International Journal of Advance Research in Science and Engineering
Volume No.06, Issue No. 10, October 2017
www.ijarse.com
IJARSE
ISSN: 2319-8354

Crop Monitoring System using Raspberry Pi

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ABSTRACT

Today in green house people have to look at each and every crop which is planted in green house and if any changes in the environment takes place that will damage that crop this people will come to know when they will see that crop. Crop Monitoring System is a light intensity based used to control the devices and monitor the crops. Most of the time to differentiate between day and night time, measuring light from sun light is essential. Where, light measurement and analysis is an important step in ensuring efficiency and safety. Plant growth in farming is purely dependent on light intensity falling on the top of canopy. This introduces real time remote. Light intensity monitoring system using Raspberry Pi which enables the user to track the lighting system in green house remotely for improving plant growth. The main feature of this system is instantaneous light intensity monitoring and data storage in the database on the cloud for future use in any internet enabled device. This facilitates experts to take right decision at right time to obtain desired results in plant growth. All the detailed architecture of software and information will be described in this paper.

Keywords: Internet of Things, Raspberry Pi, Relay, Wi-Fi Modem, Wireless Sensor Network.

I. INTRODUCTION

A wireless sensor network is composed of spatially distributed nodes equipped with sensing device to monitor and to measure characteristics of the physical environment at different location. WSNs are designed and deployed for different purposes by various organizations. WSN based monitoring application ranges from simple data gathering, to complex Internet-based information systems. Accurate and quantifiable measurement of light is essential in creating desired outcomes in practical day to day applications as well as unique applications such as Traffic lighting system, Poultry Industry , Gardening , Museum lighting system , at emergency exists etc. Hence light measurement and analysis is an important step in ensuring efficiency and safety. Many of the industries are burdened with limited number of resources and real shortage of experts on their fields real time remote monitoring presents an effective solution that minimizes their efforts and expenditures to achieve the desired results within time.

We aim to have a real time remote light intensity monitoring system using Raspberry Pi which enables the user to track the lighting system remotely. Raspberry Pi is a low cost ARM powered Linux based computer which acts as a server, and it communicates with clients with LAN or external Wi-Fi module. The key feature of this system is light intensity being monitored instantaneously and data stored in the database for future use, and shown in the form of dynamic charts of the user according to the user requirement in a terminal device like

Tablet or Smart Phone or any internet enabled device. This empower experts to make right decisions at right time to get desired results.

COMPONENTS USED

Raspberry Pi: Raspberry Pi is a small, powerful, cheap , and education oriented computer board introduced in 2012. This credit card-sized computer with many for interfacing with many devices . The Raspberry Pi board contains a processor and graphics chip, program memory(RAM) and various interfaces and connectors for external devices. Some of these devices are essential, others are optional but all Raspberry Pi models have the same CPU named BCM2835 which is cheap, powerful , and it does not consume a lot of power. Raspberry Pi operates in the same way as a standard PC, requiring a keyword for command entry a display unit and a power supply. SD-Flash memory card normally used in digital cameras is configured in such a way to 'look like' a hard drive to Raspberry Pi's processor. The unit is powered via the micro USB connector. Internet connectivity may be via an Ethernet/LAN cable or via an USB dongle (Wi-Fi connectivity).

Relays: Relays are electromagnetic devices that use an electromagnet to operate a pair of movable contacts from an open position to a closed position. The advantage of relays is that it takes a relatively small amount of power to operate the relay coil, but the relay itself can be used to control monitors, heaters , lamps or AC circuits which themselves can draw a lot more electrical power. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts . The coil current can be on or off so relays have two switch positions and most have double throw switch contacts.

I. **Sensors:** A sensor is a device that detects and responds to some type of input from the physical environment . The specific input could be light , heat, motion , moisture, pressure, or any one of a great number of other environmental phenomena . The output is generally a signal that is converted to human-readable display at the sensor location or transmitted electronically over a network for reading or further processing.

Temperature Sensor: Measuring the heat in the environment.

Light Sensor: Controlling or switching on/off of the light.

Humidity Sensor: Measuring the amount of water vapor in the air.

II. RELATED WORK

The communication is done by the time interval. Each and every features are given particular time through time slicing. So it was reliable enough. This type of system made use of wired technology. These are various nodes connected to each other and then data is transmitted to Internet. But the nodes are connected in wired. If any node failed there would be tremendous loss. The standardization was not that. The system does not support the proper security.

System makes use of radio interference for transferring data between machine to machine. Depending on the radio channels used where according to WSN technologies used. There was the time delay in data transfer. More risk where noticed while using radio channel, one should know about the environment and WSN technology that is being used. The technology also relies on the retransmission mechanisms such as carriers repeat request

which used to the increased delay in data transfer. Therefore it requires choosing the new and improved way of WSN technologies.

System makes use of web-based application . But now a day people more believe on the fast working components and not on the computer based applications. It happens if the emergency case happened. Therefore there should be the system that controls the environmental situation directly.

1. Problem Formulations

The system is expected to determine the environmental value and then classifying first which action to be performed for controlling. The action to be performed for controlling the environment depends on the threshold value. The challenges for controlling and monitoring of environment are mentioned below:

Time Consuming: The process involves selection of the technology that will provide very small response time.

Expensive: The process of implementing the architecture should be such that it should be low in cost and setup should be easy.

Unfeasible: This reality is compounded by the fact that for each and every sensor we have to establish a threshold value and corresponding actions that has to be taken which becomes impractical.

To avoid these challenges the system implementation relies on another system for identifying the threshold value, the technologies used for transferring the data and controlling action that has to be performed. However, there is another cost effective way to identify the threshold value and to develop automatic controlling mechanism which is called an indirect study of the environmental controlling and monitoring mechanism that will be already available in the database.

III. PROPOSED SYSTEM

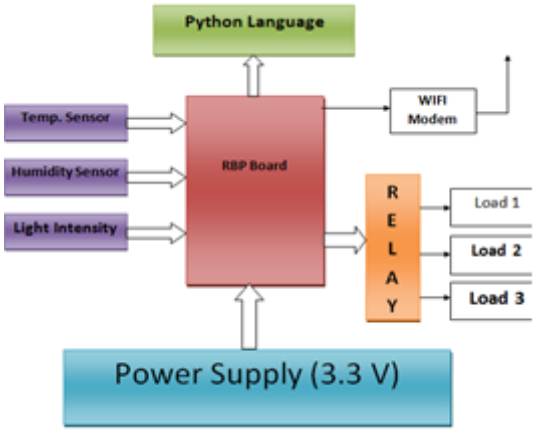

Figure 1: Block diagram of proposed system

This is the basic block diagram of the system. The components that are used are : Sensors, RBP board, Relay circuit, Wi-Fi Modem , Power supply, and user machine. The programming language used is Python. The lists of potential sensors used are Temperature sensor, Light sensor, Humidity sensor. These are the digital sensors working is divided in two cases as follows:

Case I: MONITORING

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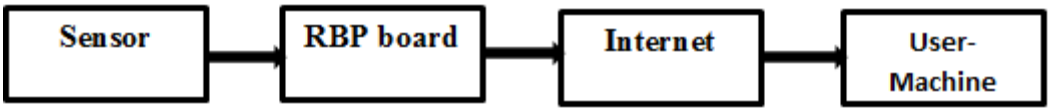

Figure 2: Block diagram for Monitoring

In this case sensors will first sense the parameters of the crop the sensed value is send to the RBP board which will send this data over internet through wireless connection User will be able to see the results on his/her phone or desktop/laptop through the user will be able to monitor the greenhouse easily.

The Flow is shown below:

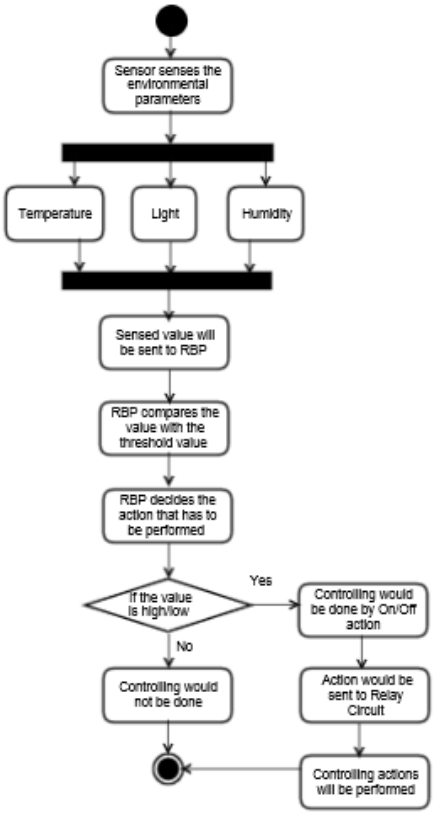

Figure : Flowchart of system for controlling

In this phase temperature, light and humidity will be controlled so as to maintain the greenhouse environment. The sensors will transmit the sensed value to RBP. RBP will compare those digital values with the set threshold value. If the value goes high/low the RBP will display the alert message. RBP will take the decision which action to be taken, this actions will be sent to the relay circuit. Relay circuit perform actions like ON/OFF e.g. suppose the temperature goes high then FAN will be switched on, and if the humidity goes low then sprinkling of water will be done. Here the controlling action is performed by relay circuit so it will provide advantageous to the system as no human source is required for controlling.

2. Advantages of our proposed solution

Response Cost: As we are using the wireless technology and low power consumption components, thus reduces the cost of the system.

Response Time: We are making use of relay circuit which helps in automatic controlling. Therefore the controlling becomes easier and it reduces response time.

Transmission of data over Internet: As we are using Wi-Fi modem which will be used for transmission of data over Internet.

IV. FUTURE SCOPE

Webcam: The idea of a webcam in the greenhouse was there from the beginning, but because of budget constraints it was moved into the "future ideas" category at a very early point. It is something that, while not necessary to any control over the functionality of the greenhouse, could prove to be a valuable addition since a person can get a visual idea of what might be happening.

SMS/Messages: It can be further extended that if threshold values get crossed that data would be immediately sent to the admin of the greenhouse so as to take an effective action to come out from the bigger risk.

GSM/Mobile: In future we can even control the system through the mobile. This would be advantageous as the person is anyone be would be able to monitor and control the system through mobile. Android app can be developed for the same.

CCTTV: CCTV can be placed in the greenhouse which will capture the movement in the greenhouse so if anything wrong is going in greenhouse then admin will come to know.

Cyber Attacks: System code can be further developed to protect the system from cyber attacks.

V. CONCLUSION

"Embedded Web Server" is new technology which can be used for monitoring and controlling parameters. This technology facilitates the monitoring and controlling of parameters remotely with the help of Raspberry Pi and webpage. This system is inexpensive, scalable, and highly efficient and it also provides fast response. As it uses a low powered Raspberry Pi board and efficient low powered sensors, it helps to atomize the industry in less cost and less energy which decreases overall cost of the atomization.

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