Polyhouse Technique using RaspberryPi Implemented in IOT

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Abstract— *The main aim of this project is to monitor the crops by monitoring the temperature, humidity, moisture values from the crop and also monitor the diseases using camera and send and receive signals using the IOT and microcontroller. Temperature sensor measures the temperature and the anolog signal is obtained. The humidity and the moisture sensor values are also obtained. The disease monitoring is done using the controller itself by image processing technique. The polyhousing automation is done using the controller- RaspberryPi 3B model. The status of the entire operation can be known by the IOT.*

1. Introduction

Embedded Ethernet is used for the supervision and moderation of the physical parameters in any domain such as industrial, commercial, home, agricultural etc. We can see there are various problems in monitoring the parameters in the irrigational plant such as moisture of the soil, temperature of the soil. Now a day's various problems are rising in polyhouse superintendence. We required lots of man power for maintenance of polyhouse.

2. Applications

We can use Embedded Ethernet for home automation based applications for controlling the various components such as lights, fans, ACs, etc. To deal with these daily and toil full problems, we decided to launch this project which will satisfy the above discussed problems. By using such type of system we can control and monitor the parameter through your mobile phones or by your personal computers.

3. LITERATURE SURVEY

A. Literature Survey 1

In this section various image processing techniques are discussed along with the obtaining of various parameters that are key points to the experiment. Sir Anup Vibhute of SK Bodhe says in his Applications of Image Processing in Agriculture that the process is being used in more fields as it is very easy to obtain accurate results and the added communication of data obtained as advanced the process more effectively as the feedback is obtained so easily and the monitoring system is well under survilance.

B. Literature Survey 2

Sir G.Jones, C.Gee, F.Truchetet -Modeling agronomic images for weed detection and comparison of crop/weed discrimination algorithm performance says that the comparison of algorithms for the better results. In this the two algorithms were tested for better results by conducting the experiment with the sample given. The relative real time picture which is given as a sample was subjected to the algorithms and tested effectively where the pixel classification was the key parameter.

C.Literature Survey 3

Sir HosseinNejati, ZohrehAzimifar, Mohsen Zamani-Using Fast Fourier Transform for weed detection in corn fields can be done effectively where the robots are given camera and the algorithm is given in such a way that the robots identify the difference between the crops and the weeds and remove the weeds and thereby providing additional yield and truncating false yields. This method is far more useful and thereby 92% accuracy is obtained from the identification of weed plants and hence helps in large scale crop cultivation.

4. Components

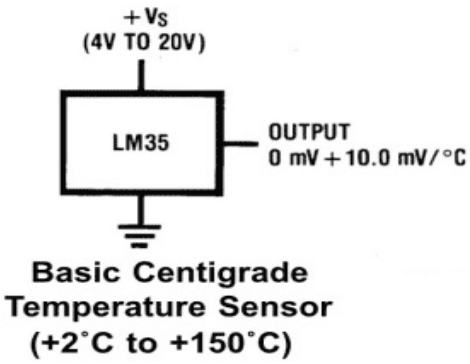
- Raspberry Pi – 3B model
- Temperature Sensor
- Moisture Sensor
- Humidity Sensor
- Relay Drive
- Power Supply
- Camera

A. Raspberry Pi

- The Raspberry Pi- 3B model is the main processor. The memory can be expanded using external memory card.
- It provides 4 USB ports and has inbuilt wifi.

B. Temperature Sensor

Temperature is a environmental quantity. The temperatature can be calculated directly from a heating source or from the heat radiating from a source. Thermocouples, Thermistors, Resistance Temperature Detectors(RTS's) are mostly used in calculating the temperature of the heating source.



C. Moisture Sensor

The moisture sensor is widely used to measure the moisture content in the soil. The soil moisture sensor is dipped in the soil in which in the threshold value is already set. Depending on the moisture level the sensor shows output either HIGH/LOW if the plant needs human help to sprinkle water to get the value back to the threshold value.

Features :

Digital output, easy to adjust.
Nickel plating to avoid corrosion.
Working voltage: 3.3V-5V.
On-board LM393 chip.
Dimension of the board: 3.2cm * 1.4cm.

The soil moisture sensor values are recorded in series and the threshold value is the key parameter to be set preset.

D. Humidity Sensor

The humidity sensor measures both humidity and the air temperature. The humidity sensor works by sensing the minute temperature changes in the atmosphere. There are different kinds of humidity sensors are resistive, capacitive and thermal. All three sensors works in different ways to find the humidity of the atmosphere.

E.Relay Drive

Relay drive is used in motor control. Whenever the value of the water level goes below that of the threshold value predetermined by the farmer, The driver circuit turns on the motor and in this way the plants are always kept moisturized and the threshold value is maintained always

F. Power Supply

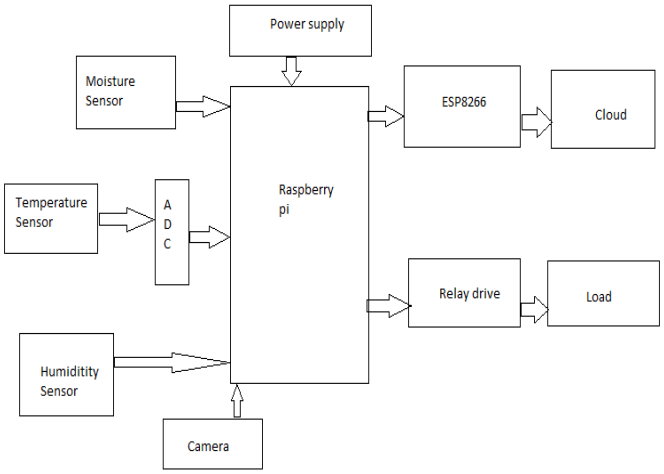
All electronic components require power supply. The power from the line which is 230v is converted into 12v and 5v as the components only require less voltage. The components like Raspberry Pi, Relay drive and motor runs in 12v supply.

The supply that is used should be Uninterrupted power supply(UPS), Reliable and should be with the better power quality. The supply should be able to draw limited current from the source, better power factor, only withdrawal of required voltage, current and frequency from the source. The power supply should also be able to shut down the entire process incase of emergency and store energy so that the operation is a continuous and an uninterrupted process.

G. Camera

The camera is used to capture images in the entire polyhouse and the status is updated to the farmer. The picture of the plants are taken and given as the input to the image processing technique. The picture taken is usually RBG(Red, Blue, Green).The image processing is done using the pixel verification.

5. BLOCK DIAGRAM



6. DESIGN

A. Hardware

The hardware of the system consists of two parts: Raspberry pi 3B model and relay driver.The Raspberry Pi Foundation designed this little board, the Raspberry Pi, to address a last generation of computer programmers and hardware engineers. So, this little board here is low cost, it's easily accessible, it's very simple to use.

B. Why Raspberry Pi 3B

Board	Raspberry Pi 2 Model B	Raspberry Pi 3 Model B
Processor	Broadcom BCM2836	Broadcom BCM2837
CPU Core	Quadcore ARM Cortex-A7, 32Bit	Quadcore ARM Cortex-A53, 64Bit
Clock Speed	900 MHz	1.2GHz (Roughly 50% faster than Pi2)
RAM	1 GB	1 GB
GPU	250 MHz VideoCore IV®	400 MHzVideoCore IV®
Network Connectivity	1 x 10 / 100 Ethernet (RJ45 Port)	1 x 10 / 100 Ethernet (RJ45 Port)
Wireless Connectivity	None	802.11n wireless LAN (Wi-Fi) and Bluetooth 4.1
USB Ports	4 x USB 2.0	4 x USB 2.0
GPIOs	2 x 20 Pin Header	2 x 20 Pin Header
Camera Interface	15-pin MIPI	15-pin MIPI
Display Interface	DSI 15 Pin / HDMI Out / Composite RCA	DSI 15 Pin / HDMI Out / Composite RCA
Power Supply (Current Capacity)	1.8 A	2.5 A

C. Camera Interface

The camera interface block in the block diagram is used to interface the camera and the image processing algorithm is given this input and the process is done. The constant monitoring is done using the camera interface block in the block diagram and senses and transmits if in case any image is being sent.

D. Display Interface

The display of the entire data is a stream of output data obtained in the smart phone of farmer using cloud. This process is called the IOT. The output is continuously monitored and the data is transmitted effectively and the displayed output is monitored.

E. Micro SD card

Micro SD card is used in this project as the raspberry pi contains the SD card port. In this the Rasbian OS is installed and the entire process is done. The Micro SD card can be a 8GB or a 16GB memory card.

F. Networking

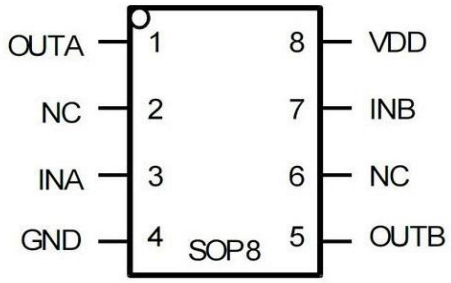
The entire process needs Wifi as the communication is one of the key factor. The Ethernet cable is used or the inbuilt wifi in the raspberry pi is used for networking. This enables the transmission and reception of stream of data from the poly house to the farmer and the command signals from the farmer to the site to carry out the instructions given.

G. Real time clock

The raspberry pi does not have a real time clock. Therefore It is unable to keep track of the time of the day when it turned off. Therefore the entire system connected to the wifi enables it to keep lead with the real time or the connection of I2C helps in the hardware system to keep track off the time.

H. Relay Driver

The pin diagram of the relay driver.



The total of 8 pin arrangement is done in the relay drive. The relay driver circuit is used to turn on the motor. Whenever the value of the water level goes below the threshold level, the relay driver circuit is turned on the motor is turned on. This is done as the relay driver circuit is always connected to the supply of 230v 5A.

The relay properties are useful in case of driving the motor when time required:

High side toggle switch driver
Low side toggle switch driver
Bipolar NPN transistor driver
N-Channel Mosfet driver

7. SOFTWARE

A. Operating System

The operating system used in the project is Raspbian OS. The OS is installed before the process is started. The OS is stored in the memory card drive that is inserted into the Raspberry pi. The Raspbian OS is installed by the linux commands and

The following are the instruction of to install Raspbian OS

1. Download the zip file
2. Unzip the file
3. The SD card is inserted in the card writer and the installation set up is begun.
4. Write option finished the entire procedure of installation is 5-10 minutes.
6. Now the power cable is connected and the process is begun.

8.PROCESS

The process of monitoring and controlling the polyhouse is listed below

1. The code written is Python language is dumped into the Raspberry Pi.

2. The command PYTHON_FILE_NAME is given and the run command runs the program.

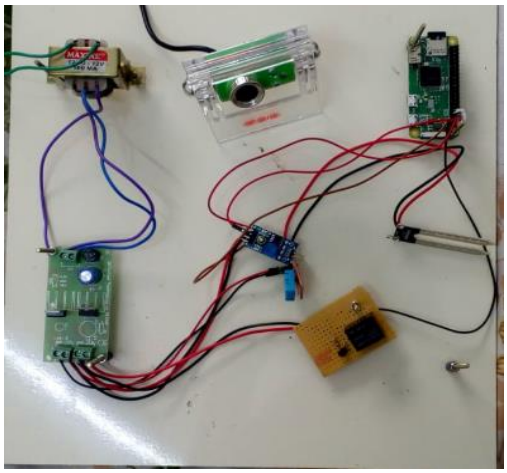
3. The series of output is obtained at the cloud which enables the farmer to monitor it contimously.

4. The temperature, Humidity, Moisture, Plant pixel level and the disease level is obtained.

5. If the water level goes below the threshold value, The relay drive goes HIGH indicating the motor to be turned on.

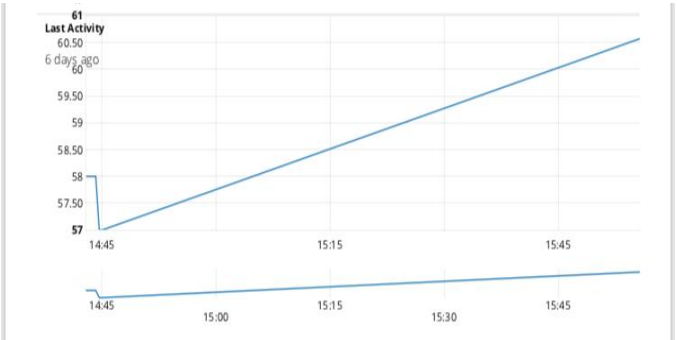
6. The camera captures the plant image and feeds it to the image processing technique and the algorithm checks for the disease in plants by comparing the density of the pixels and the output status of the plant level health is obtained a nd send to the farmer.

9. PROJECT HARDWARE



10. OUTPUT

Temperature sensor output



Humidity sensor output

11. CONCLUSION

The required output is obtained using the mentioned components. The Raspberry pi 3B model is used to monitor and control the entire polyhouse. The output is sent to the farmer continuously and controlled round the clock. This technique has indeed reduced the efforts of man power when it comes to closed environment farming.

12. REFERENCES

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