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A Iot-Based Farm Management System In Modern Cities Using Image Processing

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Abstract: *The recent technological advances have paved the way for developing and offering advanced services for the stakeholders in the agricultural sector. A paradigm shift is underway from monolithic tools to internet based systems that will enable more effective collaboration between stakeholders. This new paradigm includes the technological support of application developers to create specialized services that will seamlessly interoperate, thus creating a sophisticated and customisable working environment for the users. Here in this project, the system is like smart agriculture where it detects insect damage on cultivated crops through monitoring and updates the information through Ethernet. This system makes automatic irrigation possible, so in the end it reduces the manpower involved.*

Keywords: *automatic irrigation, insect damage, smart agriculture*.

I. Introduction

Agriculture has been the primary occupation in India. By empowering the agriculture sector, we are helping our nation to develop. Farming in india is done using the common ways. The fact that most of the farmers lack proper knowledge makes it even more erratic. A large portion of farming and agricultural activities are based on the predictions, which at times fail. Since we know the benefits of proper soil moisture and its quality, air quality and irrigation, in the growth of crops, such parameters can be ignored. We, therefore come up with a new idea of crop monitoring and smart farming using Iot. We believe that our concept will be a benchmark in agribusiness due to its reliability and remote monitoring. Our idea tries to digitalize farming and agricultural activities so that the farmers can check on the requirements of the crops and accurately predict their growth.

1.1. Existing System

In the existing system, the farm management is controlled only with sensors and microcontroller. The following are the sensors that are being used : Temperature sensor and Humidity sensor. The humidity sensor helps in detecting the moisture content of the soil (i.e.) water contents of the soil and drive the water motor. The temperature sensor will detect the farm house temperature.The disadvantage in the existing system are, it cannot update the status of the cultivated vegetable online and it cannot find the insect damage on the leaf.

1.2. Proposed System

In this project, we automatize the farm house maintenance with the help of microcontroller.The microcontroller helps in water irrigation for the plant. The sensors used in this project are Temperature sensor, Humidity sensor, Soil moisture sensor. The soil moisture sensor which helps to find out soil moisture content (i.e.) if water content of the soil gets reduced it drives the water motor automatically. The temperature and humidity sensor detects temperature of farm. Matlab is used to find out the insect damage in the leaf using image processing. It will detect automatically insect damage on the leaf of particular plant. The microcontroller will update through Ethernet about cultivation of vegetables.

II. System architecture

The proposed system makes use of components like the Arduino UNO R3, sensors like humidity sensor,temperature sensor, soil moisturise sensor, light dependent resistor, relay, Ethernet shield, water motors andpower supply unit. The system is of great use and can be afforded by anybody. The system is made in such away that any one can make use of it efficiently. They themselves can check the soil moisture, temperature andhumidity of the soil. Since the amount of light required by crops vary from one crop to another, in order tomonitor that, a LDR is used. The relay here is used to control the circuit. There are switches that can

operateboth mechanically and electrically. By using a software called MATLAB, a predefined set of images are giventhrough a monitoring camera with the help of which the status of the crops are updated onto the webpage. AnEthernet shield has also been used in order to connect the Arduino board to internet. The proposed system isaffordable and will be of great help to the farmers.

III. Arduino Uno

An arduinouno is basically a microcontroller board and it is based on ATMEGA328. It basically has 14 outputpins which are called as the digital pins and 6 analog pins. It has a 16 Megahertz crystal oscillator, a power jack,USB connection and a reset button. We simply need to connect to a computer using a USB to get started. AnArduino is basically based on Harvard architecture. The program instructions and data have a separate memory.The Atmega328 has 1 KB of EEPROM, 2 KB of SRAM, 32 KB of EEPROM and operates with a clock speed of 16MHz. It has a flash memory for storing code, 0.5 KB of which is used for bootloader. The importantadvantage with the Arduino is that the programs can be loaded into the device without the requirement of anyprogrammer to burn program.

IV. Temperature Sensor

Temperature is the most-measured variable in industrial application. A temperature sensor is generally usedto convert temperature to electrical value. Temperature Sensors are used to read and control the temperaturesinindustries .LM35 IC is a temperature sensor, where the output voltage is linearly relative to the Celsius. LM35doesn't need any kind of outside calibration or decoration in order to provide accuracies of ±¼°C at roomtemperature and ±¾°C over -55 to +150°C temperature range. LM35's , low output impedance, linear outputand inherent calibration create an interface to control the circuitry. A humidity sensor is basically a devicewhich can measure the relative humidity in an area. A humidity sensor can be utilized indoors and outdoors.Humidity sensors are mostly available in analog as well as digital forms. This module can convert the relativehumidity to voltage . This can be used in weather monitoring applications.

V. Humidity Sensor

A humidity sensor is basically a device which can measure the relative humidity in an area. A humidity sensor can be utilized indoors and outdoors. Humidity sensors are mostly available in analog as well as digitalforms. This module can convert the relative humidity to voltage. This can be used in weather monitoringapplications.

VI. Soilmoisture Sensor

A soil moisture sensor is used generally to measure the water content in the soil. The Soil Moisture Sensor isused to detect the moisture level of the soil and to judge if sufficient water is available for the crop.In order toassess the condition of the soil , we need to insert the module into the soil and also adjust the potentiometer onthe board so as to adjust sensitivity. The sensor outputs logic HIGH/LOW whenever the moisture content ishigher/lower than threshold that has been set by potentiometer.

A. Features

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

VII. Light Dependent Resistor

Light Dependent Resistors are generally termed as photo resistors. They are dependent on light. There resistance generally decreases when light falls on them and increases when they are kept in the dark. This istermed as dark resistance. The dark resistance can be as high as 10^12 ohms. Whenever a constant voltage isapplied to it, the light intensity increases and the current increases proportionally.

VIII. Dcmotors

A DC motor is used to convert the direct electrical power into mechanical power. It is based on the fact thatwhenever a current carrying conductor is placed in a magnetic field, then it experiences a mechanical power. When the soil moisture sensor detects that thewater content of soil is low, then motor starts working by pouring water to the plants from a tubeconnected to the motor and it stops after the moisture content of the soil comes back to normal**.**

IX. Ethernet Shield

This is the medium through which the arduino gets the capability to connect to the internet. It is actually basedon the wiz net Ethernet chip. It supports up to four simultaneous socket connections. Use the Ethernet library towrite sketches which connect to the internet using the shield. The Ethernet shield connects to an Arduino boardusing long wire-wrap headers which extend through the shield. This keeps the pin layout intact and allowsanother shield to be stacked on top.We can get connected to the internet using the RJ45 cable:

- ✓ It requires an Arduino board (not included).
- ✓ It's Operating voltage is 5V (which is supplied from Arduino Board).
- ✓ Ethernet Controller used here: W5100 with internal 16K buffer.
- ✓ The Connection speed is: 10/100Mb
- ✓ Connection with Arduino is via SPI port.
- ✓ The shield contains a considerable number of LEDs.
- ✓ PWR: It indicates that the board and shield have been powered.
- ✓ LINK: It indicates the presence of the network link and also flashes whenever the shield transmit orreceives data.
- ✓ FULLD: It indicates that the network connection is fully duplex.
- ✓ 100M: It indicates the presence of a 100 Mb/s network connection.
- ✓ RX: It flashes when the shield receive data.
- ✓ TX: It flashes when the shield sends the data.
- ✓ COLL: It flashes when network collisions have been detected.

X. Software Used

A. Matlab

Matlab is a fourth generation programming language. It has been used for a long time in order to makecomplex mathematical computations easy. They include matrix, interpreting algorithms and many more.They have also been used for interfacing and they have programs that can be written in C,C++, Java,Fortran, Python.

B. Arduino Ide

Arduino IDE is used to interface with arduino through programming which can be uploaded. They generallyhave files with extension .ino.It has a text editor for writing codes. Programs written here are called assketches. The programs that are written on the arduino IDE can be uploaded to the arduino board through thearduino USB cable.The message area gives the feedback, displays the output and the errors

XI. Conclusion

This IOT based farm management system is a very reliable and a very efficient system. It can really makemanpower less and can be more helpful for people in modern cities as the status of the crops are updated on thewebpage that they can access from anywhere and at anytime.There is no necessity for them to continuously keepmonitoring the crops.With the proposed system, using the sensors, the temperature, light intensity, soil moistureas well as humidity are monitored and whenever the value seems abnormal the respective motors gets switchedon. More over this system can detect the damage caused by the insects and automatically turns on the fertilizermotor that makes the system even more efficient and reliable.

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