ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

Wireless Sensor Network Based Automatic Irrigation System Using Raspberry PI Processor

Ayesha Jabeen
M.Tech(VLSI & Embedded Systems)
Mallareddy Institute of Technology.

D.V.Rajeshwar Raju
Assistant Professor
Mallareddy Institute of Technology.

Pattem Sampath Kumar
Associate Professor & HoD
Mallareddy Institute of Technology.

ABSTRACT

This paper presents an automation of farm irrigation system embedded Linux board. The system provides a web interface to the user so that the user can control and monitor the system remotely. In this paper, Raspberry Pi is used as an embedded Linux board which is designed based on the arm 11 microcontroller architecture. Embedded Linux board makes the communication with all distributed sensor nodes placed in the farm. The goal of coordinator node is to collect the parameters like soil moisture and soil temperature. The sensors are moisture and soil temperature sensor. Raspberry Pi stores collected data in the database and analyzes the stored data. The system will work according to the algorithm developed for watering the crop. User can make the irrigation system ON or OFF remotely. The system will reduce the water consumption and giving uniform water to the crop results in increasing yield.

Keywords: ***Raspberry Pi processor, AT89S52 controller, Humidity sensor, Temperature sensor, level sensor, motor, server.***

I.INTRODUCTION:

Agriculture is the worldwide prime occupation of human being, 64% of total available land is occupied by the agriculture, and it consumes 85 % of available fresh water. This figure of water consumption increases every year due to globalization and population growth. There is a challenge in front of every country to sustain the fresh food requirement and reducing the farm water consumption. Irrigation is the process of watering the soil. The requirement of water to the soil depends on soil properties like soil moisture and soil temperature. It also depends upon the crop which grows in the soil. From last decade, few existing system working for reducing the agriculture water consumption, but these systems have some limitations.

These systems, watering is done without analyzing the soil properties, due to which systems apply non uniform water to the soil results in less yields. Also systems required more human intervention and time consuming. So we require modern technology to resolve this problem and support better irrigation management. For that we have proposed system which is Web based automatic irrigation system using wireless sensor network and embedded Linux board. The wireless sensor network creates the networks of multiple devices having capable of computation, communication and sensing.

It provides a bridge between the real physical world and virtual worlds and having a wide range of potential applications of Agriculture, home automation, science, civil infrastructure and security.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

II. RELATED WORK:

2.1 BLOCK DIAGRAM:

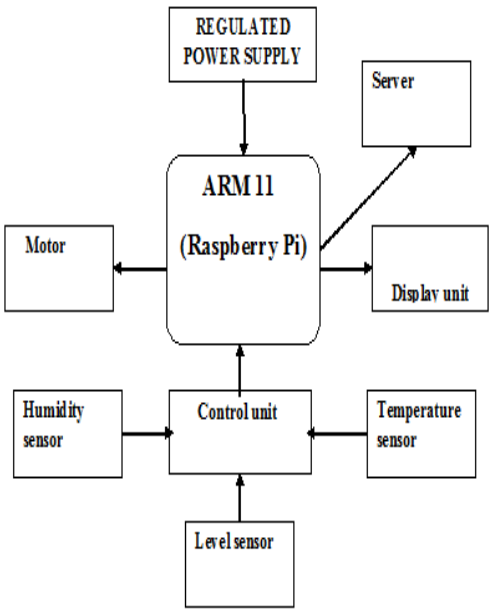

Figure-1: Block Diagram of project

2.2 EXISTING METHOD:

Villages are the backbone of our nation. The farmers strive hard day and night to yield very good results in their farm. They know the entire process how to produce a farm, when to provide water to the farms etc. When it is the time to water the farms, they just stop their current works then and there and rush to the farms to start the pump sets to water the farms.

2.3 PROPOSED METHOD:

In this project provides an excellent solution to this existing method. The farmer need not go to the farm to water his field. The system uses humidity sensor and temperature sensor to know the wetness percentage of the farm. Based on the output of the humidity sensor, the system sends the data to the processor, where the processor receives the relevant data and starts the motor to water the farm and as the output of the humidity sensor comes to the normal value, the system stops the motor. This project is implemented with high speed raspberry pi processor.

III. HARDWARE COMPONENTS:

3.1 RASPBERRY PI PROCESSOR:

Figure-2: Raspberry Pi diagram

The Raspberry Pi board involves a processor and snap shots chip, Random Access Memory (RAM) and more than a few interfaces and connectors for external devices. Some of these instruments are main others are optional. It operates in the identical method as a ordinary pc, requiring a keyboard for command entry, a show unit and a vigor give. considering that raspberry Pi board operates like pc it requires 'mass-storage', but a tough disk pressure of the variety observed in a ordinary pc is not relatively in maintaining with the miniature dimension of Raspberry Pi.

3.2 AT89S52 MICROCONTROLLER:

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density nonvolatile memory technology and is compatible with the indus-try-standard 80C51 instruction set and pinout. The on-chip Flash allows the program memory to be reprogrammed in-system or by a conventional nonvolatile memory pro-grammer. By combining a versatile 8-bit CPU with in-system programmable Flash on a monolithic chip, the Atmel AT89S52 is a powerful microcontroller which provides a highly-flexible and cost-effective solution to many embedded control applications. The AT89S52 provides the following standard features: 8K bytes of Flash, 256

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

bytes of RAM, 32 I/O lines, Watchdog timer, two data pointers, three 16-bit timer/counters, a six-vector two-level interrupt architecture, a full duplex serial port, on-chip oscillator, and clock circuitry. In addition, the AT89S52 is designed with static logic for operation down to zero frequency and supports two software selectable power saving modes.

3.3. DC MOTOR:

In any electric motor, operation is based on simple electromagnetism. A current-carrying conductor generates a magnetic field; when this is then placed in an external magnetic field, it will experience a force proportional to the current in the conductor, and to the strength of the external magnetic field. As you are well aware of from playing with magnets as a kid, opposite (North and South) polarities attract, while like polarities (North and North, South and South) repel. The internal configuration of a DC motor is designed to harness the magnetic interaction between a current-carrying conductor and an external magnetic field to generate rotational motion.

3.4. TEMPERATURE SENSOR:

In this project, in order to monitor the temperature continuously and compare this with the set temperature preprogrammed in the microcontroller, initially this temperature value has to be read and fed to the microcontroller. This temperature value has to be sensed. Thus a sensor has to be used and the sensor used in this project is LM35. It converts temperature value into electrical signals. LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. . The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full −55 to +150°C temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air.

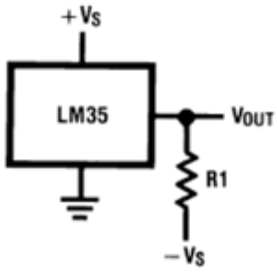

Figure-3: LM35 sensor

3.5 HUMIDITY SENSOR:

Humidity is a term for the amount of water vapor in the air, and can refer to any one of several measurements of humidity. Formally, humid air is not "moist air" but a mixture of water vapor and other constituents of air, and humidity is defined in terms of the water content of this mixture, called the Absolute humidity.

In everyday usage, it commonly refers to relative humidity, expressed as a percent in weather forecasts and on household humidity. It is so called because it measures the current absolute humidity **relative** to the maximum. Specific humidity is a ratio of the water vapor content of the mixture to the total air content (on a mass basis). The water vapor content of the mixture can be measured either as mass per volume or as a partial pressure, depending on the usage. In meteorology, humidity indicates the likelihood of precipitation, dew, or fog. High relative humidity reduces the effectiveness of sweating in cooling the body by reducing the rate of evaporation of moisture from the skin. This effect is calculated in a heat index table, used during summer weather.

3.6 HTTP (HYPER TEXT TRANSFER PROTOCOL):

The WEB Internet (or The Web) is a massive distributed client/server information system as depicted in the following diagram.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

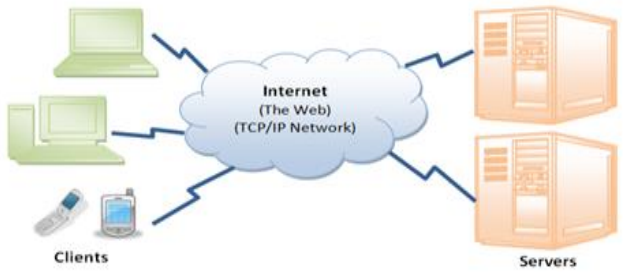

Figure-4: HTTP protocol

Many applications are running concurrently over the Web, such as web browsing/surfing, e-mail, file transfer, audio & video streaming, and so on. In order for proper communication to take place between the client and the server, these applications must agree on a specific application-level protocol such as HTTP, FTP, SMTP, POP, and etc.

IV. RESULTS:

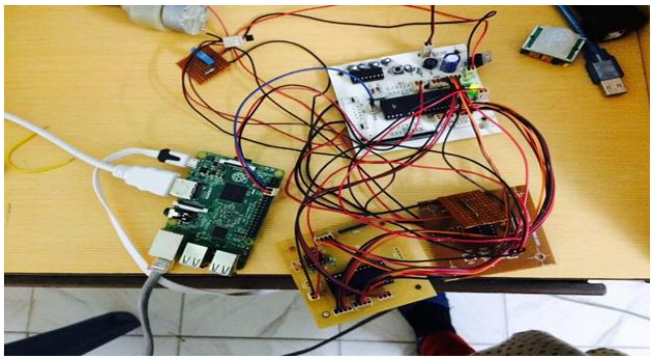

Figure-5: Hardware of the project

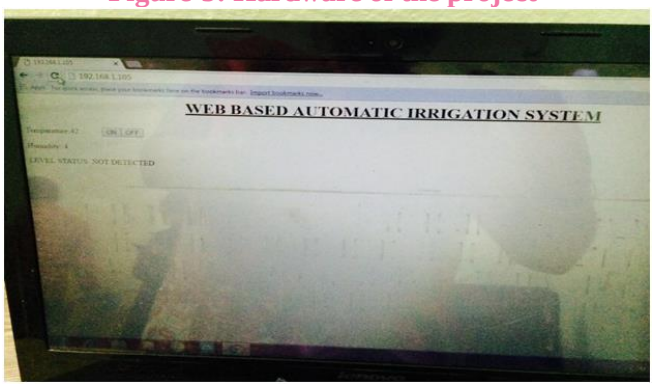

Figure-6: Output on web server

V. CONCLUSION:

The project "Web based automatic irrigation system using wireless sensor network and embedded Linux board" has been successfully designed and tested. It has been developed by integrating features of all the hardware components and software used. Presence of every module has been reasoned out and placed carefully thus contributing to the best working of the unit. Secondly, using highly advanced ARM11 board and with the help of growing technology the project has been successfully implemented.

VI. REFERENCES:

[1] Gutierrez, J.; Villa-Medina, J.F.; Nieto-Garibay, A.; Porta-Gandara, M.A., "Automated Irrigation System Using a Wireless Sensor Network and GPRS Module," Instrumentation and Measurement, IEEE Transactions on , vol.63, no.1, pp.166,176, Jan. 2014.

[2] Yunseop Kim; Evans, R.G.; Iversen, W.M., "Remote Sensing and Control of an Irrigation System Using a Distributed Wireless Sensor Network," Instrumentation and Measurement, IEEE Transactions on, vol.57, no.7, pp.1379,1387, July 2008.

[3] W. A. Jury and H. J. Vaux, "The emerging global water crisis: Managingscarcity and conflict between water users," Adv. Agronomy, vol. 95, pp. 1–76, Sep. 2007.

[4] Mirabella, O.; Brischetto, M., "A Hybrid Wired/Wireless Networking Infrastructure for Greenhouse Management," Instrumentation and Measurement, IEEE Transactions on , vol.60, no.2, pp.398,407, Feb.2011.

[5] Wark, T.; Corke, P.; Sikka, P.; Klingbeil, L.; Ying Guo; Crossman, C. Valencia, P.; Swain, D.; Bishop-Hurley, G., "Transforming Agriculture through Pervasive Wireless Sensor Networks," Pervasive Computing, IEEE , vol.6, no.2, pp.50,57, April-June 2007.

[6] Rani, M.U.; Kamalesh, S., "Web based service to monitor automatic irrigation system for the agriculture field using sensors," Advances in Electrical Engineering (ICAEE), 2014 International Conference on , vol., no., pp.1,5, 9-11 Jan. 2014.

ISSN No: 2348-4845
International Journal & Magazine of Engineering, Technology, Management and Research
A Peer Reviewed Open Access International Journal

[7] Genghuang Yang; Yuliang Liu; Li Zhao; Shigang Cui; Qingguo Meng; Chen HongDa, "Automatic irrigation system based on wireless network," Control and Automation (ICCA), 2010 8th IEEE International Conference on , vol., no., pp.2120,2125, 9-11 June 2010.

[8] Zhang Feng, "Research on water-saving irrigation automatic control system based on internet of things," Electric Information and Control Engineering (ICEICE), 2011 International Conference on, vol., no. pp.2541,2544, 15-17 April 2011.

[9] Yan Xijun; Lu Limei; Xu Lizhong, "The Application of Wireless Sensor Network in the Irrigation Area Automatic System," Networks Security, Wireless Communications and Trusted Computing, 2009. NSWCTC'09. International Conference on , vol.1, no., pp.21,24, 25-26 April 2009.