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SMART IRRIGATION AND CROP SUGGESTION USING RASPBERRY-PI

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Abstract : *Agriculture plays important role in economy of India.70% Indian population directly depend on agriculture. Water is important factor for irrigation. In agriculture irrigation is essential process that influences crop production. In proposed system farmers needs to visit the field of monitoring an operating the irrigation pump. These causes to wastage of time and water.so we developed system which farmer can monitor and operate a remotely placed irrigation pump.This paper focus on smart irrigation system which is cost effective and middle class farmer use it in farm field. Today we are living in 21th century where automation plays important role in human life. It not only provide comfort but also reduce energy , efficiency and time saving. I This paper develops a small embedded system device which takes care of a whole irrigation process. The Raspberry Pi microcontroller interfaced with several sensors like temperature, soil moisture . The power detecting circuit and battery backup unit take this ESD to next level by informing presence of three phase power supply in the field. The farmer needs to send commands through SMS from her/his mobile phone to this ESD to carry out irrigation process . If and only all parameters are within a safe range, the Raspberry Pi starts irrigation process by starting the irrigation pump. The farmer gets time to time notification about the action that has taken place by Raspberry Pi. MQTT allows farmers to control a remotely placed irrigation pump from anywhere and for communication between server and mobile phone. In this way, this new engineering technology makes farmers life easier by providing remotely operated, more efficient and cost effective irrigation system. This new technology makes farmer life easier by providing remotely operated, more efficient and cost effective irrigation system*

Keywords:*Irrigation, Raspberry Pi ,Soil moisture sensor, Temperature sensor, MQTT,*

INTRODUCTION

In our country Agriculture is major source of food production to the growing demand of human population. In agriculture, irrigation is an essential process that ininfluences crop production. Generally farmers visit their agriculture fields periodically to check soil moisture level and based on requirement water is pumped by motors to irrigate respective fields. Farmer need to wait for certain period before switching o motor so that water is allowed to flow in sufficient quantity in respective fields. This irrigation method takes lot of time and eort particularly when a farmer need to irrigate multiple agriculture fields distributed in different geographical areas. previous farmers will present in their fields to do irrigation process. But nowadays farmers need to manage their agricultural activity along with other occupations. Automation in irrigation system makes farmer work much fast and comfortable. Sensor based automated irrigation system provides promising solution to farmers where presence of farmer in field is not compulsory. A small processor programmed for control a valve and also compare to valve operate motor to start irrigation. Really INDIAN farmers need cheap and simple user interface for controlling sensor based automated irrigation system. Now a day's internet is widely used. Using net connection farmer know about the agriculture field irrigation status on android mobile app. This helps farmers to know the status of farm field watering direction through a message whether the farmer is far away from field know the status of water motor is ON or OFF and direction of watering.

In this paper we present a subpart of fully automation accessing of irrigation motor where it is includes number of sensor node placed in different region of farm field. For experimentation we have abstracted number of soil moisture sensor used in different direction of the farm fields. The moisture level in each direction of field is sensed by sensor node and the sensed data is sent to R-pi through wireless networking device. On receiving sensor value the controller node checks it with required soil moisture value. When soil moisture in a specific field is not up to required level then controller node switch on the motor to irrigate farm. The RASPBERRY-Pi process all data and notification SMS is send to registered mobile phone which is registered in RASPBERRY-Pi. The RASPBERRY-Pi is monitoring with a screen to see the current status of the irrigation and use for change the setting of user required.Mqtt is used for communication.

EXPLAINATION

Fig shows the architecture of the sensor node that is going to be used as a part of the smart agricultural solution. Information regarding the peers is also stored which in turn helps to monitor the sensor node.Sensors placed in soil sensed data form soil.These sensors collect the data and thus pass the data to the control node of R-pi directly. R-pi process the incoming data and compare the

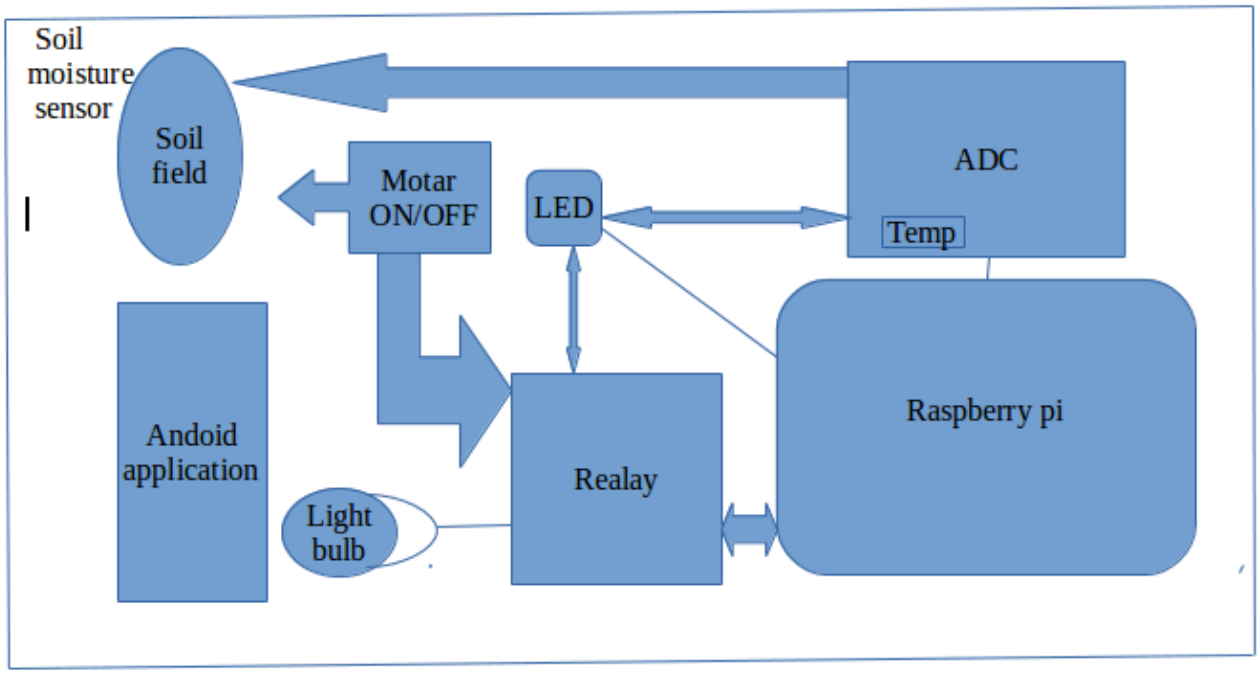


Fig: System Architecture

Valuesto the inbuilt threshold value and pass on the information to the farmer's console application. From this point it is our design approach that decides whether the motor need to on or not autonomously or by the control of the farmer. It varies from scenario to scenario.

We develop a small embedded system device (ESD) which takes care of a whole irrigation process and makes farmers life easier. The R-pi interfaced with several sensors like temperature, level and rain works as eyes of this ESD. The power detecting circuit and battery backup unit take this ESD to next level by informing presence of three phase power supply in the field. The farmer just needs to send predefined commands through notification from her/his mobile phone to this ESD to carry out irrigation process effectively. If and only if eyes of the ESD sees all parameters are within a safe range, the R-pi starts irrigation process by starting the irrigation pump.Continuous values of sensors are sending to our android app.After its reach to thresholdvalue.Then motor is automatically off or we can also on or off motor from our android app. The farmer gets time to time feedback from ESD through NOTIFICATION about the action that has taken place by R-pi.. In this way, this new engineering technology makes farmers life easier by providing remotely operated, more efficient and cost effective irrigation system.

COMPONENT

1. Relay:

The relay is an automatic protective and switching device which is capable of sensing abnormal conditions in electrical circuits. These are operated to open or close the load contacts in response to one or more electrical quantities like voltage and current. Relays are used in a wide variety of applications like electric power systems, home appliances, automobiles, industrial equipment's, digital computers, etc.

2. ADC:

In electronics, an Analog to Digital Converter (ADC) is a device for converting an analog signal (current, voltage etc.) to a digital code, usually binary. In the real world, most of the signals sensed and processed by humans are analog signals.

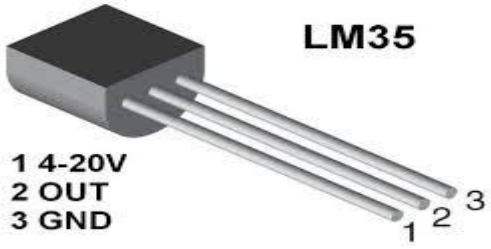
3. Motor:

Mortar is used to hold building materials such as brick or stone together. It is composed of a thick mixture of water, sand, and cement. The water is used to hydrate the cement and hold the mix together. The water to cement ratio is higher in mortar than in concrete in order to form its bonding element.

4. Soil moisture sensor:

The Soil Moisture Sensor uses capacitance to measure dielectric permittivity of the surrounding medium. In soil, dielectric permittivity is a function of the water content. The sensor creates a voltage proportional to the dielectric permittivity, and therefore the water content of the soil.

5. Temperaturesensor:



Temperature sensor is a device which senses variations in temperature across it. LM35 is a basic temperature sensor that can be used for experimental purpose. It gives the readings in centigrade (degree Celsius) since its output voltage is linearly proportional to temperature.

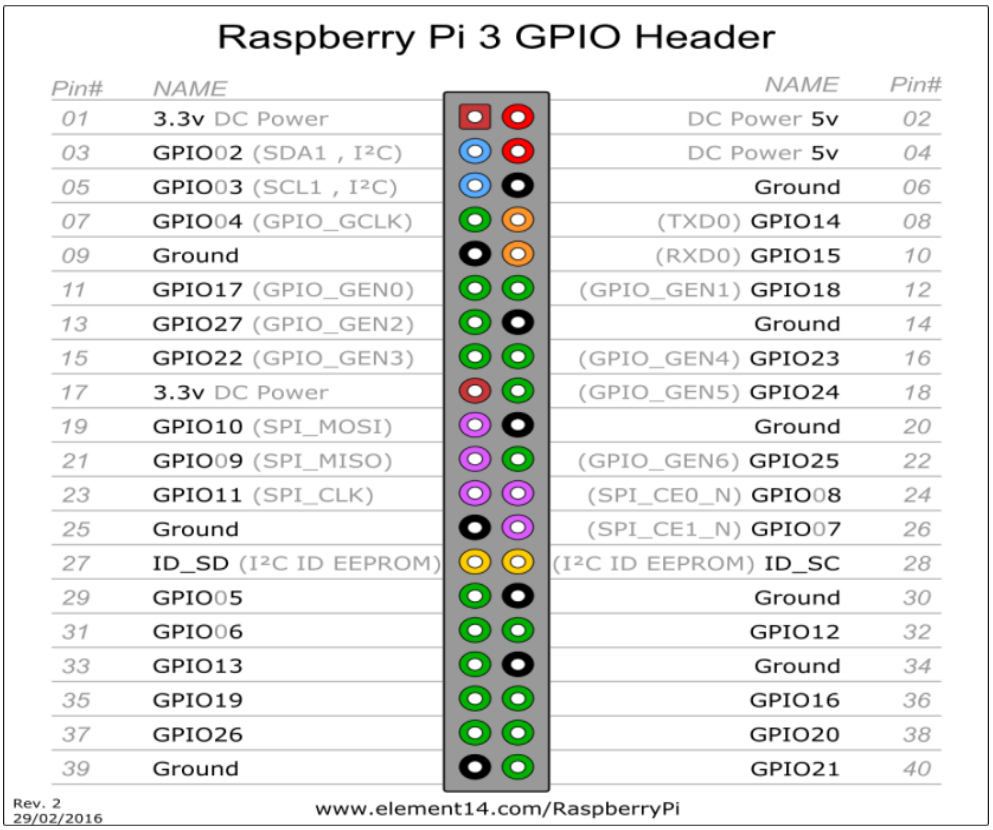
6. Raspberry pi -Description:

The Raspberry Pi is a series of small single-board computers developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries. The original model

became far more popular than anticipated, selling outside of its target market for uses such as robotics. Peripherals (including keyboards, mice and cases) are not included with the Raspberry Pi. Some accessories however have been included in several official and unofficial bundles.

According to the Raspberry Pi Foundation, over 5 million Raspberry Pis have been sold before February 2015, making it the best-selling British computer. By 9 September 2016 they had sold 10 million.

Raspberry-pi pin Diagram:



Power - These pull power directly from the Raspberry Pi 3Ground - Pins used to ground your devices. You can use any of them as they are all connected to the same line.UART (Universal Asynchronous Receiver / Transmitter) - Serial pins that are used to communicate with other devices.I2C (Inter-Integrated Circuit) - Pins that allow you to connect and talk to hardware modules that support I2C protocol. SPI (Serial Peripheral Interface Bus) - Pins that allow you to connect and talk to hardware modules that support SPI protocol.

7. MQTT:

MQTT[1] (MQ Telemetry Transport or Message Queue Telemetry Transport) is an ISO standard (ISO/IEC PRF 20922)[2] publish-subscribe-based "lightweight" messaging protocol for use on top of the TCP/IP protocol. It is designed for connections with remote locations where a "small code footprint" is required or the network bandwidth is limited. The publish-subscribe messaging pattern requires a message broker. The broker is responsible for distributing messages to interested clients based on the topic of a message. Mosquito is an open source message broker that implements the MQ Telemetry Transport (MQTT) protocol. MQTT provides a lightweight method of carrying out messaging using a publish/subscribe model. It is extremely simple and lightweight messaging protocol. These principles also turn out to make the protocol ideal of the emerging “machine-to-machine” (M2M) or “Internet of Things” world of connected devices such as phones, embedded computers or microcontrollers like the Arduino, R-pi and for mobile applications where bandwidth and battery power are at a premium.

RESULT SET

Befor Motor ON				
Component	**Threshold Value**	**Senced Value**	**Motor/Light Status**	
			ON	**OFF**
Tempture Sensor	40	35	ON	
SoilMoisture Sensor	35	30	ON	
After Motor OFF				
Tempture Sensor	40	40	OFF	
SoilMoisture Sensor	35	35	OFF	
Befor Light ON				
LED	30	25	ON	
After Light OFF				
LED	30	30	OFF	

In previous system there is no continuous sending of sensed moisture value and also there is no automation in on/off in motor. In our system we control all the irrigation system automatically without human interference. After obtaining results by monitoring and controlling farm which is display on mobile application and A hardware kit has been developed and place in our farm.In out kit consist of sensors, power supply unit Relay, Raspberry pi,LED, ADC.The optimal result obtained is displayed on our android app.In real application entire kit are fixed and put on farm.When parameters like moisture, temperature. Light are changed then that notification is get on our mobile app.If the the soil is dry then automatically motor is on and checks for water level is reached at farms.If it is maximum level then Raspberry pi automatically turn off the motor to pump water or we can also on/off by using our android app .And it is continuously monitored and controlled by controller. When there is no proper light then light is on from mobile app.

The test result shows when soil moisture level decreases the motor is on using mobile and whole irrigation process is controlled by controller node. These automatic system is also used in green house where there is need light for some plants like rose etc. Testresult shows that when there is no proper light in field then we on light from our android application.

The test result shows that automated irrigation system using Raspberry pi is more advanced and powerful option than using ardino in automatic irrigation system.

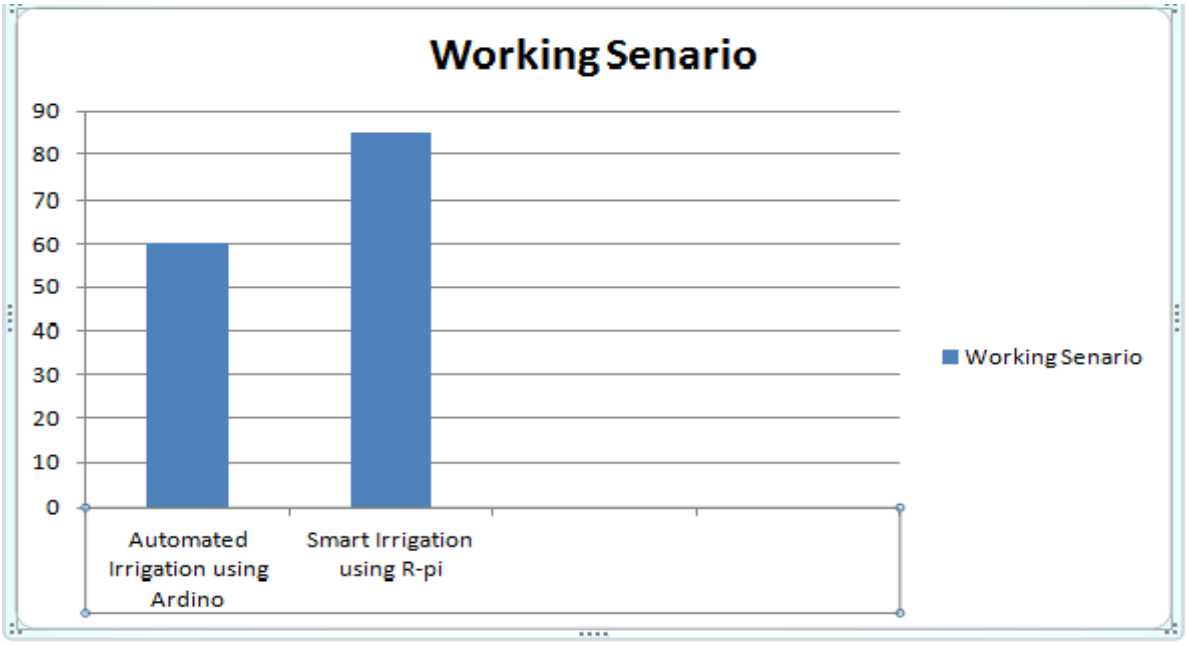


Fig: Result Set

CONCLUSION

Thus proposed and developed system done irrigation process in a smart way. This system assures protection of motor against irregular power supply, dry dun state, overheating of motor winding. Remote operation of irrigation pump, feedback facility to know status of pump and field moisture level status, authentication facility to avoid unauthorized operation, uniform distribution of water, prevention of wastage water and electricity are the main advantages of this system. This system is very helpful to farmers whose irrigation pumps are placed far away from their home and workplace. This system is used in a remote area and there are various benefits for the farmers. By using the automatic irrigation system it optimizes the usage of water by reducing wastage and reduce the human intervention for farmers. It saves energy and it automatic controlling the system. So there are the system is OFF when the field is wet and automatically start when the field id dry. It is implemented in all type of irrigation system like channel, sprinkler, drip etc. So proposed system is very cost effective and enhances agriculture productivity.

FUTURE WORK

India has different soil textures in different region of our state farmer. Can be benefitted by actual implementation of this program we done these by setting different threshold value to different crop by their requirement. Real challenges that were face and we need to overcome in reality is inter networking of nodes in an agriculture field.

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