Green House Monitoring, Control and Advanced Pesticide Warning Embedded System

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Abstract- Parameter monitoring and control of greenhouse environment play an import ant role in greenhouse production and management. This paper involve a design and implementation of an database based Wireless Sensor Network (WSN) that is used to monitor and control the essential greenhouse parameters, such as, temperature, humidity and light intensity. This implementation supports the farmers to increase the crop production. All monitored parameters are transmitted through a wireless link to computer via coordinator to be analyzed, and then initiate suitable commands to the specific devices to overcome the drifts in an environmental parameters inside greenhouse.

Keywords- WSN; ORACLE DATABASE;GREEN HOUSE;LM35;LDR.

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1. INTRODUCTION- The proposed system is an embedded system which will closely monitor and control the microclimatic parameters of a greenhouse on a regular basis round the clock for cultivation of crops or specific plant species which could maximize their production over the whole crop growth season and to eliminate the difficulties involved in the system by reducing human intervention to the best possible extent. The system comprises of sensors, Analogue to Digital Converter, microcontroller and actuators and warning system which monitored the pests and diseases throughout the country to inform farmers and to supervise and reduce the use of pesticides. When any of the above mentioned climatic parameters cross a safety threshold which has to be maintained to protect the crops, the sensors sense the change and the microcontroller reads this from the data at its input ports after being converted to a digital form by the ADC .The microcontroller then performs the needed actions by employing relays until the strayed-out parameter has been brought back to its optimum level. Since a microcontroller is used as the heart of the system, it makes the set-up low-cost and effective nevertheless. As the system also employs an LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly. Thus, this system eliminates the drawbacks of the existing set-ups and is designed as an easy to maintain, flexible and low cost solution. The aim was to reinforce the pest surveillance networks as part of the government plan. Basic factors affecting plant growth are sunlight, water content in soil, temperature, CO2 concentration etc. These physical factors are hard to control manually inside a greenhouse and there is a need for automated design arises. The system ,monitor temperature ,humidity, soil water content and concentration of carbon dioxide inside the greenhouse which then saved to a database. According to the current indoor temperature, the target temperature and the offset temperature, PID (Proportional Integral and Derivative) control method is used to control temperature control in greenhouse. The system is implemented using low power wireless components, and easy to be installed.

2. OBJECTIVE&SCOPE- The objective of this project is to design a simple, easy to install, microcontroller-based circuit to monitor and record the values of temperature, humidity, soil moisture and sunlight of the natural environment that are continuously modified and controlled in order optimize them to achieve maximum plant growth and yield, whenever any of these parameter goes above the optimum level then it automatically gives warning message. Previously we have two different system, one for monitoring and controlling and second for warning. Here we have only one system which is combination of both system i.e. monitoring, controlling and pesticide warning system. Many research and projects have been done in order to improve the conditions and cultivation of crops under green house. This system consist of wireless sensors, such as temperature sensor, humidity sensor, light sensor and so on.
The objective of the present work is to design and implement wireless sensor network using database for monitoring and control the environment parameters such as temperature, humidity and light intensity inside green house.

3. PROJECT DESCRIPTION

1. System model-

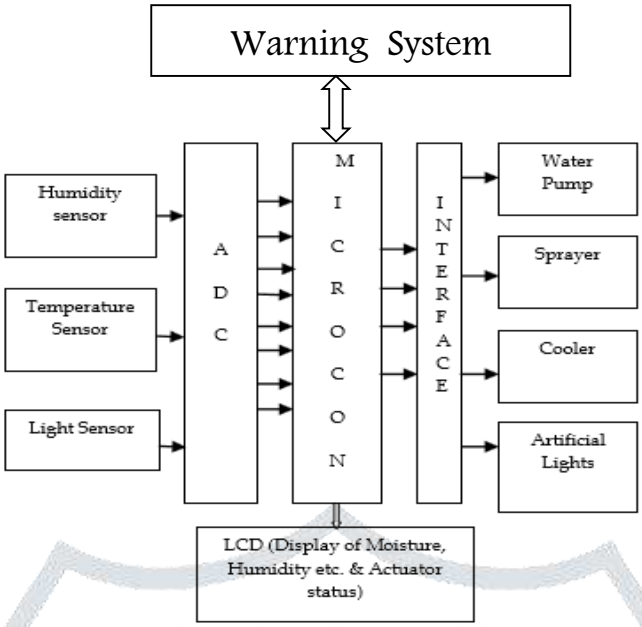


Fig 1. Block Diagram of the System

2. Hardware Description-

1:-Transducers:- A transducer is a device which measures a physical quantity and converts it into a signal which can be read by an observer .It can also be read by an instrument .The sensors used in this system are:

1- Light Sensor - LDR is variable resistor measure visible light as seen by the human eye.LDR is basically a resistor that has internal resistance increases or decreases dependent on the level of light intensity impinging on the surface of the sensor. The characteristic of this type of sensor: Fast response, Small in size. The relationship between the change in sensor resistance (R_L) and light intensity (Lux) I and can also be expressed using the equation.

2. Humidity Sensor - The sensor that used in the project is Capacitive-type humidity sensor (CHS) called AHT2M1. This type is widely used in industrial, commercial, and weather telemetry applications. The changes in the dielectric constant of a CHS are nearly directly proportional to the relative humidity of the surrounding environment. Technical Specification of this model was:
Power supply: 4.5-6V DC, Detecting range: humidity 0-100% RH, Storage humidity below 95% RH.

3. Temperature sensor- The LM35 series are precision integrated circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4°C at room temperature and ±3⁄4°C over a full -55 to +150°C temperature range. Low cost is assured by trimming and calibration at the water level.

2:- Analogue to digital- In physical world parameters such as temperature, pressure, humidity, and velocity are analogue signals. A physical quantity is converted into electrical signals. We need an analogue to digital converter (ADC), which is an electronic circuit that converts continuous signals into discrete form so that the microcontroller can read the data. Analogue to digital converters are the most widely used devices for data acquisition.

Analogue word	Transducers	S/C	ADC	Microcontroller

Fig:-2Getting data from analogue world

3. Microcontroller (At89s51):- The microcontroller is the heart of the proposed embedded system. It constantly monitors the digitized parameters of the various sensors and verifies them with the predefined threshold values. It checks if any corrective action is to be taken for the condition at that instant of time. In case such a situation arises, it activates the actuators to perform a controlled operation.

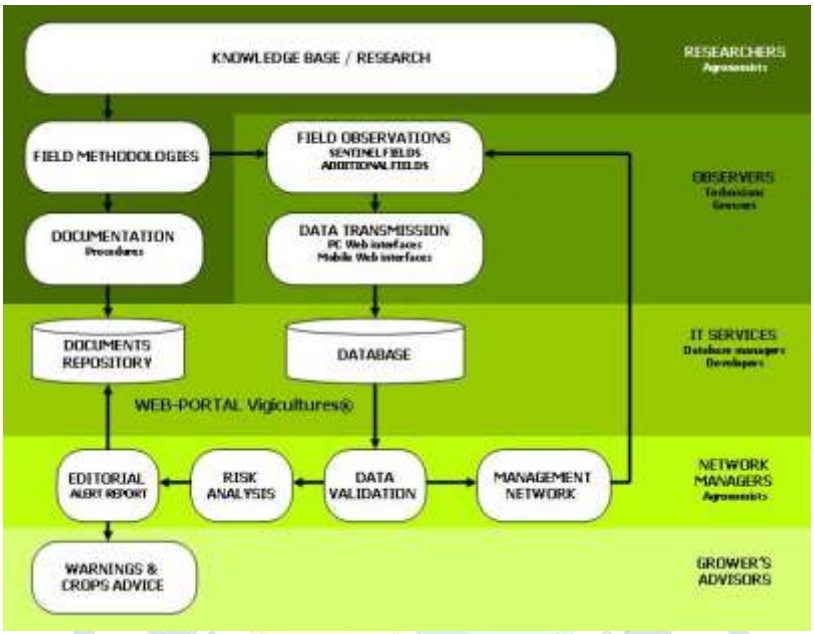
4. Liquid Crystal Display: - A liquid crystal display (LCD) is a thin, flat display device made up of any number of colour or monochrome pixels arrayed in front of a light source or reflector. Each pixel consists of a column of liquid crystal molecules suspended between two transparent electrodes, and two polarizing filters, the axes of polarity of which are perpendicular to each other.

5. Relays: - A relay is an electrical switch that opens and closes under the control of another electrical circuit. In the original form,

the switch is operated by an electromagnet to open or close one or many sets of contacts. Because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical amplifier.

6. Power supply connection: - The power supply section consists of step down transformers of 230V primary to 9V and 12V secondary voltages for the +5V and +12V power supplies respectively.

7. Warning System: - Agronomic and crop protection knowledge are the foundation stone of the system (figure 1). They have enabled a specialized observation methodology to be developed for each pest and crop. They are based on the knowledge of researchers in every institute and have mostly been published, as for example for wheat diseases (ARVALIS, 2007). These methodologies are applied by the observers, grouped into regional networks, to a number of fields chosen at the beginning of the growing season. These « sentinel » fields are monitored regularly by observers who upload the data observed on each pest into the information system. Depending on the situation, these networks of selected fields are complemented by information measured on additional fields to alert the network managers to a particular risk situation.



Software description:-

1. Oracle: - Oracle 10g Vision is an integrated development environment used to create software to be run on embedded systems (like a microcontroller). It allows for such software to be simulated on a computer before being loaded on to the microcontroller. Oracle 10g is a software working as a user friendly interface for programmer boar. The programmer connects to the computer's serial port (Comm. 1, 2, 3 or 4) with a standard DB9 Male to DB9 Female cable. Baud Rate - 57600, COMx Automatically selected by window software. No PC Card Required.

2. Programmer: - The programmer used is a powerful programmer for the Atmel 89 series of microcontrollers that includes 89C51/52/55, 89S51/52/55 and many more. Major parts of this programmer are Serial Port, Power Supply and Firmware microcontroller. Serial data is sent and received from 9 pin connector and converted to/from TTL logic/RS232 signal levels by MAX232 chip. A Male to Female serial port cable, connects to the 9 pin connector of hardware and another side connects to back of computer.

4. CONCLUSION

In this paper, we have designed and implemented a system that can understand the greenhouse environment and the state of crops by using sensors and optimize crop growth conditions with emphasis on the condition. A step-by-step approach in designing the microcontroller based system for measurement and control of the four essential parameters for plant growth, i.e. temperature, humidity, soil moisture, and light intensity, has been followed. The results obtained from the measurement have shown that the system performance is quite reliable and accurate.

The continuously decreasing costs of hardware and software, the wider acceptance of electronic systems in agriculture, and an emerging agricultural control system industry in several areas of agricultural production, will result in reliable control systems that will address several aspects of quality and quantity of production. Further improvements will be made as less expensive and more reliable sensors are developed for use in agricultural production

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