The complete block diagram is shown in figure 4. The system includes hardware that consists of raspberry-pi 2, SD memory card, Web camera, GSM module, DC motors, sensors, LCD, and ADC. The whole system works on 5v dc regulated power supply. The MCP3208ADC interface to rasp-pi with SPI protocol, the three sensors like temperature sensor, humidity sensor, and soil moisture sensor connected to ADC, these sensor data send to rasp-pi via ADC. The temperature sensor provides temperature per degree Celsius to rasp-pi. SD card for installing a raspberry pi operating system. We are using two dc motors one for water motor and another for pesticide motor. If soil moisture is below the threshold value then the water motor is automatically ON. If temperature and humidity increase mean any disease development environment created then the owner can make the pesticide motor ON or OFF manually. GSM module interfaces to rasp-pi using UART protocol. The Whole data monitor is on the web page.

Plant disease detection using the OpenCV, web camera would take in an image input of a plant leaf. This application would detect possible symptoms of the disease like black/yellow/white spots from the leaf. Each characteristic of disease such as the color of the spots represents different diseases.

5. Flow Chart

a. Irrigation system flow chart

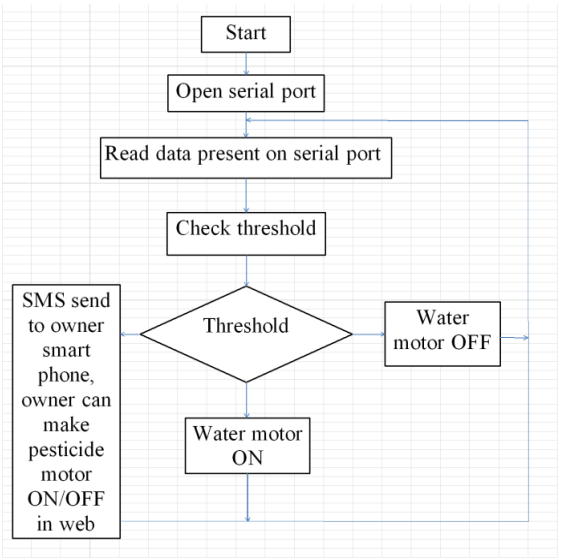

Fig.5. Irrigation system workflow chart.

The flow chart of sensor work as shown above fig5, in this soil moisture, humidity, and temperature sensors are the interface to raspberry pi via MPC3208 analog to digital converter. The soil moisture sensor measures the content of moisture in the soil. If soil moisture reaches a low threshold value then water motor OFF, if less than the threshold value then water motor ON. If a temperature and humidity value reach a bow threshold value then SMS send to the owner smartphone, the owner can make the pesticide motor ON/OFF on this smartphone or on web page. The process is continuously going on.

a. Plant disease detection system flow chart

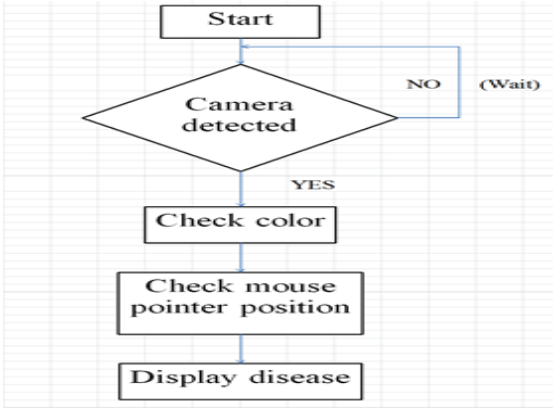

Fig.6. Plant disease detection workflow chart

The plant disease detection workflow chart is shown in fig6. In this web camera interface to the raspberry pi, if it detects it will check the color of a plant leaf. If it is not detected then wait a few minutes, once the camera is detected then check mouse pointer position on that color of a plant leaf. After it is displayed disease type on the window.

6. Result And Analysis

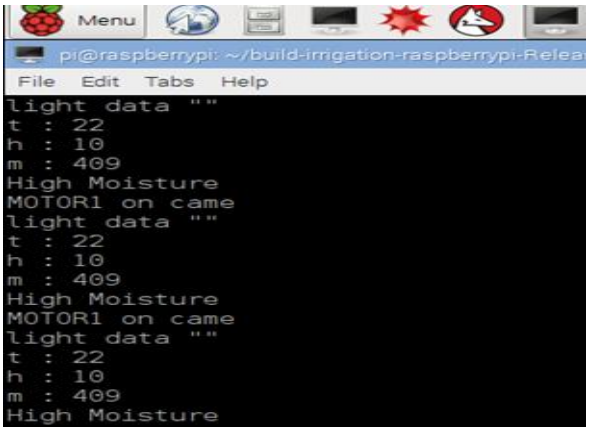

Fig.7. Received sensor data on window

The sensor data like so,il moisture, temperature and humidity values are display on LCD window as shown in fig 7.

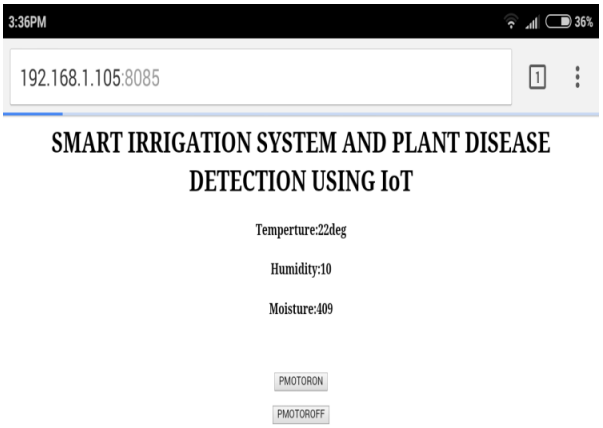

Fig.8. Sensor data display on HTML web page

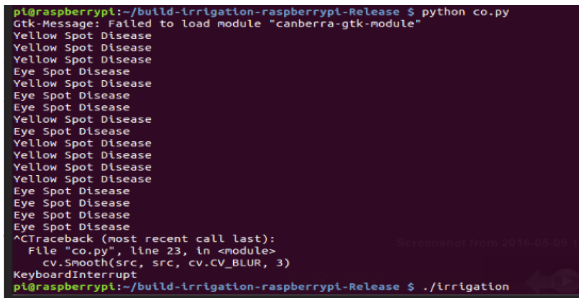

Fig.9. Sugar cane leaf diseases detection data display on window

A. Segmentation

In this stage, the concept of the intensity difference between leaf detected areas is used to segment leaf from the background. As shown below:

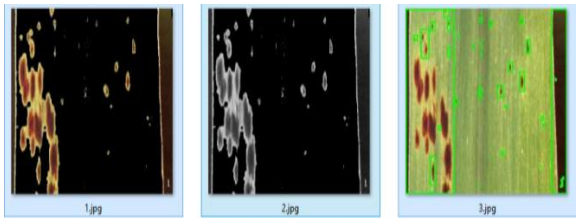

Fig.10. Sugar cane Eyespot disease

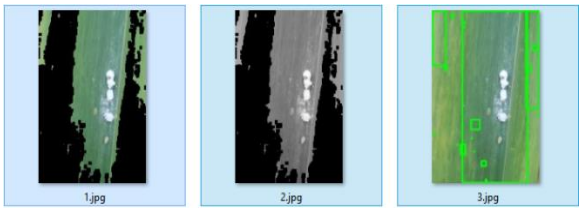

Fig.11. Sugar cane white flyleaf disease

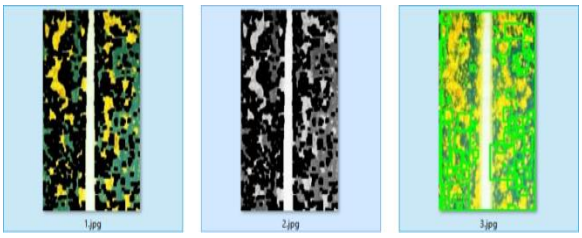

Fig.12. Sugar cane mosaic leaf disease

Fig 10, 11, 12 these all segmented images of sugarcane leaf based on that we are detecting sugarcane diseases.

Fig.13. System hardware setup

7. Conclusion

This paper designs the automated irrigation system using IoT and sugar cane plant disease detection using OpenCV. In this ,we have used raspberry Pi as an embedded Linux board which allows collecting the sensor information from the sensor node continuously and providing the web interface to the user. The system is watering to the crop uniform by analyzing the soil parameters; it will help to reduce the freshwater consumption. By providing the web interface and automation users can easily monitor the system and it will minimize human intervention. It also provides measures environmental parameters like temperature and humidity based on that owner can make pesticide motor ON/OFF. And

Identification of sugar plant diseases is the key to preventing the losses in the agriculture product.

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