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Vertical Agriculture Monitoring System In Iot

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Abstract- The proposed system is a new technology applied to the management of large scale, commercial agriculture to overcome the disadvantages in the normal agriculture. It promises high yields and lower input costs by real- time and automatic monitoring of environmental and soil conditions using different sensors. Normally, agriculture needs large amount of lands for cultivation. In our system, space is managed by implementing cultivation in different floors. It overcomes the disadvantages like landslides, floods and some animal attacks in agriculture which cause crop destruction. Climatic condition monitoring is one of the most important aspects in agricultural production. It has its direct impact on productivity and maintenance of field crop and it is monitored here using sensors. Monitoring the soil parameters and environmental conditions like temperature, humidity, soil moisture, soil pH, soil nutrients, sunshine and height of the plant are performed using sensors.

Index Terms– urban agriculture, vertical farming.

I.INTRODUCTION

The main of our project is to perform agriculture in building and monitoring various parameters using sensors. This project is designed with various sensors to measure the soil parameters, climatic conditions and crop characteristics like temperature, humidity, light, soil nutrients, soil pH level and height of the crops.

A. Agriculture- Essential for living

B. Agriculture is a science or art or practice of farming and cultivation of soil for growing crops and rearing of animals to provide food and other products. It is the key development to sustain and enhance human lives.

Fig 1.1 Agriculture

A. Agriculture in building

Urban agriculture is an emerging technology to overcome the drawbacks in the normal agriculture. It reduces

- our environmental footprint
- cuts transportation costs
- enhances food security / safety
- conserves water
- protects rivers
- improves health
- reduces waste
- Cools buildings.

Fig 1.2 Building farming

II. EXISTING SYSTEM

In the existing agriculture, landslides, floods, heavy rainfall, some animal attacks cause the destruction of the crops. High quality soil is most essential for the crop and food production. Without high quality soil, crops fail and famine occurs. In many cases worldwide, the poor soil management is the biggest issue that erodes country's ability to grow their own crops. Large farming lands implements tractors. It combines the compression of soil beneath restricting the gas exchange, rainfall percolation and microbial activity. These activities may sometimes make the land infertile for generations. Also, now-a-days, most of the agricultural lands are converted into residential areas due to population growth.

III. PROPOSED SYSTEM

The proposed systemovercomes the problem like landslides, floods, heavy rainfall, lack of space for agricultureand animal attacks since agriculture is carried out in building.

The system checks for the soil fertility and quality of soil using sensors. It especially solves the problem in space management. Our project is implemented to reduce the manual monitoring of agricultural lands. We use various sensors to measure the soil parameters, climatic conditions and crop characteristics like temperature, atmospheric humidity, light, soil nutrients-NPK level, soil pH level and height of the crops

Why sensors?

Sensor is a transducer whose purpose is to detect some changes in its environment.. It detects changes in quantities and provides a corresponding output, generally as an electrical or optical signal. In our project, we use sensors to monitor the vertical agricultural parameters.

BLOCK DIAGRAM

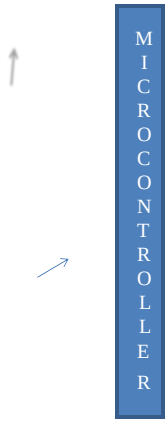


Fig3.1: System architecture

A. Sensing the agricultural parameters

This unit consists of fixing various sensors in various floors our agricultural buildinglike temperature sensor, humidity sensor, soil pH sensor, soil moisture sensor, ultrasonic sensor, soil nutrient sensor and ldr sensor.

- ***Temperature sensor***

It is used to monitor the temperature values in each floor of our agricultural building and returns the changes in temperature values continuously.

	Cotton	Peer	
	Peanuts		

Fig 3.2 Temperature sensor- Thermistor

A thermistor (temperature sensor) is a type of resistor whose resistance varies with temperature.

$\Delta R = k \Delta T$

Where, ΔR- change in resistance

ΔT- change in temperature

k- first-order temperature coefficient of resistance.

- ***pH sensor***

Soil pH level is monitored to determine whether the soil is acidic or alkaline in nature. According to the values, crops which grow in acidic and alkaline soil are separated and are planted accordingly.

Sweet potatoes	Rice		
	Wheat		
	Watermelon		
	Apples		
	Grapes		

Fig 3.3 pH sensor

Soil pH is considered as a master variable in soils as it controls many chemical processes that take place in the soil. The optimum pH range for most plants is between 5.5 and 7.0, however many plants have adapted to thrive at pH values outside this range sometimes up to 8.

5.0-5.5	5.5-6.5	6.5-7.0	7.0-8.5
Blueberries	Barley	Some cloves	Plum
Potatoes	Corn	Sugar beets	Cherry

Table.1 pH values and crops cultivated.

- ***Humidity sensor***

Humidity level is monitored by the humidity sensors to know the atmospheric humidity. It means that it measures both the temperature and moisture in the air.

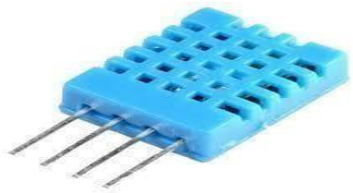


Fig 3.4 Humidity sensor

Most common type of humidity sensor used is called 'capacitive measurement'. It relies on electrical capacitance or the ability of two nearby electrical conductors to create electric field between them. Sensor itself is composed of two metal plates with non conductive polymer film between them. Thus, film collects the moisture from the air and this moisture causes the voltage change in the plates. The changes in voltage are converted into digital reading showing the amount of moisture in the air.

- ***LDR sensor***

Photo resistor diode or cadmium sulphate is a resistor, whose resistance decreases with increasing intensity of light. With this, we can calculate the sunlight intensity level.

It is made up of high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

Fig 3.5 LDR sensor

- *Ultrasonic sensor*

Ultrasonic sensors are placed in the ceiling of our agricultural building. It generates the ultrasonic waves which is reflected back when an obstacle hits. Using this principle, we can calculate the height of the crops.

Fig 3.6 Ultrasonic sensor

- *Soil moisture sensor*

To know the moisture level in the soil, moisture sensors are included in our project. If the moisture sensor senses that moisture level in the soil is low, the relay Pump gets automatically on.

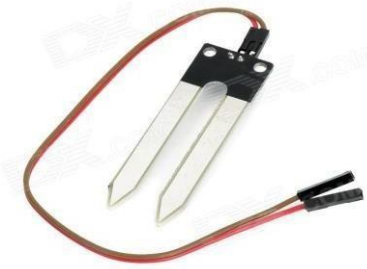


Fig 3.7 Soil moisture sensor

Soil moisture sensors measure the water content in soil. The probe is made up of multiple soil moisture sensors. Analytical measurement of free soil moisture requires removing a sample and drying it to extract moisture. Soil moisture sensors measure some other property like electrical resistance,dielectric constant, or interaction with neutrons, as a key for moisture content. The relation between the measured property and soil moisture must be tabled and may vary depending on soil type.

- *Soil nutrient sensor*

Soil NPK level i.e. Nitrogen, Phosphorus, and Potassium values are monitored using soil nutrient sensors.

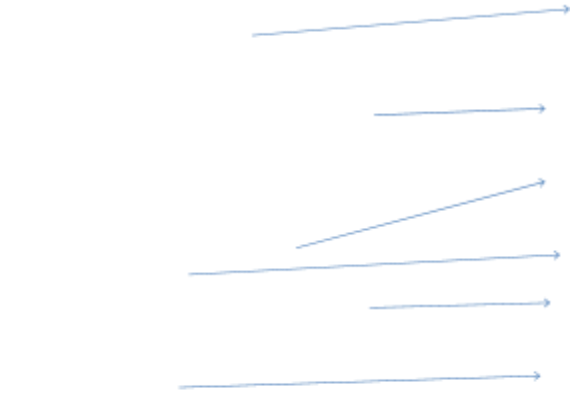
Onsite monitoring of soil nutrient concentration offers the opportunity for high quality of soil at relatively lower costs. This would allow for an efficient mapping of nutrient variability in soil to facilitate variable-rate nutrient application.

B. *Gatherin and transferring datathrough zigbee*

All the values from the sensors are gathered and transmitted to the microcontroller. Before sending it to the controller, the values are amplified using amplifiers and converted to digital signals using ADC converters.

We check the soil moisture sensor value, if the soil moisture value is low, the dc pump will gets on automatically.

HARDWARE IMPLEMENTATION



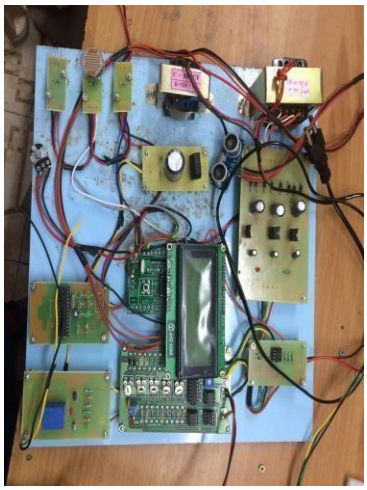


Fig.11 Embedded sensors

LDR

ULTRA SONIC SENSOR
MICRO CONTROLLER
ZIGBEE

16X4 LCD DISPLAY
HUMIDITY SENSOR

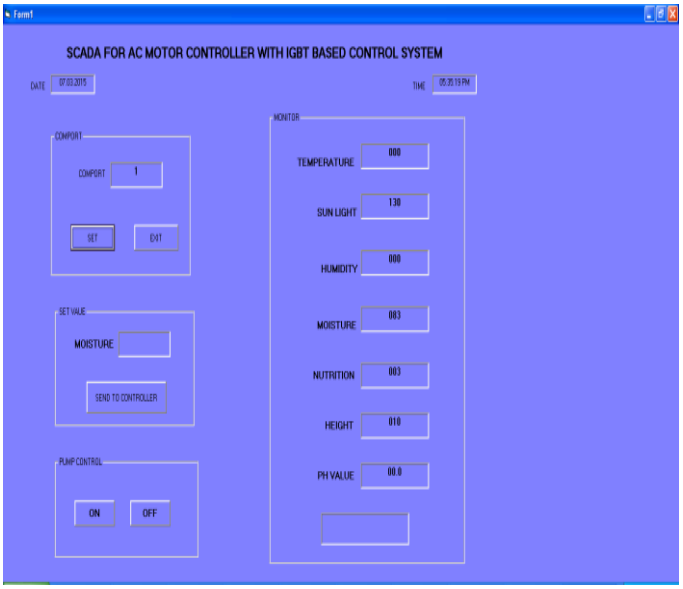


Fig.12 User interface

C. *User interface*

The values are received through zigbee receiver and are sent to the personal computer through RS232 cable.Wecreate a form which consists of parameters like temperature, humidity, sunlight level, moisture level, height of the crops, NPK level, and ph level.The values sensed are shown in the respective text boxes.After the verification of port number, we set the moisture value for the soil. If the value exceeds theset value, the pump gets automatically

IV.CONCLUSION

Vertical farming is encouraging agricultural methods on.for future use.In the precision agriculture the performance degradation in soilcan't be detected. Inour project the sensors continuously monitor the soil parameters. So wecan immediately take the remedy to overcome the faults.In building farmingthe land space usage is limitedbecause we aredoing agriculture infloors. From this wecan manage theland space.We canmonitor various agricultural parameters, climaticconditions and plantcharacteristics usingsensors continuously. Fromthis we can reducethe manual effort.

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