

Web based Automation of Farm Irrigation System Using Embedded Linux Board.

Navnath B. Jadhav
Department of E&TC
SVCET, Rajuri, Pune
navnathjadhav69@gmail.com

Chanakya Kumar Jha
Department of E&TC
SVCET, Rajuri, Pune
erchankya@gmail.com

Abstract:- This Paper Present the Automation of Farm Irrigation system using a sensor Network (SN) and Raspberry Pi. ARM 11 Microcontroller Architecture is used as a Raspberry pi2 .Embedded Linux Board communication with the sensors network through the Analog to Digital converter. The aim of sensor network is to collect the parameter Soil temperature and Soil moisture .Each sensor network consist of moisture sensor (Humidity sensor) and temperature sensor for sensing physical quantity. Raspberry pi2 collect data from sensor network and analyze the same data. Hence raspberry pi taking data from sensor node and allow the user to monitor data from web server. User can control and monitor data and irrigation system ON or OFF by remotely. Advantage of this system is Reduce the wastage of water and reduce the consumption of water.

Keywords-Sensor network (SN); Raspberry pi(Rpi); Embedded Linux Board ;web design.

Introduction

Irrigation is a process of providing water to the Crop. The requirement of the water to the crop depends upon the soil properties like soil moisture and the soil temperature. It also depends upon the which Crop is given in which type of soil. From last year's number of existing system will try to reduce the agriculture water consumption and water Wastage, but these system have some limitations. These system watering is done without analyzing the soil properties due to which system apply non uniform water and its effect on less yields. Also Irrigation system requires more human intervention and waste of time.

So we require latest technology to resolve these problem and support better Irrigation management. For that we have proposed system Farm Irrigation system using web and Raspberry Pi (Embedded Linux Board). The sensor network sensing the Physical quantity and communicate with the analog to Digital converter is a bridge between Sensor node and the Raspberry Pi.

Raspberry Pi sense the soil temperature and soil moisture data and save the collected data on the web database. If the analyzed data shows that the water is required the Raspberry pi send command to the water pump controller make on the Irrigation system on.

I. FARM IRRIGATION SYSTEM

A.Irrigation System

This is block diagram of irrigation system.

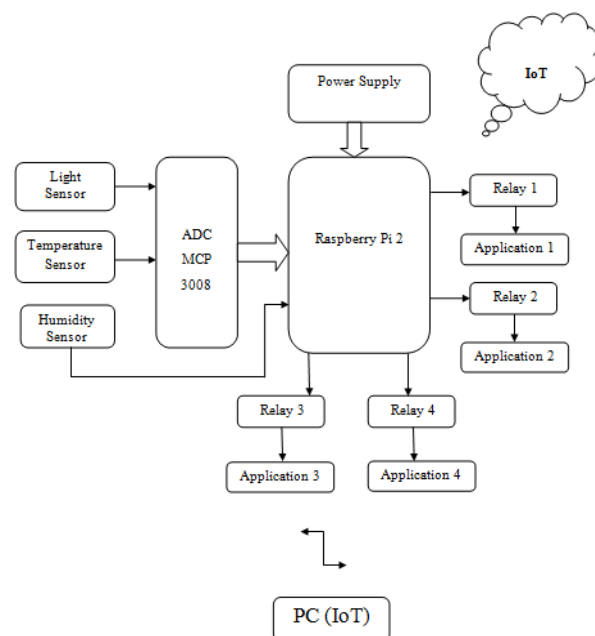


Figure 1.System Block Diagram

We are using MCP3008 as a data converter. This ADC converts analog input from different sensors in to digital output which is fed to ARM11 which in turn to be displayed on web page.MCP 3008 device are successive approximation of analog to digital converter and this ADC have inbuilt

sample and hold circuit.

The MCP 3008 is programmable to provide 4 pseudo differential input or 8 single ended inputs. ARM 11 is important system in our project. This is used to control, monitor and make decisions for System. For ARM 11 we are using raspberry pi.

a) Sensors

1) Temperature sensor

In this system LM35 temperature sensor is used. this is 3 pin sensor that pin is Vin, Vout, and ground. This is digital temperature sensor and provides 9 bit digital data and the range of this sensor is 0 degree Celsius to 70 degree Celsius. Accuracy is 0.5 degree Celsius. Figure show LM35 Temperature sensor.



Figure 2: Temperature Sensor.

2) Soil Moisture (Humidity) sensor

This sensor has detection probes and sensor board that probe is put into the soil. This sensor is working on the principle of Ohms law.

When soil have more water content that time more current flowing through the one probe to another probe it means less resistance . When soil have less water content that time less current flowing through the one probe to another probe it means more resistance. Resistance input is given to the Raspberry Pi.

3) Light Sensor

Light sensor is used for Politian application for maintain the temperature of the Farm. It is Light dependent resistor and light sensitive device.

As show in below figure arrow indicates light falling on it.

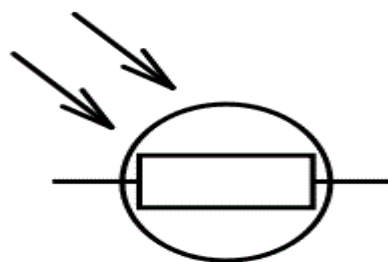


Figure 3: LDR Symbol.

c) Introduction to Raspberry pi

Raspberry pi is credit type minicomputer now it become very popular. It has 512 MB Internal RAM.

Figure 4 show the Raspberry pi Picture.

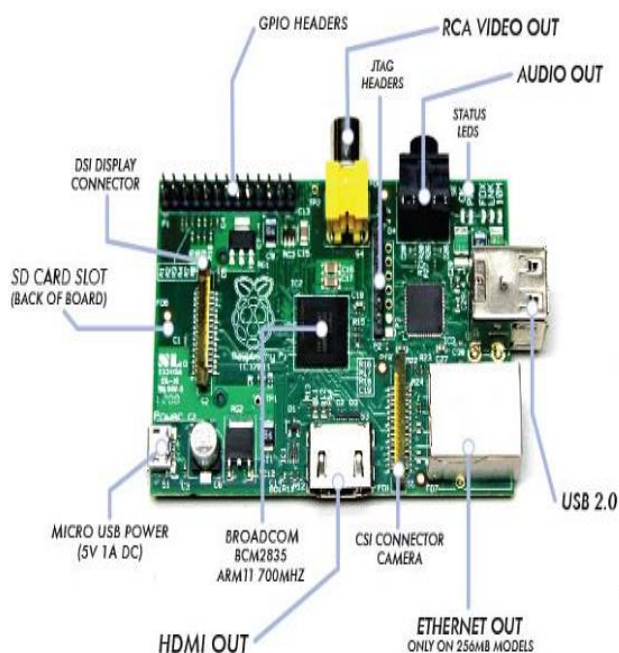


Figure 4: Raspberry Pi.

Raspberry pi is Brain of Irrigation system. Raspberry pi minicomputer is interface with the analog to digital converter at input side and relay at the output side. Raspberry pi take signal from ADC and store into the database that data given to the Web server.

II.IRRIGATION SYSTEM WORKING

we have developed two sensor node separated from each other The space between two node depend upon the types of soil.

Humidity sensor give the Resistance input to the Raspberry Pi
From each sensor node temperature sensors give the Temperature in Degree Celsius.

Working of System:

1. Temperature sensor threshold level is set at 40 degree C beyond that Fan (Relay 1) will get on automatically else it will get off.
2. Light sensor threshold level is set at 900 Ohm resistance beyond that Lamp (Relay 2) will get on automatically else it will get off.
3. Humidity sensor is used to check humidity of agricultural area.
4. Relay 3 & Relay 4 is used for manually controlled application using webpage.
5. All these activities can monitored and controlled through webpage.

III. ALGORITHM

1. Start
2. Initialize raspberry pi
3. Check input signal from ADC and web page
4. Go to step 9 if there is no signal from ADC
5. Send parameters from ADC to web page.
6. Display parameters on web page.
7. Go to step 9 if there is no signal from web page
8. Drive respective relay according to input from web page.
9. Wait for 5 second after that go to step 3

IV. EXPERIMENTAL TEST RESULT

In the Experimental setup Raspberry pi module is interface with the sensor through analog to digital converter.

Sensor network is mounted in the Farm Temperature sensor give analog data to the ADC and LDR also give data to the ADC. Moisture sensor is directly interface with the raspberry pi .

From the reading of input sensor relay get actuated and from that relay Motor pump get ON or OFF.

Figure 6 showing Experimental setup and Figure 7 show web page. From that web page user control and monitor the Irrigation system.

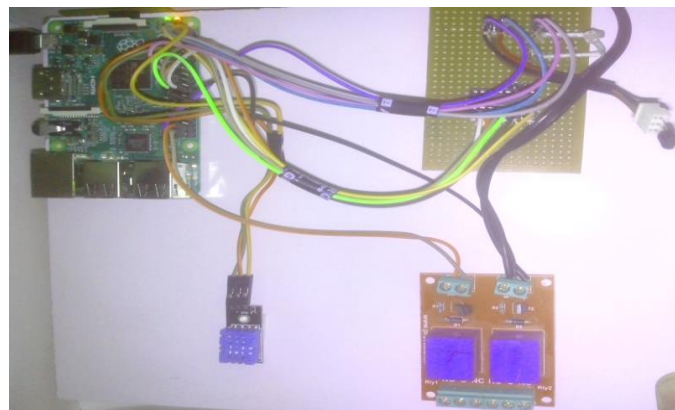


Figure 5: Experimental Setup

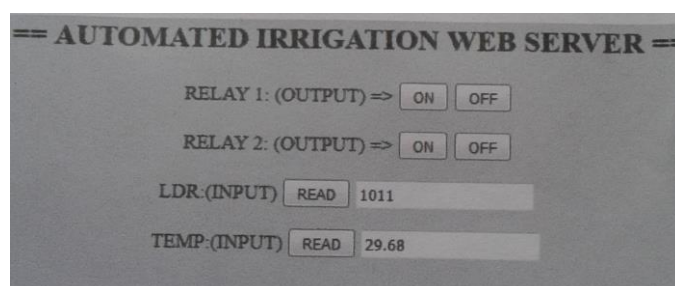


Figure 6: Experimental Result

V..CONCLUSION

This paper is design for the automation of Farm Irrigation system by using sensor network and the raspberry pi. Raspberry pi module collects the data from the Sensor node and that data is store into the database.

User can Monitor and control that data from the Web page. Due to this system Uniform water is given to the Crop its result in increasing the Yield and reduces the waste of the water.

. The web server display the contents of sensor data from that data user can monitor and control the water pump.

References

- [1] Pandurang H. Tarange, Rajan G. Mevekari and Prashant A. Shinde, "Web based Automatic Irrigation System using wireless sensor network and Embedded Linux board", 2015 International Conference on Circuit, Power and Computing Technologies [ICCPCT] doi: 978-1-4799-7075-9
- [2] R. C. Burns, R. M. Rees and D. D. E. Long, "Efficient data distribution in a Web server farm," in *IEEE Internet Computing*, vol. 5, no. 4, pp. 56-65, Jul/Aug 2001. doi: 10.1109/4236.939451
- [3] Chetan Dwarkani M, Ganesh Ram R, Jagannathan S and R. Priyatharshini, "Smart farming system using sensors for agricultural task automation," 2015 *IEEE Technological Innovation in ICT for Agriculture and Rural Development (TIAR)*, Chennai, 2015, pp. 49-53.
- [4] C. Kumar Sahu and P. Behera, "A low cost smart irrigation control system," 2015 *2nd International Conference on Electronics and Communication Systems (ICECS)*, Coimbatore, 2015, pp. 1146-1152. doi: 10.1109/ECS.2015.7124763