International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 04 | Apr -2017 www.irjet.net p-ISSN: 2395-0072

REAL TIME MONITORING IN AGRICULTURAL WAREHOUSE USING IOT

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Abstract - *Nowadays farmers are facing huge losses due to some storage requirements which are not being fulfilled and due to lack of access to affordable refrigeration systems. Hence we have come up with a project where in all the crops are being monitored in real time with the help of sensors. Basically this project uses raspberry pi which acts as a microcontroller as well as server and sensors like temperature, moisture, smoke and a light sensor. All these sensors can be easily controlled with the mobile through a web application developed using python.This project help us to monitor in real time and allows the user to control the changes if required.*

***Key Words*: Real-time monitor, Warehouse, Web-app, IOT, Flask module.**

1. INTRODUCTION

In these days, most of the work is automated with the help of computer and laptop with latest technologies. Efficient monitoring of temperature, humidity, and other conditions without being present physically at the location helps us to get a better outcome. Here our main purpose is to observe, control and monitor the warehouse atmosphere, thus making the user to manage the data in real time. Warehouses or storage areas with the small scale units are very close to each other are the leaf nodes of network. They are responsible to collect information about light, temperature and other environmental factors to prevent the food from decaying and getting rotten. Here the central node which is a web application is responsible for passing information to management mode using laptop or mobile phone.

1.1 System Architecture

Fig shows the block diagram of smart agriculture monitoring system.Web-app module is used to keep information about the changes in the climate.

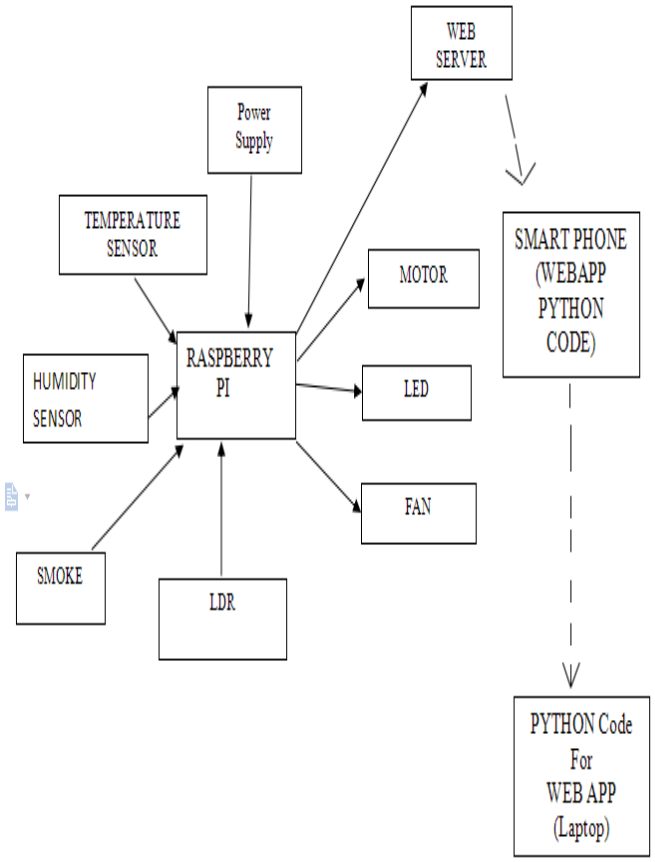


Fig.1

A. Hardware's required

a) Raspberry pi

b) LM35 temperature sensor

c) Humidity Sensor

d) Smoke Sensor

e) Light Dependent Resistor

f) Motor

g) LED

h) FAN

i) Relay board

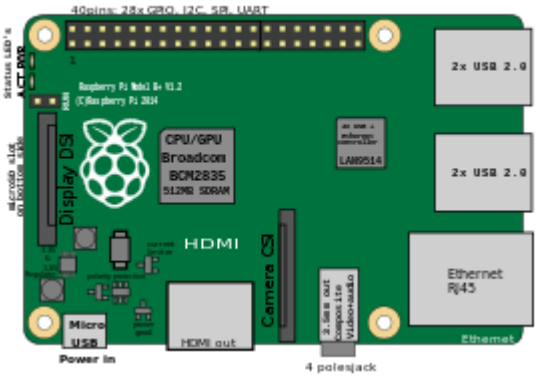


fig.2: Raspberry Pi

Raspberry Pi is basically a device designed which acts as a microcontroller as well as a server.Eben Upton who was a creator had a goal to create a low-cost device which would be easily understandable and affordable at pre-university level. As the price was affordable and due to its small size it became easy for tinkerers, makers and other electronic enthusiasts to adopt it for the projects which require more than a basic microcontroller (such as Arduino devices).Raspberry Pi may be slower than a modern laptop or desktop but is still a complete linux computer and provides all the expected abilities, at a low-power consumption level. It is an open hardware with an exception of Broadcomm SoC(System on chip), which runs most of the components of CPU board, graphics, USB controller etc. Most of the projects made with raspberry pi are open and well documented.

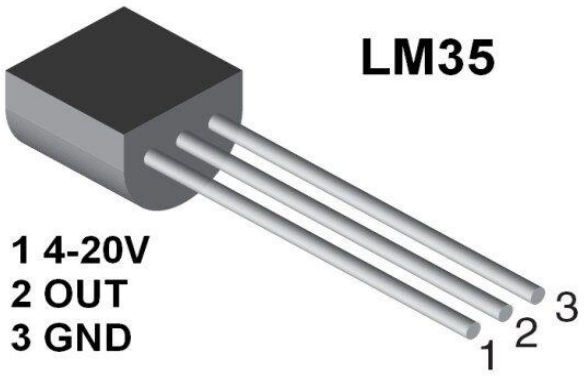


fig.3:LM35

LM35 is an IC temperature sensor with its output proportional to the temperature. Here the sensor circuit is sealed and is not subjected to oxidation or any other process. Here temperature is measured more efficiently when compared with a thermistor. Even after having its low self-heating it does not cause more than 0.1Oc temperature rise in air. Range of the temperature is between -55°C to 150°C.Here the output voltage varies by 10mV in response to every degree Celsius rise/fall in ambient temperature i.e. its scale factor is 0.01V/oC.

fig.4: HUMIDITY SENSOR

Humidity Sensor also known as hygrometer senses and reports both moisture and air temperature. Relative humidity is the ratio of moisture in air to the highest amount of moisture at a particular air temperature and also is one of the important factors.

Relay:

Relays are basically switches which operate both mechanically and electrically with an electromagnet. It works when there is a low-power signal and this information is useful in order to control the circuit. It is used, where a single signal controls number of circuits. They are also used to switch the incoming signals from one source to different destinations. They can also be used to perform Boolean and other logical operations in a computer.

The MQ-2

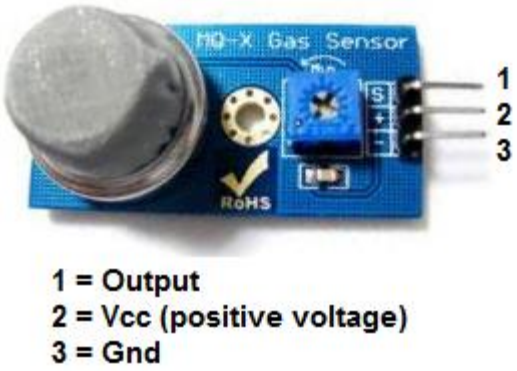


Fig.5: SMOKE SENSOR

Smoke sensors are used to detect smoke based on the voltage levels.More smoke indicates greater voltage. This sensor has a built-in potentiometer to adjust sensitivity to smoke. Based on the adjustments with the potentiometer, one can change how sensitive it is to smoke. Hence it's a form of calibrating it to adjust how much voltage it will put out in relation to the smoke it is exposed to.By wiring the MQ-2 to a raspberry pi it can read the amount of voltage output by the sensor and output to us if any smoke has been detected if the value is above threshold. Hence we can know that smoke is being detected.As we know Raspberry Pi cannot process analog signals by itself we need an analog-to-digital converter to convert the analog signals to digital signals, so that raspberry pi can manage it.Hence we need an ADC chip and the one used is MCP3002.With the help of this the Raspberry Pi can interpret analog signals.

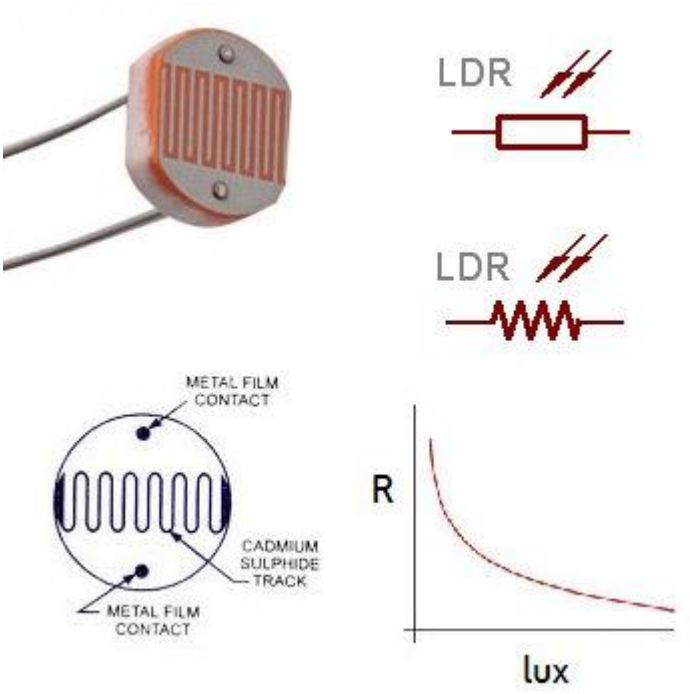


fig.6: Light Dependent Resistor

Basic principle of an LDR is photo conductivity. It is an optical phenomenon in which the materials conductivity is increased when light is absorbed by the material. When photons fall on the device, electrons are excited present in valence band to conduction band. All these photons should have energy greater than band gap of a semiconductor material in order to make the electrons jump from the VB to CB.Hence when the light with enough energy strikes on the device; more and more electrons are excited to CB which results in large number of charge carriers. Result is more current starts to flow through the device when circuit is closed and we can conclude that the resistance of the device has been decreased.

B. Software Description

Software part includes an operating system called NOOBS(New Out of the Box Software) which contains Raspbian.Raspbian is pre-installed with the software for programming and other purposes. It is basically having python , Scratch , Sonic Pi , Java etc.Also it acts as an easy installer.

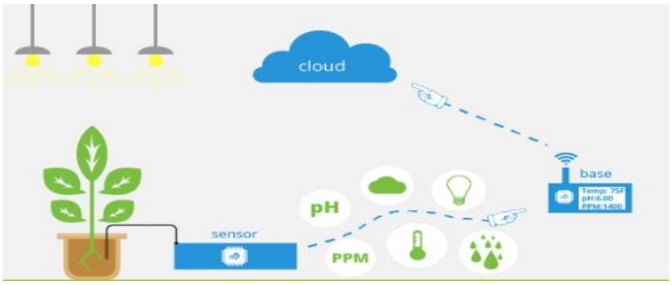
Here python basically is an intrerpreted, interactive ,object-oriented and high level programming language with multiple features. It is being used as a blackened code for entire project. Logic of this project is designed in python .Flask is a python web framework built with a small core and is easy to extend . It is used to transfer the environmental conditions in warehouse to the WebApp in real time.It eliminates need of database's.

Front End for our project includes HTML,JavaScript and CSS through which web page UI is being developed .Web application's and web pages are created using Hypertext Mark-Up Language(HTML).With CSS one can design animate the web pages or application. JavaScript is basically used to control client side web pages on browser and even mobile applications.

Web service:

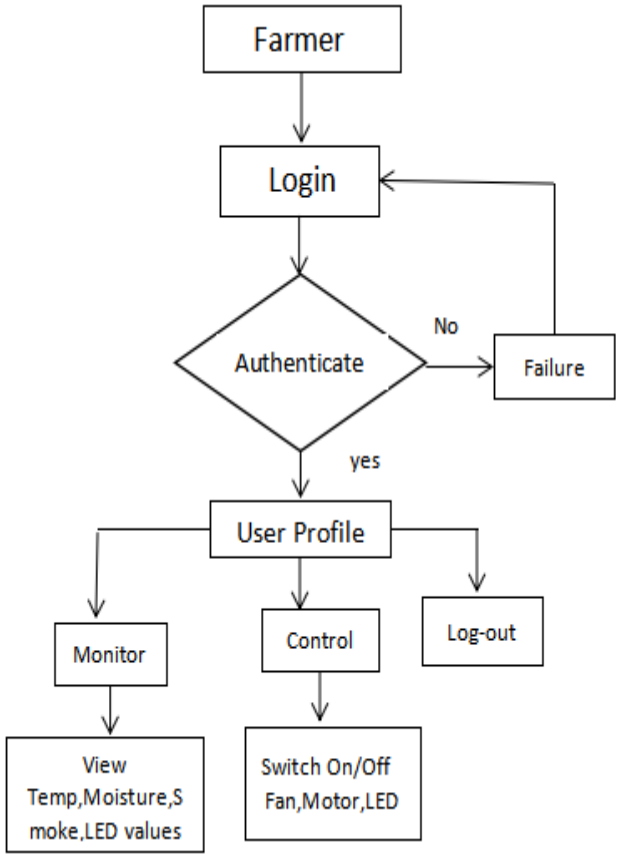
A Web service is a method of communication between two electronic devices over a network. It is a software function provided at a network address over the Web with the service always on as in the concept of utility computing. The user or farmer will be given an web URL through which one can access the dashboard of this project. One can use the service either in a cell phone or a laptop and computer.

1.2 **WORKING**



Most of the systems have different designs based on its functionalities. In this project the design includes a single microcontroller, temperature sensor, humidity sensor, smoke sensor, LDR, internet and a cell phone or laptop. Apart from the server entire unit is placed within warehouse or cold storage.

Microcontroller located at the center of the block diagram is the control unit for each node. Program is being embedded within a microcontroller which helps to take action based on inputs provided by output of the sensors. Temperature and humidity sensors checks if there is any change in temperature and humidity within the warehouse or cold storage facility and smoke sensor is used to detect and poisonous gases. Few products need specific lighting facility in order to maintain their quality; hence LDR sensors are placed at such locations. It generates an output voltage with change in their surrounding environment. These output voltages are fed to pins of ADC unit of microcontroller. This microcontroller processes the incoming voltages from the sensor depending on the program embedded within it.Output is passed to web app where the user is able to view and control settings. A web application is being created which receives all data from hardware and is being displayed. Here we have a login system for the manager wherein he can view and monitor the environmental conditions of warehouse as shown in flow chart below.



WEB APP FLOW CHART

2. FUTURE SCOPE

This project has enormous potential and can be used in various other ways, due to its cheap and cost efficient design.

Precision Agriculture Storage- Level of accuracy of a weather forecast affects the crop productivity to a great extent. Future iteration can be made in order to collect data at the base station and incorporate remote stations to directly control irrigation systems. Web services for alerting and analytics can be added, in addition to a monitoring user interface. Also we can use a web camera to capture live crop images over Wi-Fi.

3. CONCLUSIONS

This project shows the significance of using wireless device net in correctness undeveloped arena.

Also this project sheds the light on the cultivation in India and it shows how the automation of cultivation using wireless device network helps us to resolve a lot of Indian agrarian trouble and recuperate the harvest.

An instance of the greatest significant harvests is designated, which is the vegetable harvest, to training the practice of wireless device system for exactness undeveloped in India.

ACKNOWLEDGEMENT

We would like to thank ISE dept from Dr.AIT as well as our project guide Assistant Professor Pushpalatha S (ISE) from Dr.AIT who has given an opportunity and complete support for the success of the project.

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BIOGRAPHIES

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