IoT Based Solar Irrigation System

P. Niranjana[1] M. Prashanth[2] R. Sanjay[3] K. Sriram[4] S. Padhmanabha Iyappan[5]
[1,2,3,4]B.E Student [5]Assistant Professor
[1,2,3,4,5]Department of Electrical & Electronics Engineering
[1,2,3,4,5]Valliammai Engineering College, SRM Nagar, Kattankulathur- 603 203, Kancheepuram, Tamil Nadu, India

Abstract— An automatic irrigation system is to be designed which switches the motor ON/OFF on sensing the moisture content, temperature and pH of the soil. Due to global warming and many climate changes, nowadays there is no fixed time of rain and the amount of rain so there is a great chance of the crops getting destroyed. Less rain leads to under irrigation and excessive rain leads to over irrigation and both these would result in yield reduction. In this paper we introduce a system which can control the irrigation according to the need. The advantage of using this method is to reduce human intervention and ensure proper irrigation. The system is powered by a renewable source of energy i.e. SOLAR ENERGY. This system is connected to the user by IOT (Internet of Things) and user can check the status and control the system from the android mobile phone. There is also a LCD which displays the moisture, temperature and the pH of the soil.

Key words: IoT, LCD, Solar Energy, Temperature Sensor, WIFI Module

I. INTRODUCTION

India is an agriculture based country. Agriculture is the main source of food for any country and thus it is important to have a proper irrigation system. Due to global warming and many climate changes nowadays there is no fixed time of rain and the amount of rain so there is a great chance of the crops getting destroyed. Less rain leads to under irrigation and excessive rain leads to over irrigation and both these would result in yield reduction. In this paper we introduce a system which can control the irrigation according to the need.

Irrigation is a scientific process in which water is supplied to the land or soil for cultivation. Traditionally the dry area which has very low water content, people had to be supply water to the field either through canals or hand pumps, tube wells. Conventional irrigation method had faced problems such as problems of hard labor.

The proposed system describes the development of a wireless industrial environment measuring temperature and light detection, where the wireless connection is implemented to acquire data from the various sensors, in addition to allow set up difficulty is to be reduced. By using IoT technology we send the sensors data to an authorized web server.

The Raspberry Pi 3 will cost the same as its antecedent, but with an additional feature of Bluetooth and Wi-Fi. With its built-in wireless connectivity, the new Raspberry Pi 3 is clearly placed as a low-cost hub for Internet of Things (IOT) devices, or flexible, low-cost basis on new types of connected gadgets.

As for inputs, raspberry pi can read the status of buttons, switches, or different sensors.

- CPU: Quad-core 64-bit ARM Cortex A53
- GPU: 400MHz Video Core IV multimedia
- Memory: 1GB
- USB ports: 4
- Video outputs: HDMI via 3.5 mm jack
- Network: 10/100Mbps Ethernet and 802.11n Wireless LAN
- Bluetooth: 4.1
- Power source: 5 V via Micro USB
- Size: 85.60mm × 56.5mm
- Weight: 45g (1.6 oz)

II. OBJECTIVE

In this paper we introduce a system which can control the irrigation according to the need. This system consists of temperature, moisture and PH sensors which will tell the user about the conditions of the field and according to it the user can control the system. This system is also automatic i.e. we can preset some certain values for the moisture and when the moisture goes below the threshold level the system will automatically switch on the pumps until the moisture level goes to the required. The main objective of this project is to reduce the human intervention and ensure the proper irrigation according to our needs by using IoT (Internet of Things) in remote areas.

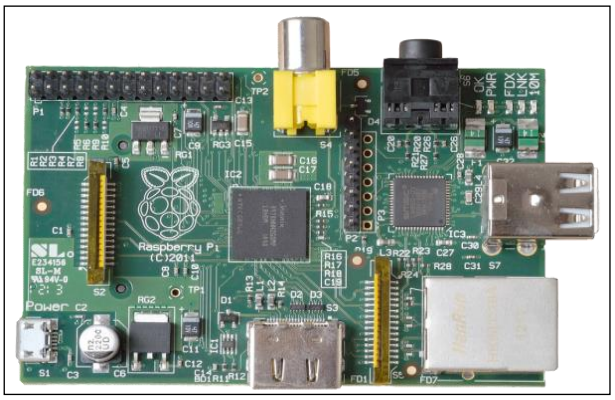
III. NEED

The modernized way of providing water to the plants at the correct time in a particular volume for the proper growth of the plants in order to get the maximum yields. This is technically called smart irrigation. India is having a lot of variety climate and weather conditions. These conditions range from intense heat to intense cold and from extreme dryness to excessive rainfall. Due to these reasons, smart irrigation is needed in Indian environment. There are two major components in this project which are moisture sensors and a motor or water pump. The purpose of the moisture sensor is to sense the level of moisture in the plant. The motor or water pump provides water to the plants. The moisture sensor indicates the level of moisture in the plant and sends the signal if water is needed. The motor/water pump exhilarates water to the plants until the optimum moisture level is met.

IV. HARDWARE DESCRIPTION

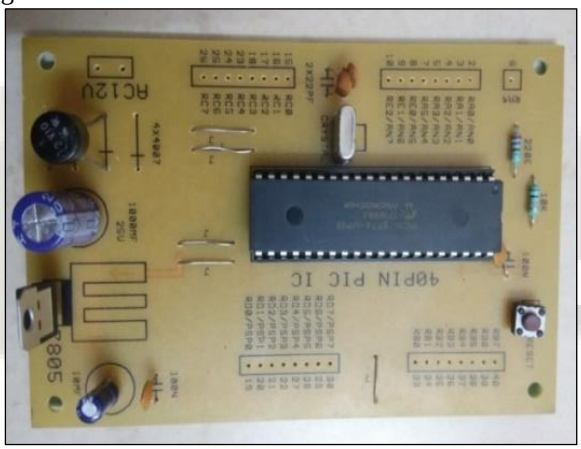
A. Raspberry pi

"Pi is a single-board computer". Pi is small in size but little bigger than a credit card, it packs enough power to run games, word processor, image editor and any program of similar magnitude. It was introduced as an educational gadget to be used for prototyping and for those who want to learn more about programming concepts.



B. PIC (Programmable Interface Controllers) microcontrollers

PIC (Programmable Interface Controllers) microcontrollers are the worlds smallest microcontrollers that can be programmed to carry out a huge range of tasks. These microcontrollers are found in many electronic devices such as phones, computer control systems, alarm systems, embedded systems, etc. Various types of microcontrollers exist, even though the best are found in the GENIE range of programmable microcontrollers.



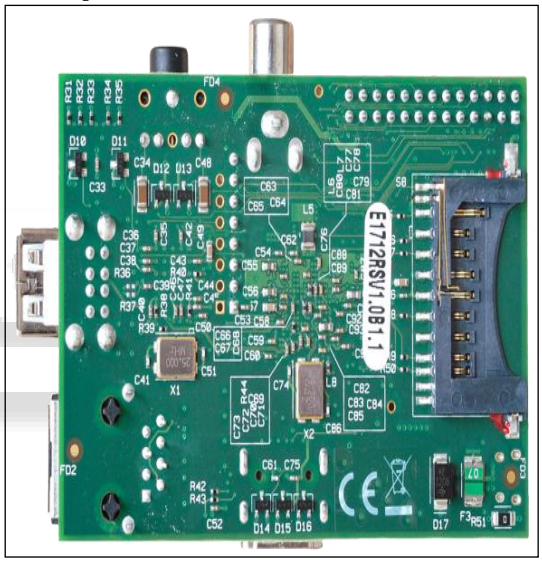
These microcontrollers are programmed and simulated by a circuit-wizard software. Every PIC microcontroller architecture consists of some registers and stack where registers function as Random Access Memory (RAM) and stack saves the return addresses. The main features of PIC microcontrollers are RAM, flash memory, Timers/Counters, EEPROM, I/O Ports, USART, CCP (Capture/Compare/PWM module), SSP, Comparator, ADC (analog to digital converter), PSP(parallel slave port), LCD and ICSP (in circuit serial programming) The 8-bit PIC microcontroller is classified into four types on the basis of internal architecture such as Base Line PIC, Mid Range PIC, Enhanced Mid Range PIC and PIC18

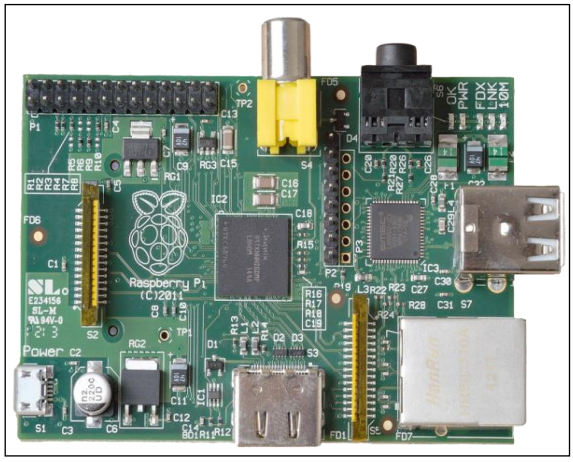
C. Humidity and Temperature Sensor

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data.

D. Water level Sensor

Water level sensor Level sensors are used to detect the level of substances that can flow. Such substances include liquids, slurries, granular material and powders. ... Such measurement can be used to determine the amount of materials within flow of water in open channels.



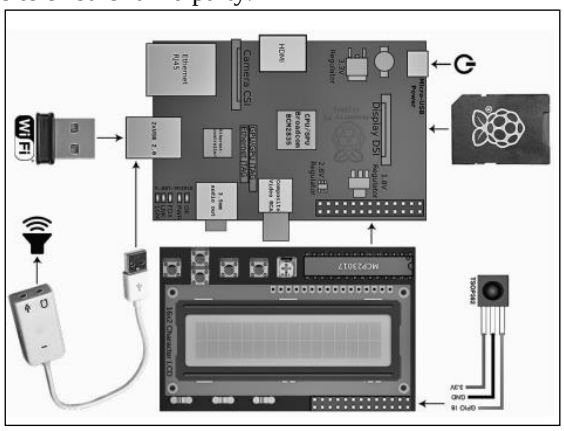


V. SOFTWARE DESCRIPTION

A. Raspbian Operating System

The Raspberry Pi primarily uses Raspbian, a Debian-based Linux operating system. Ubuntu MATE, Snappy Ubuntu Core, Windows 10 IoT Core, RISC OS and specialised

distributions for the Kodi media centre and classroom management. Operating systems available via the official website of other third party.



B. Android application

The android app is controlling raspberry pi and through the mobile application we can monitor all the actions happening with Raspberry pi

VI. WORKING

Raspberry Pi is the heart of the overall existing system. The Raspberry Pi Model 3 incorporates a number of enhancements and new features. Improved power consumption, enlarged connectivity and greater IO are among the improvements to this powerful, small and lightweight GPIO(General Purpose Input Output) pins. The Raspberry Pi cannot directly drive the relay. It has only zero volts or 3.3 V. We need 12V to drive electromechanical relay. In that case we need a driver circuit .The driver circuit takes the low level input and gives the 12V amplitude to drive the relay which operates at 12V .We are using here 2 relay to switch on Water motor , sprinkler.

Initially the sensor senses the humidity and moisture content where the difference in range of values is noted and compared with the standard values of the lands quality. Soil moisture sensor gives a resistance variation at the output. That signal is applied to the comparator and signal conditioning circuit. Those signals are sensed and the input is given to the Raspberry pi controller through the GPIO pins. Each and every GPIO pins are interfaced and assigned for various purposes. These values are being processed by the CPU of the raspberry pi. The data processed is then backed up in the cloud server .This backed up data is then access from portion with the help of internet. The raspberry pi data is backed up with the help of wifi or Zigbee. AIE as a input to the android cloud server. Here the android access as a client and cloud be the server. In this client-server model, the client is usually considered as front end and server is usually as considered as back end. The input from the mobile is given to the raspberry pi from which the command is given to the motor operation.

VII. ADVANTAGES

This technology is nominated for efficient smart irrigation systems and it may provide a valuable tool for preserving water. Maximum sucking up of water by the plant is ensured by sprinkling water evenly using motor. So there is less wastage of water. This system also automated as we can control the amount of water we want deliver to the plants when it is needed based on types of plants by keeping an eye on soil moisture and temperature. This project can be used to irrigate agricultural land where manpower needs to be minimized. Many aspects of the system can be changed according to the need and controlled through android application.

- Simpler and easy to install and configure.
- Saving energy and resources, so that it can be utilized in appropriate way.
- Farmers would be able to spread the proper quantity of water at the proper time by automating farm or nursery irrigation.
- Avoiding irrigation at the incorrect time of day, reduce runoff from overwatering saturated soils which will enhance crop/plant's performance.
- Automated irrigation system uses shower to turn motor ON and OFF.

VIII. FUTURE SCOPE

The proposed approach is to add security in the notification area of the project. Since notification is sent through twitter it is mandatory to add additional security in the system. By applying multiple encryption algorithm we can add security to the architecture. This algorithm may be Blowfish, SÁ, two fish, advance encryption standard (AES). As the twitter notification is triggered in the thinks peek software the data will be encrypted using any of the encryption algorithms so that the data is secured. There are multiple policies which are applied to make internet secure. But its studied that less number of policies are applied. Twitter architecture is based on networking domain and cloud sub domain which is keen to network security. Our project scope can be improved by adding feature which can tell the climate condition and water the plants/crops according to the need. If rain is predicted more, less water is supplied to plant. The total cost of providing enough water to the plants throughout a year long can be calculated. By storing the values constantly we can study about the nature call such as Drought

IX. CONCLUSION

Through Internet of Things we can access remotely existing network framework, new openings are created for more direct integration of country into digital infrastructure and resulting in improved efficiency benefits. In India, farmers use ancient irrigation techniques through manual control which include more manpower. This result in more wastage of water. Hence we require an efficient, precise monitor and water control system which can automate the water need of plants. It saves manpower, money and the most important money and ensures judicious use of water.

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