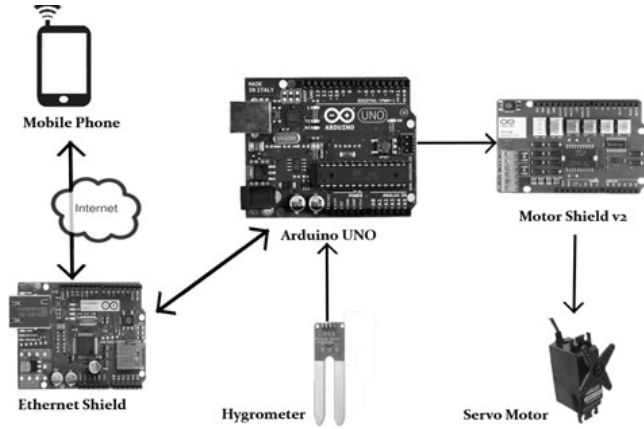The work flow of plant watering system is shown in the Figure No. 2.
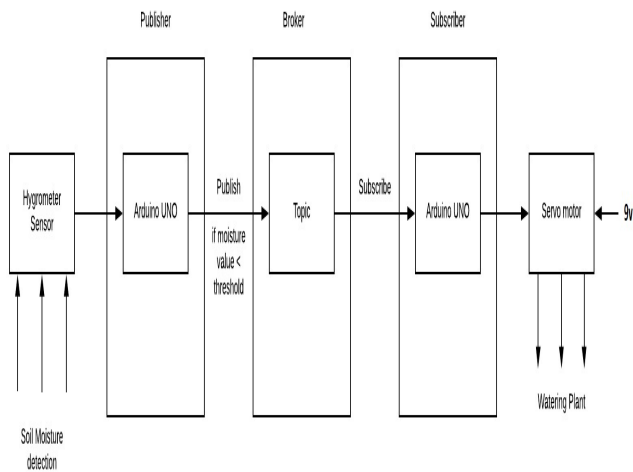

Figure 1: Hardware Representation

Figure 2: Flowchart for Plant watering system

The detailed steps are as follows:
1. Soil hygrometer sensor will be employed in the soil. It will detect the moisture level of the soil and send to the Arduino UNO. Arduino (publisher) will compare moisture level with mentioned threshold.
2. If this notified moisture level is below the threshold value for respective plant, a notification will be sent to MQTT broker via wifi.
3. MQTT broker on receiving the notification, notifies the arduino (subscriber) which is interested in the topic and subscribed to the same.
4. Subscriber on receiving the notification from broker waters the plant by turning on servo motor with 4.8v power supply.

Farmer has to sign up on an android app following some set of steps which are explained in Figure No. 3. After farmer

has successfully signed up, his profile will be created and he will be able to see and navigate through pages. App pages will have weather prediction and many other useful and important data. The working of the system after successful login is shown in the Figure No. 4.
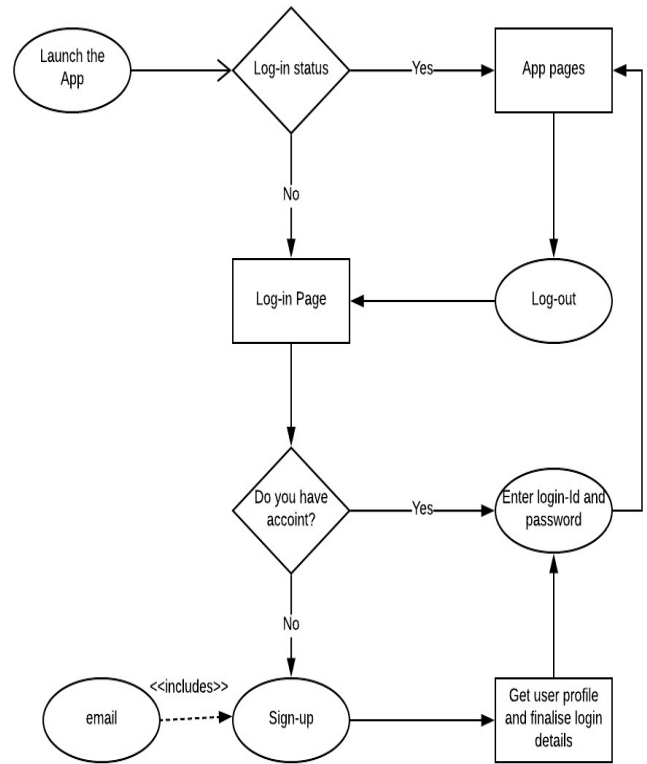

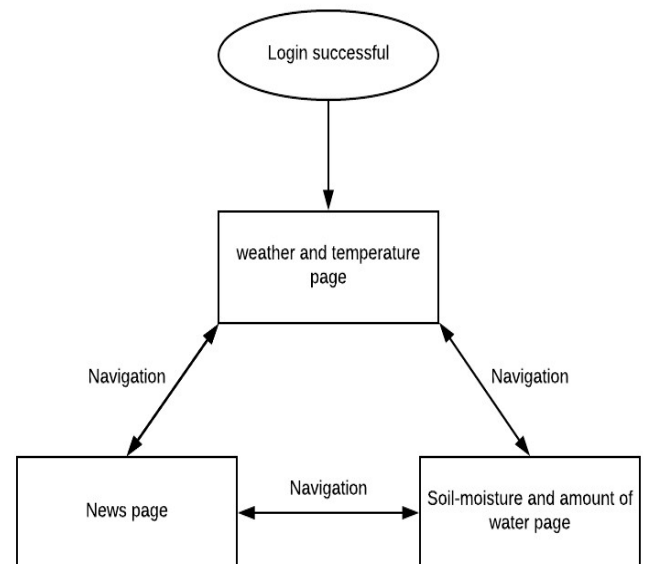Figure 3: Flowchart for Android application (Part A)

Figure 4: Flowchart for Android application (Part B)

VI. RESULT AND ANALYSIS

Figure 5,6,7,8, and 9 are the screenshots of android app.
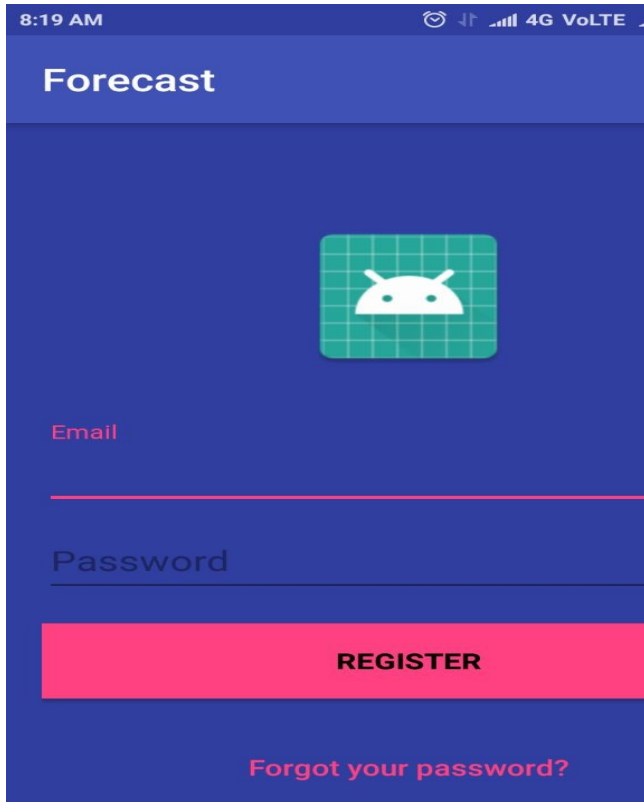

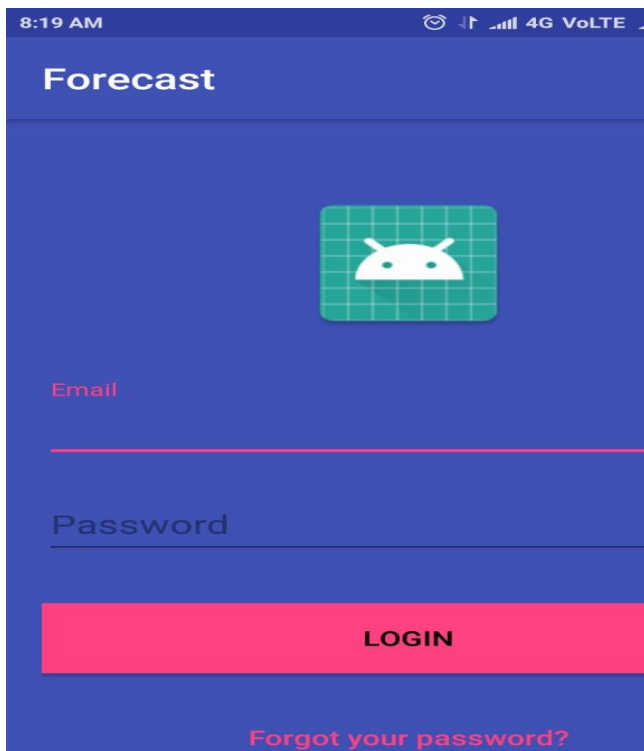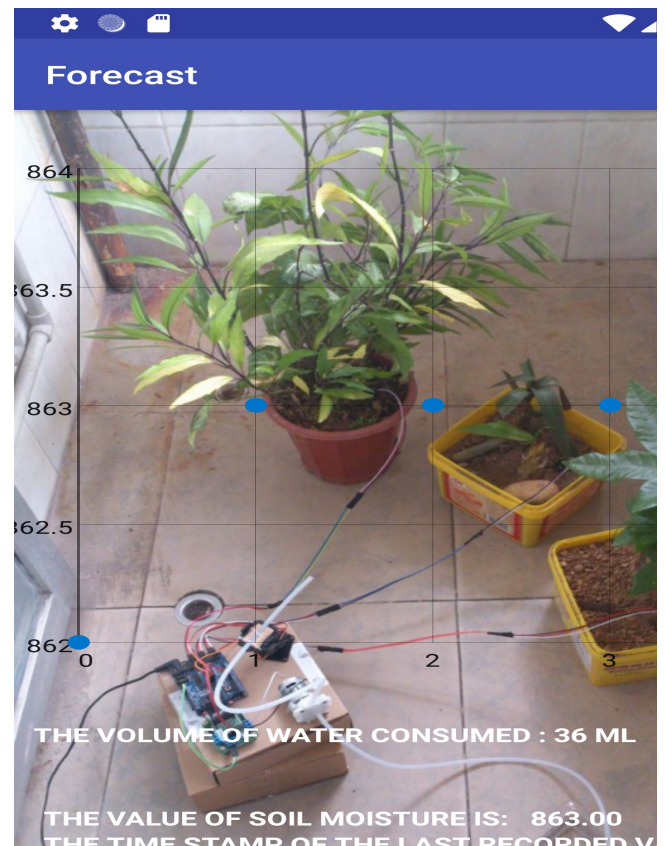Figure 5: Registration Page

Figure 6 : Login Page

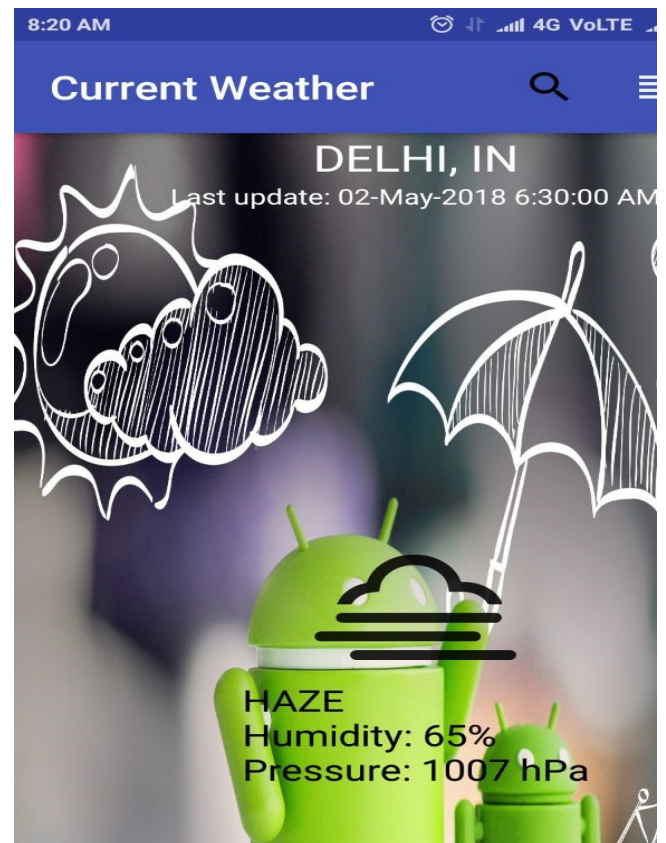Figure 7: Soil moisture and water use Page
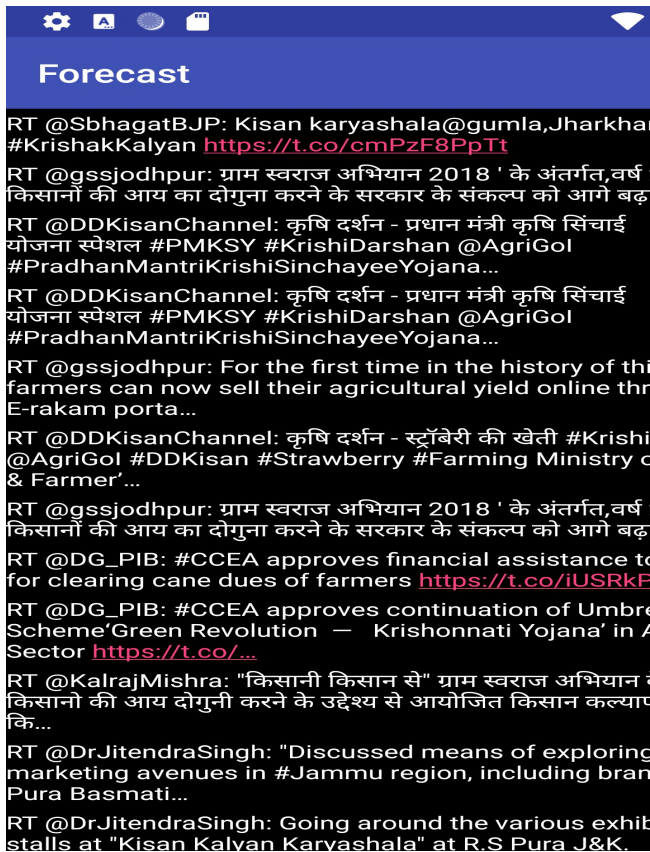

Figure 8 : Weather and Temperature Page

Figure 9 : News Page

Usage of MQTT protocol has decreased the network traffic and computational overhead as subscriber gets notify only when moisture value falls below threshold, this eliminates continuous checking of subscriber for moisture value drop at publisher.

VII.   CONCLUSION

As watering is an indispensable cultural practice and essential part of farming, automating it with the use of technology will lessen the burden of farmers. In addition to this point, automatic watering system will enhance the life style of farmers. Water conservation is another important aspect, which is taken care by using automation of watering system. This will not only foster greater productivity but will ameliorate a farmers life reducing stress and also instilling zeal to learn new technology which is essential in this era of Digital Revolution.

ACKNOWLEDGMENT
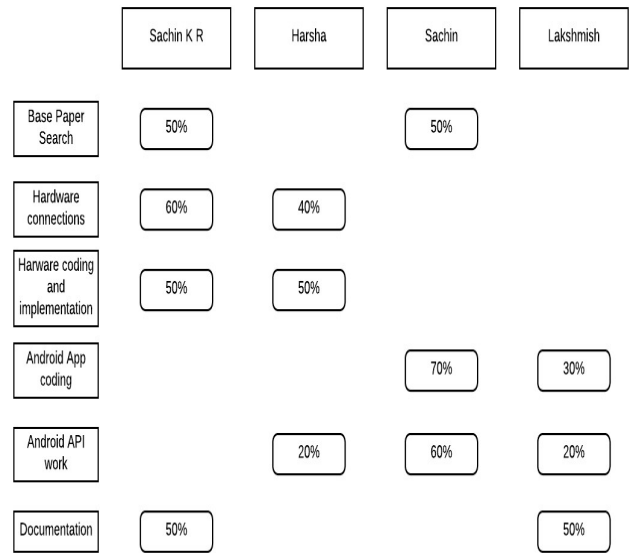
INDIVIDUAL CONTRIBUTION

Figure 10: Gantt chart for representation of Individual contribution

BASE PAPER

"Intelligent Automatic Plant Irrigation System", "Intelligent Automatic Plant Irrigation System". Authors Shaikh Gauhar Zareen1, Khan Sanna Zarrin2, Ansari Rabsha Ali3, Prof. S. D. Pingle4. International Journal of Scientific Research And Education |November-2016

FUTURE WORK

1) Prediction of best suitable crop/grain to grow by considering price and suitable environmental conditions required for the crop/grain in order to allow farmer to achieve the maximum profit.
2) Calculating power consumed by the system and applying the principles to reduce electric wastage and efficient usage of electricity.
3) Providing more functionality and better user interface for the Agrisense android app.

REFERNCES

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[2]. "Arduino Based Automatic Plant Watering System", S. V. Devika, S.k.Khamuruddeen, Sk.Khamurunnisa, Jayanth Thota, Khalesha Shaikh, Associate Professor, Dept. of ECE, HITAM,Hyderabad, India, MSC 2nd Year, Department Of Electronics, HRD, Hyderabad, India. Website www.ijarcsse.com