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Smart Voice Controlled Farm House Automation, Plant Watering and Street Light Control System

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Abstract: *Adopting an optimized irrigation system has become a necessity due to the lack of the world water resource. The system has a soil-moisture sensor. This project focuses on a smart irrigation system which is cost effective. Automation allows us to control various appliances automatically. The objective of this project is to control the water supply to each plant automatically depending on values of soil moisture sensors. Mechanism is done such that soil moisture sensor electrodes are inserted in soil. Automatic irrigation scheduling consistently has shown to be valuable in water use efficiency with respect to manual irrigation based on direct soil water measurements. The aim of the implementation is to demonstrate that the automatic irrigation can be used to reduce water use. The implementation is an automated irrigation system that consists of a soil moisture sensor which senses the soil humidity and automatically waters the field. Therefore, the object of this review study was to provide significant knowledge about early fault detection and diagnosis in aeroponics using intelligent techniques (wireless sensors). So, the farmer could monitor several paraments without using laboratory instruments, and the farmer could control the entire system remotely. Moreover, the technique also provides a wide range of information which could be essential for plant researchers and provides a greater understanding of how the key parameters of aeroponics correlate with plant growth in the system.*

Keywords: Irrigation, IoT, Raspberry Pi, Wi-Fi, Voice Control, Traffic Lights, Soil Moisture etc.

I. INTRODUCTION

At the present era, the farmers have been using irrigation technique in India through the manual control in which the farmers irrigate the land from time to time. This process sometimes consumes more water. Automatic irrigation scheduling consistently has shown to be valuable in water use efficiency with respect to manual irrigation based on direct soil water measurements. Irrigation of plants is usually a very time-consuming activity which has to be done in a reasonable amount of time; it requires a large number of human resources. All the steps were executed by humans traditionally. Nowadays, some systems use technology to reduce the number of workers and to reduce the time required to water the plants. With such systems, the control is very limited and many of the resources are still wasted. Water is one of these resources which is used excessively. Mass irrigation is the method which is used to water the plant. This method represents massive losses since the amount of water given exceeds the plants' needs. The excess water gets discharged by the holes of the pots, or it percolates through the soil in the fields. In addition to the excess cost of water, labour is becoming more and more expensive.

The idea of designing a new system for the street light that do not consume huge amount of electricity and illuminate large areas with the intensity of light is concerning each engineer working in this field providing street lighting is one of the most important and expensive responsibilities of a city. Lighting can account for '0-3) I of the total energy will in typical cities worldwide Street lighting is a particularly critical concern for public authorities in developing countries because of its strategic importance for economic and social stability" inefficient lighting wastes significant financial resources every year and poor lighting creates unsafe conditions ,energy efficient technologies and design mechanism can reduce cost of the street lighting drastically for annual control is prone to errors and leads to energy wastages and manually dimming during mid night is impracticable. Also dynamically tracking the light level is manually impracticable the current trend is the introduction of automation and remote management solutions to control street lighting.

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II. LITERATURE SURVEY

Bennis et al., proposed the model which includes soil moisture, temperature and pressure sensors to monitor the irrigation operations. Specifically, we consider the case where a system malfunction occurs, as when the pipes burst or the emitters block.

Joaquín Gutiérrez, Juan Francisco Villa-Medina et al. "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module, In this paper the System has a distributed wireless network of soil-moisture & temperature sensors placed in root zone of plants. Gateway unit handles sensor information, triggers actuators, and transmits data to a web application. An algorithm was developed with threshold values of sensors that was programmed into a microcontroller-based gateway to control water quantity.

Sangamesh Malge, Kalyani Bhole, "Novel, Low cost Remotely operated smart Irrigation system" In this paper a Small embedded system device (ESD) which takes care of a whole irrigation process. The PIC18F4550 microcontroller interfaced with GSM module works as a brain and several sensors like temperature, level and rain works as eyes of this ESD. If and only if eyes of the ESD see all parameters are within a safe range, the PIC18F4550 starts irrigation process by starting the irrigation pump. The farmer gets time to time feedback from ESD through SMS about the action that has taken place by PIC18F4550.

Pravina B. Chikankar, Deepak Mehetre, Soumitra Das, "An Automatic Irrigation System using ZigBee in Wireless Sensor Network" In the research field of wireless sensor network power efficient time is major issue which can be overcome by using ZigBee technology. The main idea is to understand how data travels through wireless medium transmission using WSN and monitoring system. Design of an irrigation system which is automated by using controllable parameter such as temperature, soil moisture and air humidity because they are the important factors to be controlled in PA (Precision Agriculture).

Sneha Angal "Raspberry pi and Arduino Based Automated Irrigation System" The paper presents a home automation system which is based on Raspberry pi, Arduino microcontrollers, and zigbee and relay boards to water plants. Raspberry pi acts as the control block in the automatic irrigation system to control the flow of motor. The commands from the irrigation system. By using moisture sensor, we will make the irrigation system smart and automated. System once installed has no maintenance cost and is easy.

Bhagyashree K. Chate, Prof. J. G. Rana ,"Smart irrigation system using Raspberry pi" The aim of this paper is to develop a smart irrigation monitoring system using raspberry pi. Focus area will be parameters such as temperature and soil moisture. This system will be a substitute to traditional farming method. We will develop such a system that will help a farmer to know his field status in his home or he may be residing in any part of the world. It proposes a automatic irrigation system for the agricultural lands. Currently the automation is one of the important roles in the human life.

III. MOTIVATION

Irrigation is the most important need for the farm. It requires manpower and other things. If the schedule for plant watering is irregular then it effects on that farm. Same situation happens with garden. To overcome this problem, we have developed automatic irrigation system. In today's digital world the google can do anything on using internet. As the part of new technology, we have implemented voice-controlled farm house so that the farmer can operate and monitor it from anywhere, anytime.

IV. BLOCK DIAGRAM

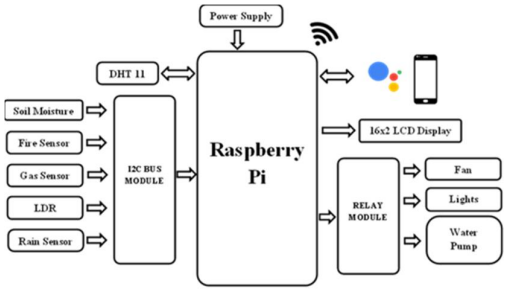

Fig 1: Block Diagram

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Block Diagram Contains:

1. Raspberry Pi
2. MQ6 gas sensor
3. Water Pump
4. Soil Moisture Sensor
5. Fire Sensor
6. LDR
7. Rain Sensor
8. DHT11
9. Motor Driver
10. Relay, Buzzer, Led
11. 16x2 LCD
12. Google Assistant
13. Android Device

V. CIRCUIT DIAGRAM & DESCRIPTION

5.1 Circuit Diagram of Proposed System

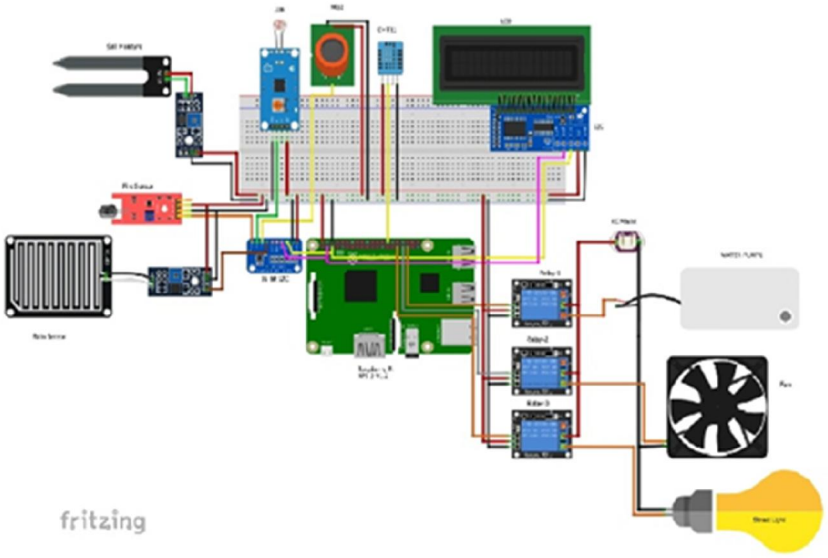

Fig 2: Circuit Diagram

5.2 Proposed System

In this project "Smart Voice Controlled Farm House Automation, Plant Watering and Street Light Control" System design is done based on two requirements.

(1) Hardware Requirements

(2) Software Requirements

A. Hardware Requirements:

Raspberry Pi3 B+ model

Raspberry Pi3 B+ acts as a micro-computer for main processing and measures the soil moisture, temperature, humidity, rain, light intensity, gas intensity from the input given by the sensors, in order to control the devices like relay, motors, lights, etc.

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Relay Module (Four Channel)

Relay is used to drive the high voltage devices like fan, bulbs, etc. Relays operated on 5 volt and it control 230Volts. It works on digital signal (0 or 5 volt).

Pump Motor:

Pump motor play's important role in irrigation. It is used to sink water from river, well, boar well, lake, etc.

DHT11

DHT11 sensor consists of a capacitive humidity sensing element and a thermistor for sensing temperature. The humidity sensing capacitor has two electrodes with a moisture holding substrate as a dielectric between them. Change in the capacitance value occurs with the change in humidity levels. The IC measure, process this changed resistance values and change them into digital form.

Soil Moisture Sensor

The moisture of the soil plays an essential role in the irrigation field as well as in gardens for plants. As nutrients in the soil provide the food to the plants for their growth. Supplying water to the plants is also essential to change the temperature of the plants. The temperature of the plant can be changed with water using the method like transpiration. And plant root systems are also developed better when rising within moist soil. Extreme soil moisture levels can guide to anaerobic situations that can encourage the plant's growth as well as soil pathogens.

LDR

Light Dependent Resistor (LDR) is also called a photoresistor or a cadmium sulfide (CdS) cell. It is also called a photoconductor. It is basically a photocell that works on the principle of photoconductivity. The passive component is basically a resistor whose resistance value decreases when the intensity of light decreases. This optoelectronic device is mostly used in light varying sensor circuit, and light and dark activated switching circuits. Some of its applications include camera light meters, street lights, clock radios, light beam alarms, reflective smoke alarms, and outdoor clocks.

Rain Sensor

A rain sensor or rain switch is a switching device activated by rainfall. There are two main applications for rain sensors. The first is a water conservation device connected to an automatic irrigation system that causes the system to shut down in the event of rainfall. The second is a device used to protect the interior of an automobile from rain and to support the automatic mode of windscreen wipers. The rain sensor works on the principle of total internal reflection. ... An infrared light beams at a 45-degree angle on a clear area of the windshield from the sensor-inside the car. When it rains, the wet glass causes the light to scatter and lesser amount of light gets reflected back to the sensor.

Gas Sensor (MQ2):

Using a MQ sensor it detects a gas is very easy. You can either use the digital pin or the analog pin to accomplish this. Simply power the module with 5V and you should notice the power LED on the module to glow and when no gas it detected the output LED will remain turned off meaning the digital output pin will be 0V. Remember that these sensors have to be kept on for pre-heating time (mentioned in features above) before you can actually work with it.

Software requirements of system are developed by using:

IFTTT:

IFTTT stands for If This Then That. It's a service that lets you connect to cloud services and Internet-enabled devices to create some useful automated actions for your online activity and "in real life" (IRL).

Services

IFTTT lets you connect your cloud accounts like Gmail, Facebook, Alexa, or Google Assistant. It also lets you connect internet-enabled devices like WeMo plugs, D-Link Wi-Fi cameras, Nest thermostats, mobile phones, and more.

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Applets
A single automation that you've created to connect two cloud services or devices. Applets usually include some form of logic that defines when a specific action will cause a specific trigger.

Trigger
An event that causes the applet to become active. This could be an incoming email that has a specific subject line, your mobile phone logging into your home Wi-Fi network or a website RSS feed getting updated with new content.

Action
The event that you want to put into motion when the trigger you defined occurs. This could be sending an SMS to your phone, turning on a Philips Hue light, or adding a new row to a Google Sheets spreadsheet.

Activity
This is a log in IFTTT that shows all of the triggers and actions that have recently occurred.

Ingredients
This is the information passed from the "Trigger" event that you can use when customizing the "Action".

Adafruit IO
Adafruit.io is a cloud service - that just means we run it for you and you don't have to manage it. You can connect to it over the Internet. It's meant primarily for storing and then retrieving data but it can do a lot more than just that!

Thingspeak Cloud
"ThingSpeak "is an open-source Internet of Things (IoT) application and API to store and retrieve data from things using the HTTP and MQTT protocol over the Internet or via a Local Area Network. ThingSpeak enables the creation of sensor logging applications, location tracking applications, and a social network of things with status updates".

Telegram Application
Telegram application provides messaging facility over an internet. Telegram bot will able to send any message and data from any IoT device using internet. In this system telegram is used to send our required food material and gas booking orders.

5.3 Working
This system is designed to reduce efforts for watering plants and automate the farm house. The sensors are used to detect the environmental conditions like humidity, temperature, Soil Moisture, etc. When system senses the soil moisture it will send the data to the user and waiting for the next commands. When user send the voice command to the device then device take further action as per programming. The water pump enabled after the action taken by the controller.
Humidity and temperature is detected by the DHT11 and send to the user. It is very useful feature when the user is away from the farm house and home. Fire sensor and gas sensor is used to detect any hazards caused by the fire and gases. So that it will help user to protect his farm from fire.
The fans and heaters are used to maintain the temperature of the farm house and home. This are also controlled as per the input of the sensors. LDR sensor is used to detect intensity of the Light; hence it can be able to differentiate the day and night time. By using this input the street lights are automatically turned ON at the time of night and also turned OFF on the morning. This system is also useful in-home automation. Status of all input sensors are displayed on the monitor to verify the system is working or not and also for the calibration process.
This system needs an internet connection to connect with remote device like android, Laptop, etc. Android device is also for the sending voice commands to the raspberry pi.

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VI. ALGORITHM

1. Start
2. Initialize the system.
3. Capture Soil Moisture and Weather condition.
4. Compare the captured data with the set point of the sensors.
5. If it below the threshold then turns on the pump.
6. Else wait for voice commands.
7. Check commands and activate the system.
8. Go back to step 3.

VII. FLOW CHART

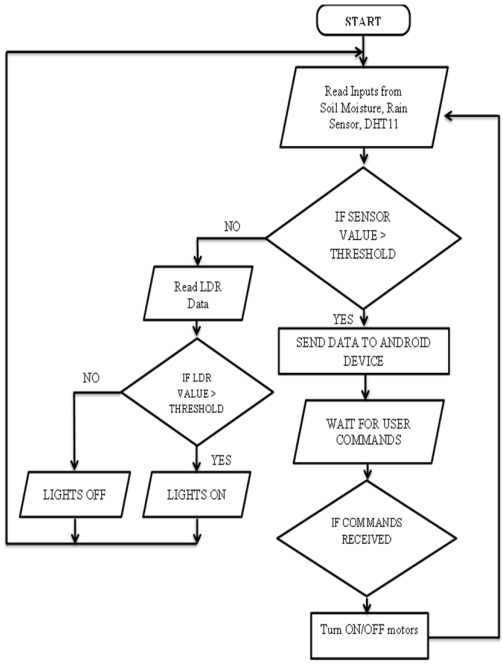

Fig 3. Flow Chart

VIII. ADVANTAGES

1. Automatically controlled system.
2. System also works without internet.
3. System is also used in industries.
4. Street light control.

IX. APPLICATIONS

This system having its own controls on devices like electricity, water pump, fan, bulb, etc. This type of system is used:

1. Plant Irrigation system
2. Smart farmhouse.
3. In gas industries to prevent from big explosion.
4. In smart homes.
5. Used for street light control.

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X. RESULTS

Fig 4. Output data On LCD (Welcome Text)

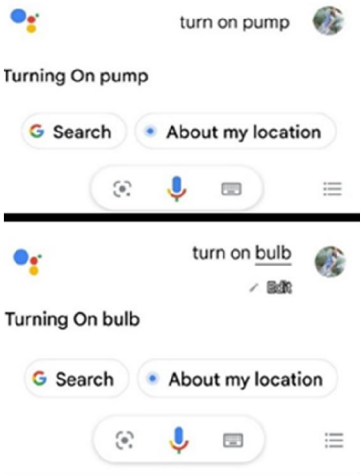

Fig 5. Google Assistant Voice Command Inputs

Fig 6. Output Notification When Action Taken

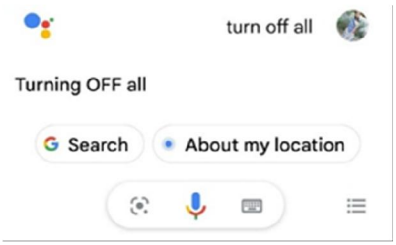

Fig 7. Commands for turning off everything

Fig 8. Output data on LCD

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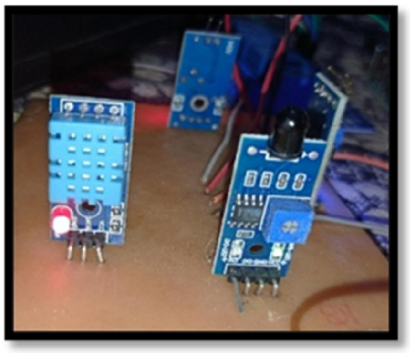

Fig 9. Sensors for collecting data

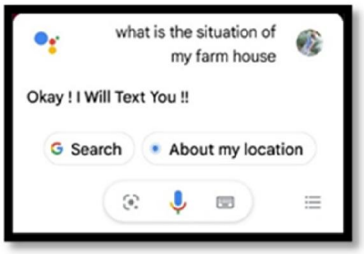

Fig 10. Voice Commands for taking data from sensors on server

Fig 11. Data Sent on server and Message sent on android

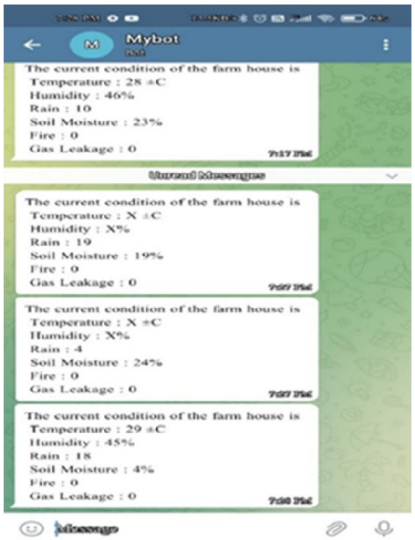

Fig 12. Data received on Telegram

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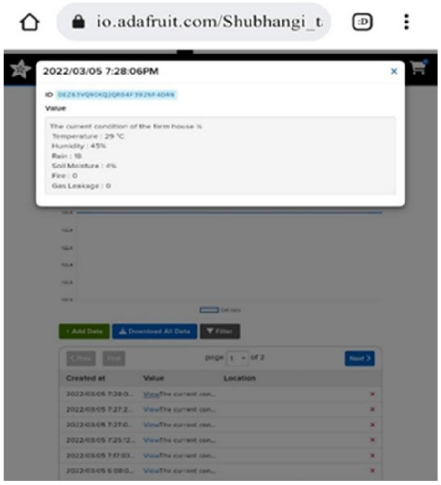

Fig 13. Data Stored on Adafruit IO Server

Fig 14. Emergency Alert

XI. CONCLUSION

After doing extensive research on this project, we can say that this type of automation is very useful in smart farming. This project is able to or protect farm from fire and harmful gases by its own controls. System having automatic watering system. Hence it saves lot of time and the system regularly updates important notifications and warnings. The device monitors temperature, humidity, rain, light intensity and perform specific action within a time. Also, all the controls accessed by voice assistant from anywhere and anytime.

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