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# IOT Based Remote Smart Irrigation System

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**Abstract—**The main motive for mission is to focus on water management in agricultural land. India stands highest position in farming and water is a main source in agriculture ,where 70 percentage of world's fresh water are committed to agriculture, surveys conducted by the Tata institute of social science(TISS) shown that there is a deficient of water in urban cities, so in order to save water and utilize the water resources effectively by the technology like IOT .We have come up with a solution of conserving water by using ESP32 mcu model (wifi module) and sensors so that farmers get an information about the content of moisture in the soil through android application .

**Keywords—**Android Application, Conservations, IOT, Sensors, TISS.

## I. INTRODUCTION

Agriculture is widespread in India,As per 2020, agriculture employed more than 41.49% of the workforce and India rank first in the worldwide with highest net cropped area, because of increase in population supplements of natural resources also required respectively and agriculture uses 70 percentage of world's fresh water and in India most of the irrigation system is operated manually in manual operation

sometimes the farmer fail to switch off the motor and leads to a water wastage and we are in a situation where we need to save each drop of water .Thus to overcome this problem we are replacing traditional method by automated irrigation by current technology like IOT(Internet of technology), IOT plays a very important role in every sector ,it is a network which enables various physical devices, and other home appliances which is embedded with software and helps to exchange the data between two device ,and motor is made to be ON and OFF automatically and motor operation is mainly depends on sensors value like humidity sensors ,temperature sensors ,soil moisture sensors values ,these sensors are kept near plants and sensors connected to a microcontroller that is ESP32 ,Based on the condition the motor will control the flow of water to the plant. IOT based smart agriculture management system which helps in utilizing of water resources effectively.

### *A. Basic architecture of IOT*

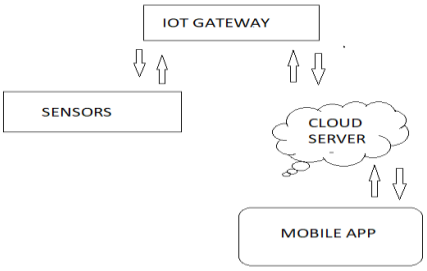


**Fig. Architecture of IOT**

## II. LITERATURE SURVEY

We conducted a Literature survey study with utmost ten publication papers and our 3 studies with top three papers of those mentioned below.

[1] Sensor based automated irrigation system using IOT. This irrigation system uses the sensors to sense the temperature and humidity of the surroundings. The solenoid valves controls flow of the water. The signal sent through the microcontroller based on the sensor readings monitors the opening and closing of the solenoid valves. Two mobiles are connected together using GSM, MAX232 is used to connect the microcontroller and the GSM. If the soil moisture is low the microcontroller will give the signal to the connected mobile which will turn on the buzzer indicating that the water valve should be open. This system does not include any extraordinary features, this is the basic level model.

[2] Automatic drip irrigation using wireless sensor networking and algorithm of data mining. In this model, the data mining algorithm is used to take the decisions for the drip irrigation. The automated drip irrigation system which contains wireless networking sensor will be placed all over the farmer's farm. The data of the networks will be given to the base stations and ZigBee will receive these data. For decision making the data will be processed in the base station. The web application will monitor all the observations.Basically, the data mining algorithm takes the decisions from sensor for the drip irrigation system.

[3]Wireless sensor automated irrigation system using DTMF technology.The wireless sensors and the DTMF (dual tone multiple frequency) coming together can help to control the sprinkler or drip irrigation system. Instead of using packet switching, the circuit switching is used by the SMS controlled devices, the farmer can use his mobile phone or any other device which can send SMS for the purpose of controlling and starting the irrigation or spraying the pesticides over the plants using this DTMF technology. This system is very economical as it reduces the power consumption and the system implementation charges.

## III. DESIGN AND IMPLEMENTATION

### A. *Hardware specifications*

- *ESP32*,ESP WROOM 32 MCU Module is a powerful and WiFi-BT-BLE MCU module which is used for variety of applications and ranging from low-power sensor networks to the most demanding tasks like voice encoding and MP3 decoding.ESP32S chip is designed to be scalable and adoptive. It contains 2 CPU cores which can be controlled or powered and its clock frequency varies from 80Mhz to 240Mhz.
- *Rain sensor*,it measures the water content in the soil. This helps the farmers to manage their irrigation systems. Sensor module outputs a high level of resistance when the soil moisture is low. It has 2 state binary output and adjustable sensitivity.

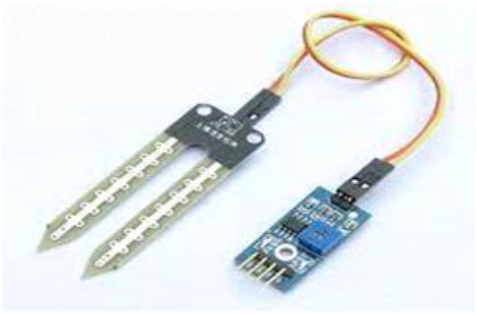

**Fig. Rain sensor**

- *Temperature sensor*,The LM35 series are precision integrated circuit temperature sensors and it has an advantage over linear temperature sensors calibrated in Kelvin. This can be used with single power supplies or with plus and minus supplies. So, its task is just to keep sending the user the live readings of the temperature measured. Its features are,Calibrated directly in Celsius. It is suitable for remote applications, Operates from 4 to 30 volts, Low cost due to water-level trimming.

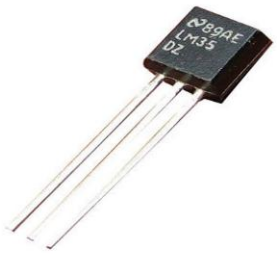


**Fig. Temperature sensor**

- *Humidity sensor*, HR 202 Humidity is coordinated circuit sensors which can be utilized to gauge the nearness of water in arrive. It can be utilized as a part of events like clinics, workshop and so on. The operational temperature extend is from 20 to 95 percentage RH.
- *Lead acid battery*, the lead acid battery is the cheapest secondary power source, it can be recyclable. Lead acid batteries remains the first choice in many domestic applicationsmainly due to the low capital cost.

### B. *Software specifications*

- *Arduino IDE 1.8.13* (using UniversalTelegramBot.h package),The open-source Arduino Software (IDE) makes easy to write code and upload it to the board. This software can be used with any Arduino board. The IDE interface is streamlined and quite simple to use. The facts gathered with

the aid of the sensors is sent to the Arduino UNO. The gathered information may be displayed in an Arduino IDE. The Arduino IDE is made using the java language and the code written in it to program the Arduino language which is set of C or Cpp functions.

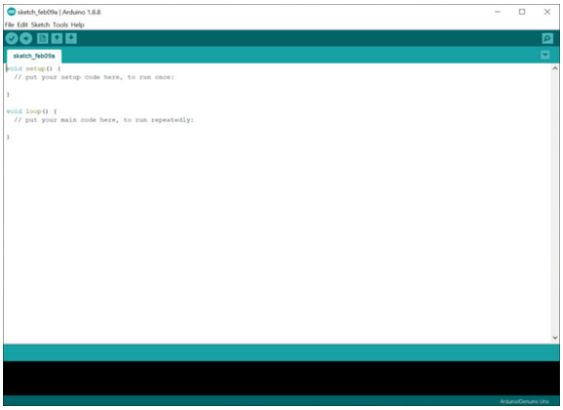

**Fig. Arduino IDE 1.8.13 programming environment**

## IV. METHODOLOGY AND EXPECTED RESULT

### *A. Working*

This proposed model works using a ESP32 developer kit (a WiFi-Hotspot IOT based device). This device is powered using a 12V dc battery. The sensors which are going to give us live values of them if a change is detected are the Rain, Soil Moisture & Temperature sensors. Here we're connecting 4 SPDT relays to make the motor which pumps up the water to work under 4 different conditions according to the readings measured in the sensors.

The IOT device will be connected to the Cloud (ThinkSpeak) via Internet. When the given condition are obtained in the sensors, it will give an indication through the buzzer and the connected 16x2 LCD display will display the current readings if the conditions are achieved. So, this is how the work flow will be happening throughout this system block.

### *B. Block diagram of the system*

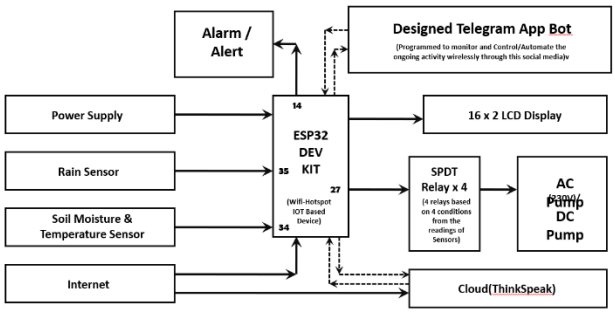


**Fig. Workflow of the whole system**

This proposed model works using a ESP32 developer kit (a WiFi-Hotspot IOT based device). This device is powered using a 12V dc battery. The sensors which are going to give us live values of them if a change is detected are the Rain, Soil Moisture & Temperature sensors. Here we're connecting 4 SPDT relays to make the motor which pumps up the water to work under 4 different conditions according to the readings measured in the sensors. This work includes an embedded system for automatic control of irrigation. This project has wireless sensor network for real-time sensing of an irrigation system.

This system provides uniform and required level of water for the agricultural farm and it avoids water wastage. When the moisture level in the soil reaches below threshold value then system automatically switch ON the motor. When the water level reaches normal the motor automatically switches OFF. The sensed parameters and current status of the motor will be displayed on user's android application.

### *C. Sensor readings*

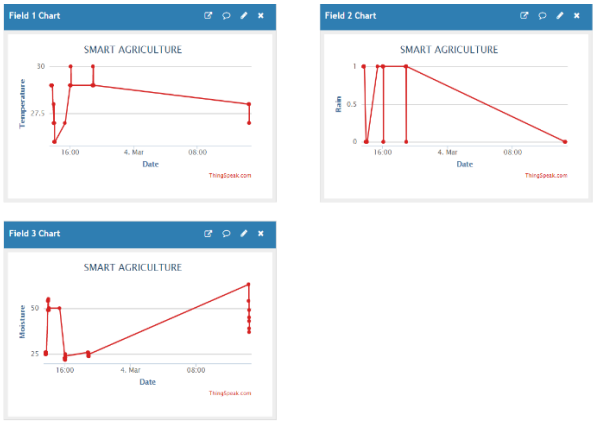


**Fig. The values observed from the sensors through the cloud**

The above are readings of the sensors attached to the system which was shared to the cloud (ThinkSpeak) via Internet. The image shown below are the calibrations sent and recieved and the programmed conditions we have got using our designed telegram bot application.

### *D. Telegram bot applicationlive configurations*


**Fig. The calibrations sent and received from the bot application**

As we'll be using Arduino IDE software for programming the ESP32 IoT based Arduino uno board, we are going to be using an inbuilt sub application called as Universal Telegram Bot UniversalTelegramBot.h to bind connection between the module and the telegram bot (application) which enables the option of remotely accessing it from the user's smartphone.

*E. Work flow*

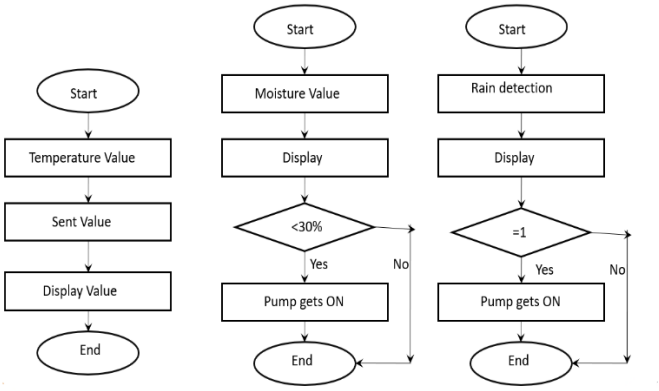


**Fig. Flowchart representing how these sensors work**

The above are the work flows of the sensors according to the conditions given. The temperature sensor just sends it current values and displays it in the display if any temperature variation happens. The moisture sensor reads the value, displays it in the display, if its total value goes lesser than 30 percentage, it will form the condition of turning ON the motor or if it exceeds 30 percentage it breaks the iteration and ends the current cycle. The rain detecting sensor reads the value and displays it in the display. If its value goes equal to 1, it will form the condition of turning ON the motor and if not the motor remains in the idle state. These sensors will keep reading their current values and once if variations happen, it will display the updated readings.

*F. Applications*

- Crop irrigation monitoring.
- Weather conditions.
- Soil status.

## V. CONCLUSION AND FUTURE ENHANCEMENT

The role of smart agriculture using IOT(internet of things),cloud computing and optimization is to get a latest technology in agriculture and farming for better water management and irrigation system , many features are added to improve the functionality of smart agriculture .The automated system helps the farmer to know the conditions of crops such as moisture ,temperature ,and humidity and according to that condition he can run the motor respectively and conserve the water resources .Thus, this system is user friendly and reliable to use .

Although the working of this smart agriculture using IOT is efficient some future enhancement can be made ,where camera is made to fix, monitoring of crop health and water management can be done.

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## REFERENCES

[1] Nikesh Gondchwar, R. S. Kawitkar, "IOT based smart agriculture," International journal Of Advanced research in computer and Communication Engineering (IJARCCE), vol. 5, no. 6, Jun. 2016.

[2] Narayut Putjaika, Sasimanee Phusae, Anupong Chen-Im, Phond Phunchongharn and Khajonpong Akkarajit Sakul, "A control system in intelligent agriculture by using arduino technology," in Fifth ICT International Student Project Conference(ICT-ISPC), 2016..

[3] Tejas Bangera, Akshar Chauhan, Harsh Dedhia, Ritesh Godambe, Manoj Mishra, "IOT based smart village," InternationalJournal of Engineering Trends and Technology (IJETT), vol. 32, no. 6, Feb. 2016, ISSN: 2231- 5381.

[4] Jaiganesh.S., Gunaseelan.K , V.Ellappan ," IOT Agriculture to improve Food and Farming Technology ", Proc. IEEE Conference on Emerging Devices and Smart Systems (ICEDSS 2017) 3-4

March 2017, Mahendra Engineering College, Tamilnadu, India.R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.

[5] http://www.libelium.com/libeliums-new-smart-agriculturextreme-sensor-node-provides-maximum-accuracy-for-cropmonitoring/ accessed at April, 2019.

[6] http://www.libelium.com/libeliumworld/agriculture/ accessed at April, 2019.

[7] Monitoring green areas in Spain to develop a Smart Garden system, http://www.libelium.com/monitoring-green-areas-inspain-to-develop-a-smart-garden-system/ accessed at April, 2019.

[8] A REVIEW OF RECENT ISSUSE AND CHALLENGES IN UNDERWATER SENSOR NETWORK, S.SANDHIYAA, Dr.C.GOMATHY, International Journal Of Advance Research In Science And Engineering http://www.ijarse.com IJARSE, Volume No. 10, Issue No. 02, February 2021 ISSN-2319-8354(E).

[9] Ed Trapasso, “Vineyard Using Technology to Monitor and Improve Growing Conditions”,[Online] Available : https://newsroom.accenture.com/subjects/technology/new-accentureoffering-uses-sensor-technology-to-help-companies-deploy-wirelessapplications.html Dec2004.

[10] Ning Wang, Naiqian Zhang, Maohua Wang, “Wireless sensors in agriculture and food industry—Recent development and future perspective”, Computers and Electronics in Agriculture,Volume 50, Issue 1, pp. 1-14, 2006.

[11] Xiaoqing Yu, Pute Wu, Wenting Han, Zenglin Zhang, “A survey on wireless sensor network infrastructure for agriculture”, Computer Standards and Interfaces, Volume 35,Issue 1, pp. 59-64, 2013.