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INTEGRATED FARMING SYSTEM USING IOT AND BLUETOOTH

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ABSTRACT

This paper is focused on developing an automatic irrigation system using an esp32 board with internet as well as Bluetooth remotely controlled by any android OS cellphone. So the agricultural lands are irrigated automatically without physical presence of farmer. As technology is advancing so irrigation are also getting smarter. Modern irrigation pumps are gradually shifting from conventional features switches to centralized control system, involving remote controlled switches. Presently, conventional pump switches located in different part of the agricultural land are makes it difficult for the user to go near them to operate and physically present on those areas. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled irrigation automation system provides a most modern solution with cell phone for those person who want to do agriculture without physically present on the place. Along with this automated irrigation facility, our project also provides buzzer triggered alarm system for fences rather than electric fences to ensure the safety of animals as well as crops. The intruder alert notification is sent through mobile application to alert the user, hence ensuring the safety of crops.

Keywords: *Irrigation, Fence, Relay, Buzzer, Ubidots cloud, Firebase, ESP32, HC12 module.*

1. INTRODUCTION

Water is a vital resource for living creatures, each living creature uses water per its desires, because of this importance of water in our lives, it is highly necessary to use this resource as effectively and optimal as possible. There are several sectors that come under water consumption; the biggest sector is the agricultural sector which amounts to about 70% of the water consumption.

Climate change is a major factor for the unpredictable weather and rainfall patterns. As many of the farmers depend on the monsoons which occur for about four months of the year, changes due to this unpredictable nature of weather harm the crop yield and tend to incur losses. Farmers have stated several times that the monsoon rains have become increasingly unpredictable over the past twenty years, both in the timing of the

rainfall and the total amount of rainfall per year. [1] Unfortunately, many farmers still use the traditional methods of farming which results in low yielding of crops and fruits. Thus in order to improve the yield, it's beneficial to make use of the automatic machineries rather than the current traditional approach and thereby depend less on manpower.

Here our project is introduced to eliminate all the problems the farmers face in the traditional methods in various ways. Our project has introduced an irrigation system where the water can be supplied to the large area of plantations easily through mobile application which can trigger water pump as well as gatevalves. Another application of our project is that we can determine water level of the tank and hence measure the quantity of water and fertilizer to be supplied to the crop. We have also installed alarm trigger sensors to the fence rather than using electrical fence, which as an extra feature of sending notifications giving the intruder alert to the user.

2. LITREATURE SURVEY

There have been many studies on done on the area of smart irrigation system to provide an easy and efficient method to automate the irrigation process. The different studies done are aimed towards irrigation its inefficient water consumption, absence of remote farm monitoring and lack of useful inference. In this paper we figure out an efficient method to integrate farming using IoT and Bluetooth and come up with an automated irrigation system. And also we have also installed alarm trigger sensors to the fence rather than using electrical fence, which as an extra feature of sending notifications giving the intruder alert to the user. The following are a few studies that we have referred to.

IoT based crop field monitoring and irrigation automation [3] Internet Of Things (IoT) is a shared network of objects or things which can interact with each other provided the
internet connection. IoT plays an important role in agriculture industry which can feed 9.6 billion people on the Earth by 2050. Smart Agriculture helps to reduce wastage, effective usage of fertilizer and thereby increase the crop yield. In this work, a system is developed to monitor crop-field using sensors (soil moisture, temperature, humidity, Light) and automate the irrigation system. The data from sensors are sent to web server database using wireless transmission. In server database the data are encoded in JSON format. The irrigation is automated if the moisture and temperature of the field falls below the brink. In greenhouses light intensity control can also be automated in addition to irrigation. The notifications are sent to farmers' mobile periodically. The farmers' can able to monitor the field conditions from anywhere. This system will be more useful in areas where water is in scarce. This system is 92% more efficient than the conventional approach. They developed a system using sensors to monitor the crops. The use of wireless transmission of sensor data from the field and storing it on a database along with control through mobile application proposed a proof of concept to automate the irrigation system. In their system the use of NRF24L01 for wireless transfer of data is different from our system where data is transferred through our Wi-Fi module ESP32, Hc12 and then uploaded to cloud.

Automated irrigation system using a wireless sensor network and GPRS module [4] An automated irrigation system was developed to optimize water use for agricultural crops. The system has a distributed wireless network of soil-moisture and temperature sensors placed in the root zone of the plants. In addition, a gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of temperature and soil moisture that was programmed into a microcontroller-based gateway to control water quantity. The system was powered by photovoltaic
panels and had a duplex communication link based on a cellular-Internet interface that allowed for data inspection and irrigation scheduling to be programmed through a web page. The automated system was tested in a sage crop field for 136 days and water savings of up to 90% compared with traditional irrigation practices of the agricultural zone were achieved. Three replicas of the automated system have been used successfully in other places for 18 months. Because of its energy autonomy and low cost, the system has the potential to be useful in water limited geographically isolated areas.They developed an automated irrigation using solar power for organic that are geographically isolated. Their work on internet controlled duplex communication system holds a good decision making concept for adaptation to several different scenarios. The internet link is provided where access through mobile devices are established. Our system concentrates on cloud storage and GSM technology to water the crops efficiently. In their system they use GSM module to control and transfer data is different from our system where we use cloud to control, store and transfer data.

Automated irrigation system using solar power [5] proposed a system for automated Irrigation System that involves two levels of decision making to turn the motor ON/OFF. The microcontroller has the threshold values embedded in it called secure and unsecure values which are 0cm and 10cm to turn the motor ON or OFF respectively. If the sensor values reach a mid level the farmer or the user intervenes to make the decisions accordingly. This decision is made using a decoder to read the message sent by the owner to turn the motor ON or OFF. The entire system is driven using solar power to overcome the use of electricity as an alternative.

In this paper, an automated irrigation model is proposed and successfully implemented using different circuits as demonstrated in different figures. They designed and implemented this model considering low cost, reliability, alternate source of electric power and automatic control. As the proposed model is automatically controlled it will help the farmers to properly irrigate their fields. The model always ensures the sufficient level of water in the paddy field avoiding the under-irrigation and over-irrigation. Farmers can remotely ON/OFF the motor by using cell phone even from away. The system is secured with password for the restricted number of users. Solar power provides sufficient amount of power to drive the system. To overcome the necessity of electricity and ease the irrigation system for our farmers, the propose model can be a suitable alternative. In our project, we are not implementing automated system because of two reasons. First, the pump continues to run during rainy weather where water is already available and pump is not required to run. Second, in automated system, pump continues to run even when the reservoir is empty which causes dry run. Dry run often leads to damage in pumps.

GSM based automated irrigation control using Raingun irrigation system [6] proposed a system for automatic Irrigation prototype where in the sensor nodes sends sensed values to the microcontroller that operates the solenoid valve. This microcontroller is interfaced to a mobile phone that is in auto answering mode to activate the buzzer that then switches off the motor by sending this activation signal to the microcontroller. This system is based on microcontroller application that results in lower power consumption. This system supports aggressive water management for the agricultural land. This architecture is based on the capabilities of current and next-generation microcontrollers and their application requirements. Microcontroller used for the system is promising that it can increase system life by reducing the power consumption resulting from lower power consumption. The above system involves interfacing of two communicating devices to turn the motor on and off which can be simplified by letting only the microcontroller turn the motor ON or OFF based on the decision of the farmer as implemented in our system.

Solar Fencing Unit and Alarm for Animal Entry Prevention [8] propose a method to protect farms from wild animals Operational amplifier circuits are utilized mainly for the detection of animal intrusion from the outside of farms. The proposed monitoring scheme is to provide an early warning about possible intrusion and damage by wild animals. The Solar Electric Fence system is a modern day alternative to conventional methods of fencing to protect your crops & property. Electric Fence is an effective way to reducing losses caused by animals. The progress in science & technology is a non-stop process. New things and new technology are being invented. As the technology grows day by day, we can imagine about the future in which thing we may occupy every place. The proposed system based on Atmel microcontroller is found to be more compact, user friendly and less complex, which can readily be used in order to perform. Several tedious and repetitive tasks. Though it is designed keeping in mind about the need for industry, it can extended for other purposes such as commercial & research applications. Due to the probability of high technology (Atmel microcontroller) used this“solar fencing unit and alarm for animal entry prevention” is fully software controlled with less hardware circuit. The feature makes this system is the base for future systems. The principle of the development of science is that “nothing is impossible”. So we shall look forward to a bright & sophisticated world.

In the conventional method, the power is continuously supplied to the fence. But our system sends power to the fence only when the sensor detect any humans or animals near the fence. This way huge amount of electricity is saved.

3. PROPOSED SYSTEM

Our system consists of effective application that helps the farmers in their agriculture practice. In traditional agriculture practice we have few major disadvantages. For instance, timer which will pump water when it is raining which results in wastage of water. Another disadvantage is dry run factor that happens in motor due to insufficient quantity of water in the reservoir. Suppose, we have large area of land, manually operated gatevalves are time consuming and also, wastage of energy. The safety of animals as well as farm is one of the most pressing issue due to the usage of electric fence.

The main of work falls under the following

3.1 Internet Of Things

Internet of things is the internetworking of physical devices interacting with each other to collect, control and exchange data. This system is in accordance with collecting real time values from the sensors with the objective of automating irrigation on comparison with the threshold values. The data collected can be stored on firebase and ubidots cloud, a free web services platform that allocates a user or registrant with 50mB data space. Prototype here developed is programmed to store data on cloud at an interval of 45 seconds, that is, after every sensor reading iteration. Analysis of this data stored can be used to evaluate the water usage per day, per week or per year even.

3.2 Wi-Fi Technology

Wi-Fi technology is used to update the data obtained to the cloud to keep track of the field status using sensors.[2]. The novelty about our project is the use of the ultrasonic sensor that senses the level of water in a tank. We have also used firebase and ubidots as a platform to store all the data of the sensors, this is then processed and summarized as to how much more beneficial our system is in terms of water management. The solenoid valve plays an important role in watering the plant as the plants are watered comparatively more when it is a rainy day. Lastly, we have collected data from the device and stored it in cloud which can be viewed via mobile application.

4. REQUIREMENTS

In order to build the proposed framework for the automated irrigation system, we have used following hardware and software components

4.1 Ultrasonic sensor

Ultrasonic sensor (Fig.1) measures the level of water and stores data in a ubidots cloud through esp32 or hc12 bluetooth module. If sensor detects intruder entering into the farm it will be notified to the farmer via mobile application so that farmer can control the alert system installed in farm through the esp32 or hc12 bluetooth module.

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Fig.1: Ultrasonic sensor

4.2 Bluetooth Module

The HC-12 (Fig.2) is an easy Bluetooth device working designed for transparent wireless serial connection setup. It's wireless working frequency band is from 433.4MHz-473.0MHz. It has total of 100 channels with a stepping of 400KHz between each channel. Transmitting power is from 1 dBm to 20 dBm.

Fig.2: Hc12 bluetooth device

4.3 Wi-Fi Module

The ESP32 (Fig.3) is a low cost controller which has WiFi module embedded inside. This WiFi module is used to control water pump, solenoid valve and alert system through IoT feature.

Fig.3: ESP32 WiFi module

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5. IMPLEMENTATION

In this section we will discuss about the different modules that make the project a whole.

5.1 Controlling solenoid valve via mobile application

The system enables user to control the irrigation system through a mobile application. User can irrigate the plot based on his choice and then click on the plot number he wants to irrigate. Thus controlling of solenoid valve across the whole crop can be done through an application without having to visit the crop in order to control gatevalves.

5.2 Controlling water pump via mobile application

The system uses a generic application (Fig.4) to turn on and off the motor, this is a safety unit in case any malfunction occurs during the process of automation. After pairing the Bluetooth of the system to our smartphone, the motor can be turned on and off according to convenience.

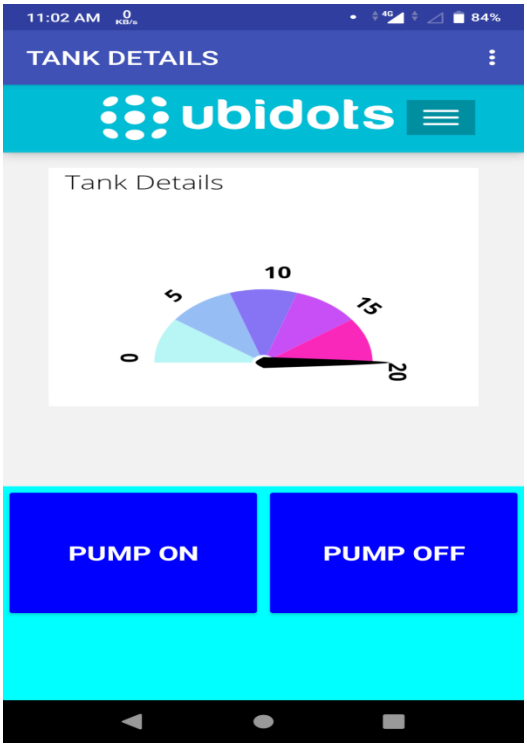

Fig.4: Mobile application

5.3 Send sensor data to the cloud

The sensors detect and measure the water level in the water tank and send the following data to cloud as shown in Fig.5. This data is later displayed in the mobile application. Thus the farmer or user can determine whether to pump water into the tank or not. The IR sensor installed in fences can detect the intruders and then alert the user about trespassing.

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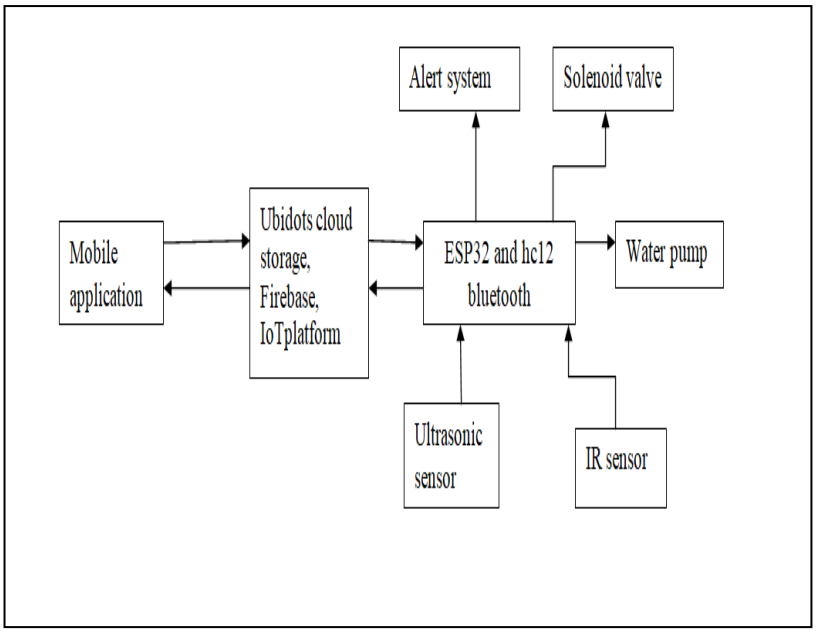

Fig.5: Control Flow Diagram

6. CONCLUSION

The irrigation system on automation uses optimal resources to improve the efficiency of the irrigation. This system can be implemented in places that face water shortage to improve agricultural sustainability. This system enables the farmer to control the irrigation system in the whole crop through a mobile application without even having to visit the farm. The system also ensures the safety of the crop by facilitating anti-trespassing system in fencing. This fencing system sends intruder alert to the farmer via mobile application as well as buzzer system. The farmer can also be aware of the water level in the tank by just looking at the application which displays the amount of water filled in the tank. Apart from water supply through application, the system also includes supplying fertilizers to the crops through irrigation system. This system also addresses the problem of unstable network by introducing Bluetooth connectivity to control irrigation via mobile application. Thus this system integrates modern technology with the farming practice to improve time and resource efficiency which later provides better outcome.

REFERENCES

[1] Indian Farmers Cope With Climate Change and Falling Water Tables by Meha Jain, National Geographic Explorer

[2] R. Suresh, S. Gopinath, K.Govindaraju, T.Devika, N. SuthanthiraVanitha, “GSM based Automated Irrigation Control using Raingun Irrigation System”, International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February2014.

[3] P. Rajalakshmi and S Devi Mahalakshmi “IOT Based Crop- Field Monitoring And Irrigation

Automation" Intelligent Systems and Control (ISCO), 2016 10th International conference.

[4] 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 ANDMEASUREMENT, VOL. 63, NO.1,JANUARY2014

[5] Jia Uddin , S.M. Taslim Reza , QaderNewaz , Jamal Uddin2 , Touhidul Islam , and Jong-Myon Kim "Automated Irrigation System Using Solar Power" 2012 7th International Conference on Electrical and Computer Engineering 20-22 December, 2012, Dhaka,Bangladesh.

[6] R.suresh1 , S.Gopinath2 , K.Govindaraju3 , T.Devika4 , N.SuthanthiraVanitha5 "GSM based Automated Irrigation Control using Raingun Irrigation System" International Journal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February2014

[7] Review Paper based on automatic irrigation system IJAICT Volume 1, Issue 9, January 2015, Doi:01.0401/ijaict.2015.09.01 Published on 05 (02)2015

[8] Krishnamurthy B, Divya M, Abhishek S, Shashank H A "Solar Fencing Unit and Alarm for Animal Entry Prevention" International Journal of Latest Engineering Research and Applications (IJLERA) ISSN: 2455-7137 Volume – 02, Issue – 05, May – 2017, PP – 128-135

[9] SanketSalvi, PramodJainS.A, SanjayH.A, Harshita T.K, M. Farhana, Naveen Jain, Suhas M V "Cloud Based Data Analysis and Monitoring of Smart Multi-level Irrigation System Using IoT" International conference on I-SMAC, 978-1-5090-3243-3/17/$31.00 ©2017 IEEE