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IOT Based Smart Obtrusion Circumvention in Crop Monitoring

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Abstract: **- The aim of this paper is to provide real time plant monitoring system along with security system to prevent the trespassing into the farmland with the concept of the(Internet of Things) IoT. The agriculture land with the distributed sensors in the field provides the status of the soil condition without the need of the physical presence of the farmer. Crop growth mainly depends on the water content and the available minerals. Hence to provide efficient crop growth the water requirement has to be periodically monitored, so that the crop growth won't be affected. These details will be stored in the cloud and can be viewed using webpage. The security requirements of the farmland is dealt by the image processing technique through the video surveillance system ant the alert message will be sent to the farmer when any intrusion occurs.**

Keywords**: Image processing, Webpage, Microcontroller, Sensors, Web cameras.**

I. INTRODUCTION

Agriculture plays a vital role in the Indian economy. But most of the farmers in our country use traditional way of farming which is time delay process to analyse data related to soil condition. This can be overcome by advanced farming methods. The automation in agriculture leads to effective crop monitoring without human interference in the field. Internet of things is the network of physical objects with sensors and microcontrollers which cannot be connected to the internet directly. The crop productivity is based on good irrigation system. In order to maintain the irrigation system effectively, sensor is placed in the field which senses the water requirement of the soil and provides irrigation automatically. On the other hand, animal intrusion can be detected using web cameras through which the object is captured. The captured image is segmented and classified which is also compared with the previously stored image using image processing technique using MATLAB software. The farmer will be alerted with the message through GSM technology.

II. LITERATURE SURVEY

This system proposed a 4D reconstruction approach to crop monitoring [2]. This employs a spatial –temporal model of dynamic scenes that is useful for precision agricultural applications. Structure from motion (SFM) is a method with the computer vision community that enables the recovery of 3D geometric information from images and this combined with Multi-View-Stereo. These methods can obtain dense, fine-grained 3D constructions. The major barrier to the direct use of these method of crop monitoring is that traditional SFM and MVS. It has the 4D reconstruction problem for crop monitoring applications. This drawback can be solved by the outcome of the proposed 4D approach which is a set of 3D point clouds, with pleasing visual appearance and correct geometric properties. A robust data association algorithm is also developed to address the problems inherit in matching images. This system explains the use of Python scripts for integrating the Internet of things, Raspberry pi, and wireless sensor networks to accentuate the methods for identification of intruders, threats to crops and delivering real time notification based on information analysis and processing without human intervention [10]. The lack of information transmission and data analysing has been solved by integration of internet of things with currently available security devices in order to achieve efficient food preservation and productivity. It does not have the technique of pattern recognition for machine learning and to identify objects and categorize them into humans, rodents and animals, also sensor clustering can be done to increase the functionality of the device. This drawback can be overcome by the grid of panels consisting PIR sensor.

In this system the term W-COHOG is used which is a histogram oriented based features with better accuracy [5]. The use of LIBLINEAR classifier is used in order to get accuracy for high dimensional data. Computer vision is applied to the security field to perform automatic surveillance. This system proposed a system of using a weighted Co-occurrence histograms of oriented gradients to recognize the animal in a given image. At first images are captured using the cameras and then installed in the forms.

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Then these images are processed to detect whether any animal exists in the given image. This result will be sent to the farmer. This system does not have the process of recognizing animals in the video. This drawback can be overcome by improving algorithm to improve the accuracy of the images.

This system explains the use of pyro electric infrared sensors. It produces an electric potential by means of a very small change in temperature. PIR sensors are suitable for detecting moving targets [8]. Many security systems are made using PIR sensors to be a good alarm for intrusion and precise counter for targets which are not only for people but also for vehicles and so on.PIR sensors are not deployed in an indoor environment where the detecting range is limited in several meters. They are used to detect target more than 20 meters away in an unattended wild ground environment. This explains a system to monitor a specific wild animal using PIR sensors. This system does not recognize more kinds of targets and the accuracy of the classification is sometimes disturbed by the use of sensors. This drawback will be overcome by using certain algorithms instead of time domain and frequency domain.

III. PROPOSED SYSTEM

The proposed system is a combination of embedded system and image processing technique. The embedded part is the plant monitoring system which is carried out using the sensors such as temperature sensor and moisture sensor which gathers the collective information regarding the moisture content of the soil and the surrounding temperature and the humidity. Finally the observed data will be sent to the webpage using the Wi-Fi module and the data can be viewed by the user.

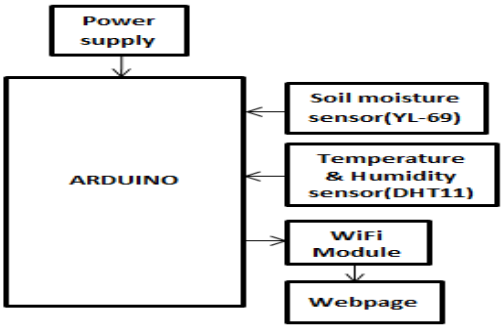

Fig 1: Block diagram for crop monitoring

For security of the crop field from obtrusion image processing technique is used. The agricultural field is fitted with multiple web cameras so that it can cover total area of the field and obtrusion from any direction can be captured. When an animal is intruded into the field, the image of the animal is captured by the web cameras. The web cameras are interfaced with computer through MATLAB programming The captured image is segmented and classified using image processing technique and it is compared with the predefined images to detect which animal has been entered. This information is sent to the microcontroller and it is updated in the webpage through wifi. A message alert is sent to the authorized person through GSM.

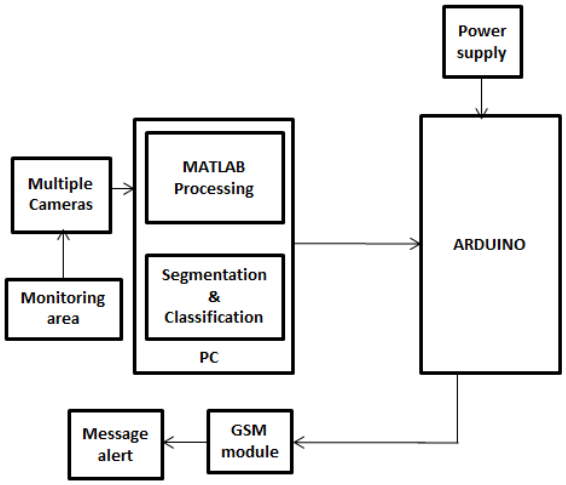

Fig 2: Block diagram for animal detection

Hardware used:

1. Soil moisture sensor (YL-69)

The soil moisture sensor also called as hygrometer is usually used to detect the humidity and moisture content of the soil. The sensor has the following: the electronic board and the probe with two pads. The probe detects the water content of the soil .The soil moisture sensor has a built-in potentiometer for sensitivity adjustment of the digital output (D0).It also has a power LED and a digital output LED pin.. The voltage value from the sensor output changes according to the water content in the soil.

2. Temperature and Humidity sensor (DHT11)

The DHT11 is a low-cost digital temperature and humidity sensor. It has two parts: a capacitive humidity sensor and a thermistor to measure the surrounding temperature and relative humidity and produces the digital value using digital output pin. It does not need any analog input pins.

3. Arduino microcontroller AT mega328

The Arduino Uno is a microcontroller board based on the ATmega328p. It has 14 digital input/output pins in which 6 can be used as PWM outputs and has 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It can be simply connected to a computer using a USB cable or powering it with a AC to DC adapter or a battery .

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The Uno differs from all other boards in which it does not use the FTDI USB to serial driver chip. Uno means one in Italian and is named to mark the new version of Arduino 1.0. The Arduino Uno can be powered using an USB connection or with an external power supply. The power source can be selected automatically. The board can be operated with an external supply which ranges from 6 to 20 volts. If the power supply is less than 7V, the 5V pin may supply less than five volts and the arduino board may become unstable. If the voltage is more than 12V, the voltage regulator may be overheated and damages the board. So that the recommended voltage range is 7 to 12 volts.

4. Wi-Fi Module

The generic ESP8266 is a low cost Wi-Fi transceiver. It has complete TCP/IP stack to send data over the internet and a microcontroller unit which is produced by a Chinese manufacturing company. This small module allows arduino to connect with a Wi-Fi network and make simple TCP/IP connections using Hayes-style commands. The ESP8266 has 8 pins namely Tx, Rx,Vcc, Gnd, CH_PD,GPIO 0 and GPIO 2 pins. The input voltage for this module is 3.3V.

5. GSM Module

SIM800 is a quad-band GSM/GPRS module. It works on the following frequencies: GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz.SIM800 has GPRS multi-slot class 12 and class 10 and it supports the GPRS coding schemes such as CS-1, CS-2, CS-3 and CS-4.SIM800 has 68 SMT pads which provides all hardware interfaces between the module and customers' boards.SIM800 has a TCP/IP protocol and a extended TCP/IP AT commands which can be used for data transfer applications.

Software used

1. Arduino

The Arduino Uno can be programmed using the Arduino software. Select Arduino Uno from the Tools > Board manager menu. The ATmega328 microcontroller on the Arduino Uno comes with pre burned boot loader function which allows the user to upload new code to the board without the use of any external hardware programmer. It communicates using the STK500 protocol. The ATmega8U2 is loaded with a DFU boot loader. The Atmel's FLIP software or the DFU programmer can be used to load a new firmware.

2. MATLAB:

MATLAB (matrix laboratory) is a multi-exemplary numerical computing environment. It is developed by Math Works. MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creating user interfaces and interfacing with the programs written in other programming languages like C, C++, C#, Java, Fortran and Python.

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IV. EXECUTION PROCEDURE

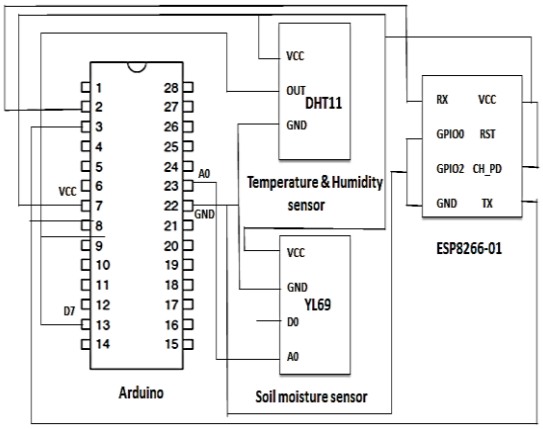


Fig 3: Circuit connection of sensors and wifi module with arduino

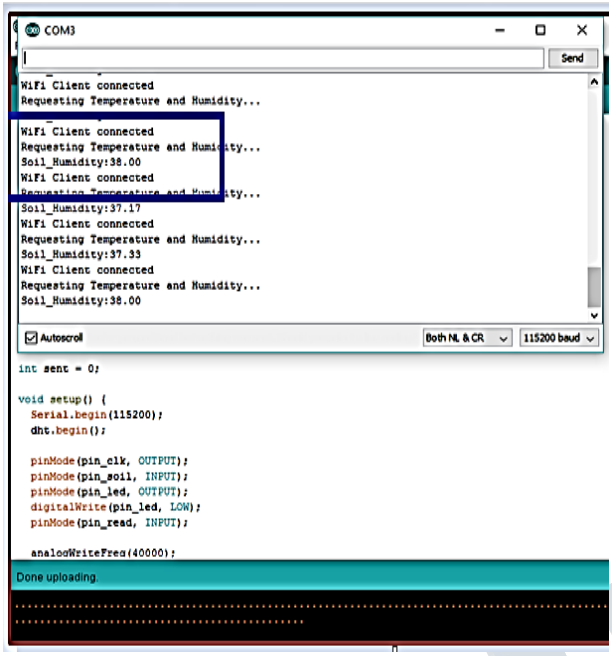
In this paper, the sensors YL-69 and DHT11 are used to monitor the temperature and humidity respectively. The analog pin A0 of the soil moisture sensor is used to observe the moisture content of the soil which is sent to the microcontroller and the output is taken from the A0 pin of the arduino. Similarly, the DHT11 sensor is used to observe the temperature and relative humidity of the surrounding which is through the digital pin D7. Collectively the sensor information is processed and uploaded to the webpage through the WiFi module ESP8266.

V. EXPERIMENTAL RESULT

ALGORITHM

- Open arduino IDE and type the code using embedded C language.
- Connections are made for soil moisture sensor (YL-69) and temperature and humidity sensor (DHT11) with arduino.
- For DHT11 sensor include the library file dht.lib.
- Include the package which supports the WiFi module in arduino.
- Select Generic ESP8266 Module from Board Manager.
- Compile the code to check any errors.
- Upload the code to arduino board.
- Click Tools > Serial monitor (ctrl+shift+M) to view the sensor data.

- Open the webpage to view the updated sensor data.



- Fig 4: Average value of sensor output
- Above is the serial monitor output of Arduino when the Wi-Fi client gets connected .
- When the Wi-Fi gets connected it request the temperature and humidity and the soil moisture is get displayed .
- And the information wil be uploaded to the corresponding webpage.

VI. CONCLUSION AND FUTURE WORK

In this paper, an efficient crop monitoring along with improved security system for obtrusion prevention for a farmland is proposed.The image processing technique used for security system is more useful than the traditional ways of animal detection.The application of IoT in which the information can be stored and retrieved from anywhere in the world.In this proposed work, the sensor part is limited only for monitoring of crops hence in future the sensors can be clustered and the system can be used for irrigation and the image processing technique can be enhanced with advanced algorithms.

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