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Scrutinize the Humidity and Syndrome of Flora in Agriculture Field and Report with ATR

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Abstract - *Agriculture has become the world's most important industry and it is the backbone of Indian Economy. Climate change and agriculture are interrelated processes, both of which take place on a global scale. Global warming affects agriculture in a number of ways, including through changes in average temperatures, rainfall and climate extremes. These variations in temperature will affect the crops in the field. Due to this, the farmers are in the need to know the information about the temperature. To provide them the necessary information, the temperature sensor is used to analyze the current temperature in that specific area. The soil moisture sensor is also used to analyze the moisture content in the soil. The information about the soil condition is also given to the farmers that help them to choose the crops which suit that climatic condition. In addition to this, we are monitoring the plant disease with the help of image processing technology. In this we are going to compare the infected leaf with the healthy leaf, which in turn the details about that affected plant is also given to the farmers. This information is given to the farmers through the voice calls that refer to automatic telecommunication report.*

Key Words: ATR, weather, image processing, voice call.

1. INTRODUCTION

Agricultural is the main stay of India's economy. The agriculture sector also provides livelihood to two-thirds of the population. Due to increase in population and urbanization, the agricultural practice is decreasing. In the present situation, the agricultural practices are not yielding the good outcome in favor of farmers.

The demands are increasing a lot because the agricultural practice needs water, tools and machinery. Other than these, the agriculture practice mostly depends on climatic conditions like temperature, humidity, wind speed and so on. The weather condition is changing day by day which in turn affects the farmers to do the practice. The solution to this would be to develop a low-cost weather monitoring system which would provide the farmers with weather parameters.

The plant disease plays a vital role in crop yielding and also it is responsible for the health aspects of living creatures. The alternate to this is to monitor the plants on regular basis to analyze the disease.

Our System was initially used to measure and continuously monitor the changes in various weather parameters such as temperature and humidity without human efforts or interference to prevent the hazardous and irreparable situations caused due to improper planning and guidance for cropland in various agricultural zones. The plant diseases are monitored by using image processing technology.

The measured parameter is recorded in the voice module with the help of speaker connected to the device. The details can be provided to the farmers through a call. For this the farmers are provided with a mobile number in which the sim is paired in the GSM module. Such that when the farmer makes a call to the respective mobile number the recorded voice information is dispatched to them.

Two such implementations came up back- to-back with image processing technology and Arduino. This system does not require any internet connections to run the module. The proposed architecture is depicted in figure 1.

2. RELATED WORKS

The survey was initially done on some technologies to gain details about the sensor network and other components used. The sensors used for this project are selected after deep study. After this, the communication method which is used to convey the information is chosen. So that, the information that is to be dispatched is effective.

The existing system uses the android application [1] to give the details about weather. This existing paper proposes the design of real-time weather monitoring system based on a mobile application using Automatic Weather Station (AWS). The system connects to the AWS equipped with several sensors for collecting data and storing the data to the web server. The Android application reads the files and displays the information provided by the web server in real-time. In this system, each and every time the already recorded same

voice content is send to the farmer. Due to the penetration of internet into India, they used the internet connection for developing their precision agriculture system.

The weather monitoring system uses the Internet of Things (IoT) concept and they are comparing the obtained meteorological data with the commercial Davis Vantage Pro2 which is installed at their farm. The manual and laboratory method of plant disease detection is more complicated so, we go for image processing technology using Raspberry Pi.

3. PROPOSED SYSTEM

Various hardware components are used for the design of this system. Arduino UNO, GSM Module, Raspberry Pi and various types of sensors are used for measuring the parameters. The block diagram of disease detection is shown in figure 2.

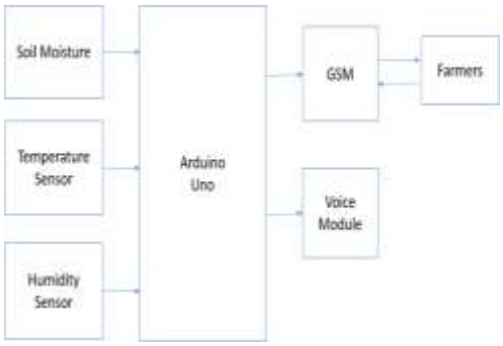

Fig- 1: Implementation Diagram

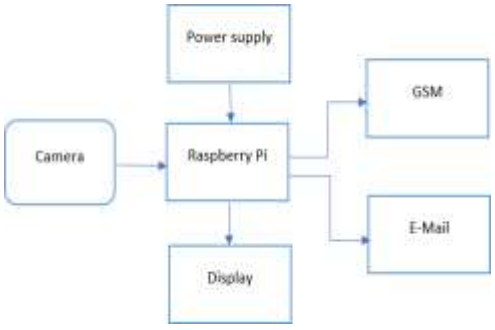

Fig- 2: Architecture of Image processing

4. HARDWARE COMPONENTS

4.1 Arduino

Arduino is an open source tool for making programs that can do a way more functioning as compared to desktop computer. The physical world can be sensed and controlled using sensors which are programmed using Arduino programming. This open-source physical computing platform is based on a simple micro-controller board, and a development environment for implementing software on the board. The pin diagram of Arduino is shown in figure 3.

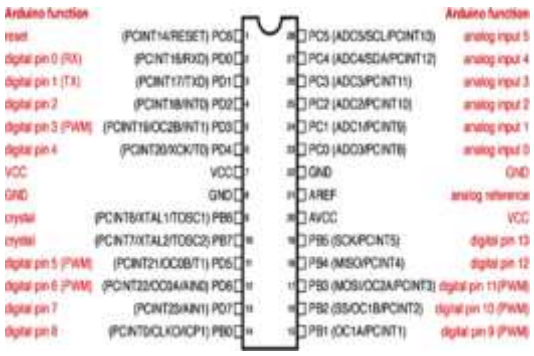

Fig- 3: Pin Diagram of Arduino UNO

4.2 Voice Module

Voice Record Module is based on ISD1820, which a multiple-message record/playback device. It can offer true single- chip voice recording, no-volatile storage, and playback capability for 8 to 30 seconds. The monitored parameters are stored in the voice module as shown in figure 4. Its working voltage is 3.3v.

4.3 GSM Module

GSM is a digital cellular technology used for transmitting mobile voice and data services.

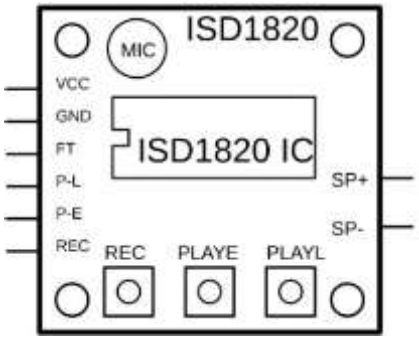

Fig- 4: Voice Module

The communication method used is the GSM module as shown in figure 5. The sim is inserted in the GSM module that wants to be paired for further processing. When it is paired then we can send SMS to the destination.

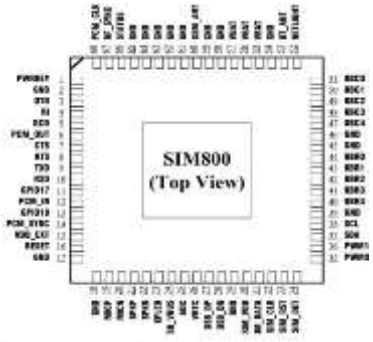

Fig- 5: GSM Module

4.4 DHT11

The system consists of DHT11 sensor which is shown in figure 6, which is a temperature and humidity sensor. This sensor will measure the primary environmental factors temperature and humidity. All the measurements made by this sensor will be in the form of analog signals. The analog signals will be converted to digital data by the microcontroller.

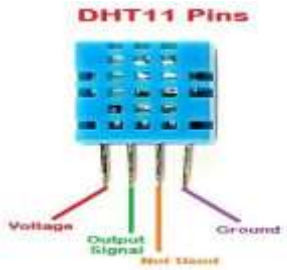

Fig- 6: DHT11

4.5 Soil Moisture Sensor

The system consists of soil moisture sensor which is shown in figure 7, gives the necessary information related to the water content present in the soil.

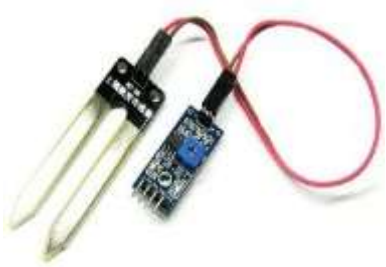

Fig- 7: Soil Moisture Sensor

4.6 Raspberry Pi

The Raspberry Pi is a low cost, credit- card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables people of all ages to explore computing, and to learn how to program in languages like Scratch and Python. The pin diagram of Raspberry Pi is shown in figure 8.

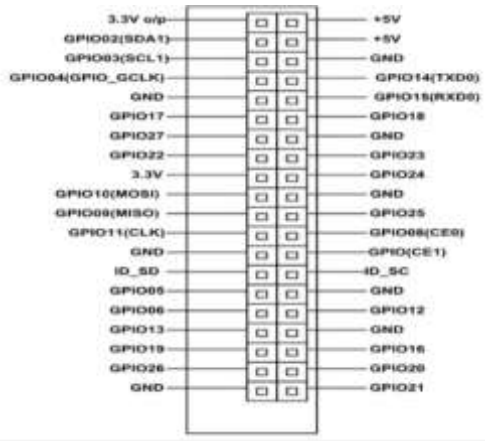

Fig- 8: Pin Diagram of Raspberry PI

5. SOFTWARE SPECIFICATION

5.1 Flow Diagram

The flow diagram of Image processing is as follow which describes the execution of analyzes of plant diseases.

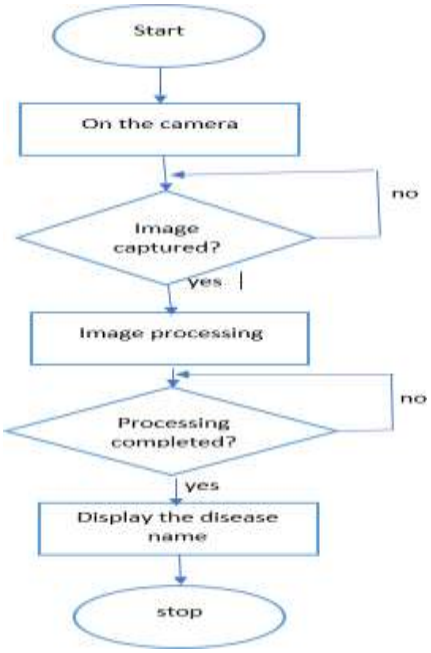

Fig- 9: Flow Diagram of Image processing

5.2 Steps to Implement

1. The image is captured in RGB format.
2. The color transformation structure is generated.
3. The color values from RGB to the space specified in that structure is converted.
4. For image segmentation the K means clustering is applied.
5. The masked cells present inside the edges of the infected cluster is eliminated.
6. The conversion of the infected cluster from RGB to HIS is done.
7. Then the SGDM matrix for H and S is generated.
8. In order to calculate the features of it, the GLCM function is called.
9. Computation of texture statics is done.
10. Finally, k-nn (classifier) is configured for recognition.

The above steps are carried out for each and every image that are captured by camera. After performing these steps, the result is transferred to the GSM module and with the help of Raspberry Pi, e- mail is sent to the farmers which is also displayed on the monitor. The technologies used includes OpenCV, python and Tomcat server.

Then, the microcontroller is programmed by using Arduino IDE and hence a program to operate and execute the process associated with the proposed system is written. Arduino programming has been used to construct the program for the proposed design. In the proposed system, the implementation of software plays a vital role while retrieving the sensor data and updating it to the voice module.

The various weather parameters are measured using the sensor. These sensor reports consist of adequate measures and solutions for the growth of the crops. After the farmer places this instrument in his selected area, within one call the information will be dispatched to them. The dispatched information will include: temperature, humidity, soil condition and most importantly, the suggestion of which crop has to be grown and the details about diseases.

6. OUTPUT

The expected output of weather monitoring is obtained from the following hardware connection image:

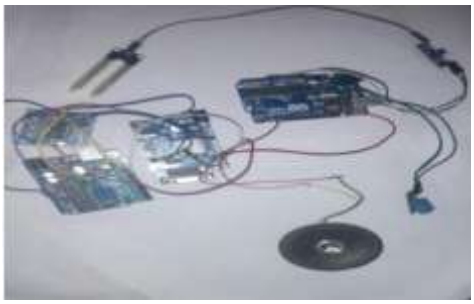

Fig- 10: Hardware Connection

The output of disease analyze is shown below:

Fig- 11: Captured image

Fig- 12: Segmented image

Fig- 13: Grayscale image

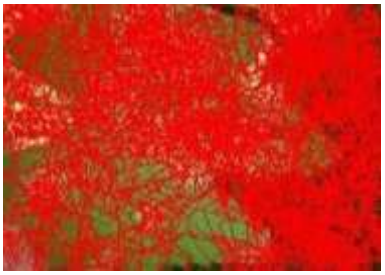

Fig- 14: Extracted image

Initially, the database of healthy leaves and disease affected leaves is created at the server. This database details are then used to compare the captured images. Here, the figure 11 shows the captured image of the leaf. Figure 12, figure 13, figure 14 represents the expected output that consist of segmented image, grayscale image and extracted image of the captured image.

3. CONCLUSION

The low-cost and reliable weather and soil monitoring system and disease detection is going to be designed with the voice module and Raspberry Pi to view various parameters and details about any affected disease. The results obtained suggest that weather monitoring and disease detection can be done efficiently in real-time and at low cost. The data getting from the system have numerous applications such as it can be used for soil sampling for soil remote sensing. This proposed system is the most compact unit for measuring weather parameters in different regions and to monitor the plant as healthy or not. This device can be used without the internet connection. The problem such as understanding the language of voice call can be overcome by using the language selection option. From this the user can efficiently use our system.

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BIOGRAPHIES

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