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AN EFFECTIVE AUTOMATED IRRIGATION CONTROL AND MONITORING SYSTEM USING RASPBERRY PI

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Abstract *- The traditional agricultural exercise need to enhance the rate of food crop production for the growing population with available resources. Efficient water management is a major concern where the lack of water resources in the farm field. Automation of appliances provides comfort, increase the efficiency, saves the energy and time. Due to the variable atmospheric conditions sometimes may vary from place to place in large field, which makes very difficult to maintain the uniformity. Proposed system consists of several sensors having different capability to measure the physical and chemical properties of water, air and soil. The system can also be monitored by the farmer anywhere, anytime there by reducing the manpower. The current field status be like humidity, temperature, moisture, crop growth level, edge detection, fire alarm, intruder detection will be intimated to the farmers through the SMS and updated in the web page using GSM technology.*

Keywords: Raspberry Pi, Soil Moisture Sensor, Webcam, Global System for Mobile communication (GSM), Internet of Things (IOT).

I. INTRODUCTION

Internet of Things commonly known as IOT is a promising area in technology that is growing day by day where devices connect with each other or to living things. IOT is a technology where in an android device can be used to monitor the function of a device and it is concerned with interconnecting communicating objects that are installed at different locations that are possibly distant from each other.

Agriculture is the major source of food production for the ceaseless growing population. The demand for food requires the rapid improvement in food production technology. Irrigation is a fundamental practice in many agricultural cropping system in farm field and essential process that influence crop production. The farmers are solely depend on the rain and the bore well water along with that moisture content of the soil changes in according to the climatic changes and sometimes cause the scarcity of water. Conventionally growers cannot be there in the field always they need to manage other works along with the agriculture. Automation of irrigation system makes agriculture easier. It is designed and coded in such a way that to supply required amount of water to a fragile area it can be very cost effective and can do a lot of water conservation.

Rainfall depends on monsoons if the rainfall is uncertain, irregular, uneven then it causes the problem for crops in farm field. According to statistics, agriculture uses 85% of available freshwater resources worldwide and 80% of the total annual rainfall occurs in only four months so we have to find the easier way to feed a water to crops for another eight months and this percentage will continue to be dominant in water consumption because of population growth and increased food demand. Agricultural irrigation based on Internet technology is based on crop water requirement rules. By using Internet technology and sensor network technology and the amount of water is supplied to the plants at the regular interval to maintain the soil moisture at the time of seed germination. Hence it may significantly enhance the usage of water and raise water productivity. Along with that, growth of the crop is displayed using IR transceiver. Camera interfaced with raspberry is used to capture the crop and image is processed for the detection of pest. If the presence of pest is determined, then pesticide is sprayed manually to govern the pest.

II. LITERATURE SURVEY

R Aarthi, Dr. A Shaik Abdul Khadir(2014) proposed and implemented the water conservation method to avoid the scarcity of water . Camera is used to monitor the crop level and edge detection where the data stored in web page[1].

Archana and Priya (2016) discussed a paper in which the humidity and soil moisture sensors are placed in the root zone of the plant. The sensed values are used to supply the water in controlled manner and the microcontroller doesn't intimate about the field status to the farmer[2].

Prof. C H Chavan and P V Karnade (2014) discussed about smart wireless sensor network for monitoring environmental parameters using Zigbee. The sensor nodes sends the data without having connectivity that is wirelessly. The central server collects all data , stores the data and displayed the data whenever it is necessary then finally sent to the client [3].

Karan kansara (2015) discussed about humidity and the temperature sensors to sense the soil condition where the nutrient content cannot be monitored. Here microcontroller can control the flow of water[4].

Joaquin Gutierrez (2013) proposed a gateway unit which manages sensor data, triggers actuators, and transfer data to web application. Photovoltaic panels used to power up and it has duplex communication link based on cellular internet interface that allows for data inspection and irrigation timing to be programmed through web page [5].

Chandan kumar sahu and Pramitee Behera(2015) discussed about different types of irrigation like terraced or channel, sprinkler, drip irrigation. They also discussed about the need and the method of irrigation that helps the farmer and does the water conservation in a low cost manner[6].

Dishay Kissoon, Hinouccha Deerpaul, Avinash Mungur(2017) proposed system mainly monitors the behavior of soil moisture, air humidity, and air temperature and measures the amount of water given to crop. The system uses machine learning and compares actual values obtained from sensors with a threshold value that has been fed to the machine learning for analysis[7].

S Reshma and B A Sarath (2016) proposed an IOT based automatic irrigation system using wireless sensor networks in which various sensors are used to measure the soil parameters. Here the system provides a web interface for the user to monitor the farm field[8].

Sonali D Gainwar and Dinesh V Rojatkar (2015) proposed an idea in which soil parameters such as pH, humidity, moisture and temperature are checked for getting high yield from soil. The system is connected with an automatic turned motor pump as per the level of moisture present in the soil. The current field status is not intimated to the farmer[9].

Yunseop kim (2008) discussed an idea in which the field conditions were site-specifically monitored by six in-field sensor stations distributed across the field. The GPS works on wireless communication which has been used to intimate about field condition. Without the internet the GPS intimation will not work properly [10].

III. PROPOSED SYSTEM

Automated irrigation system uses valves to turn motor ON apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. In addition, farmers using automation equipment are able to check the amount of rain level detection which helps to reduce runoff from over watering saturated soils, avoid unnecessary irrigation of the farm field, which will improve crop performance by ensuring sufficient water and nutrients when needed. Those valves may be easily automated by using controllers. Automating farm irrigation allows farmers to apply the right amount of water at the right time, regardless of the availability of labor to turn valves on and off. They want a featured mobile application developed for users with appropriate user interface. It only allows the user to monitor and maintain the moisture level remotely irrespective of time.

As per the fig1 the Proposed system deals with controlling and continuous monitoring of crop field by the use of sensors.

The amount of moisture content and nutrient content including the physical and chemical properties is measured by the soil moisture sensor. If any variation in the threshold value of the sensor displays the data through LCD. IR transceivers are use to check the crop growth level. It acts as both transmitter and receiver of data. If an obstacle is detected, it will show the length of the obstacle in both the LCD display and also in the remote server.

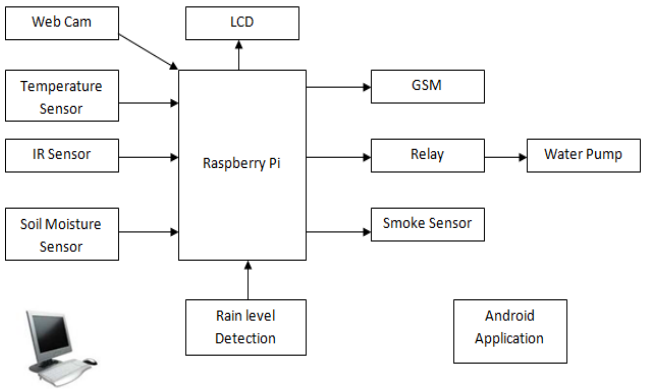

Fig 1:Block diagram of Automated Irrigation System

The microcontroller called Raspberry Pi is connected with the web cam for monitoring the intrusion detection in farm field and edge detection for any pest attack on the crop. The web cam has better resolution to detect the pest detection and the crop growth level. If the veins are straight and normal then it is free from the pest if not it is not pest free. To avoid the proliferation of pest, pesticides are sprayed immediately. Even a slight disturbance in the field like crop safety can be find out immediately by the remote server access. Temperature sensor senses the atmospheric temperature which inturn helps in giving hint to the smoke sensor. The smoke detecting sensor is a device that detects smoke, typically as an indicator of fire.

The Smoke sensor senses the smoke for example if the fire is happened in nearby fields and also in the farm field then it automatically senses the smoke and give alarm to the user and it can be put out fire using water pump. The system is provided with a GSM and android application helps the farmers to improve the crop production and reduces the manpower. The information will also be stored in the web page and can be retrieved through android application.

CONCLUSION

The prototype of the proposed systems was implemented and it proved to be efficient for the conservation of water. So that it will be used effectively where the problem scarcity of water is present. It is precise method for irrigation and a

valuable tool for accurate soil moisture control in highly specialized farm field. Crop growth monitoring is done by using the IR sensors. Camera captures the image and process the edge, pest and intruder detection. Smoke sensor gives the alarm to the farmer when it find fire with smoke. It can thus be effectively reduce the complication of agricultural labor by using sensors. By using Raspberry Pi kit that is interfaced with different type of sensors, we can monitor the growth of crops in a healthy way. In real time monitoring the system consumes less energy and cost. It is very efficient and reliable.

FUTURE WORK

We made a prototype In future, this project can be taken to the product level. To make this project as user friendly and durable, we need to make it compact and cost effective. Going further, most of the units can be embedded along with the controller on a single board with change in technology, thereby reducing the size of the system.

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