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REVIEW ARTICLE

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Controlling and Environmental Monitoring Of Polyhouse Farm Through Internet

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Abstract: All plants need appropriate environment for good health and growth. Environmental monitoring and controlling of polyhouse increases yield of crops to bring suitable environmental conditions under control in order to make it closer to the ideal as possible. Based on season, appropriate environment is needed for the growth of crops. In this project, different sensors have been used to control parameters of soil, water, air in polyhouse to maintain necessary environment through web technologies instead of any kind of human interaction. There is an automated irrigation system which gives water directly to root base of the crop. Aim of the project is to monitor and control sensors through wireless web network system and save water.

Keywords: Polyhouse, Sensors, Automation, Irrigation System, Monitoring, Control.

I. INTRODUCTION

India is big country geographically, but current agriculture management status is not enough to provide everything to the people, which can be problematic. The solution to this problem is the practice of protected farming which includes polyhouse farming. Polyhouse is nothing but a greenhouse covered with simple polyethylene sheet. The purpose of a polyhouse is to generate the optimal conditions for the full lifecycle of the plants growth. [1]

Polyhouse farming is constructed of metal structure covered by polythene. Parameters like temperature and moisture in the polyhouse are controlled to ensure timely and abundant yields.[2] Typical polyhouses come with size from 500 square meters to 10,000 square meters, which holds small land and suitable for farmers. Information for the polyhouse installation is provided by various agriculture universities, District Central Nurseries and also by private consultants [3].

Special expertise needed for polyhouse farming - the structure construction, cultivation techniques and product marketing. As part of cultivation, the pre- harvesting process include irrigation, giving pesticides, fertilizers and micro-nutrients, maintaining humidity, temperature, sunlight and humidity in the polyhouse, cutting, pruning and cleaning practices and controlling pH level and electrical conductivity of the soil. The post-harvest techniques include cutting, storage cooling chambers and transport by cooling vans. [2][3]

For proper growth of the plant, adequate and certain environment is needed. Monitoring and controlling of the environmental parameters should be given most attention in order to attain high yield. The controlling of these parameters by performing some important action may reflect in excellent growth of plant and increased yield. Various papers [4]-[6] have been published with the claim of the need and positives of polyhouse cultivation by various technologies. The required data about the available parameters inside the polyhouse is collected with the help of respective sensors and is sent to the control unit. The information is transferred to the control unit using wireless technology. [5]

Automated irrigation system's development of the deployment is presented based on microcontrollers and wireless communication within rural areas at experimental scale. The aim of the implementation was to demonstrate that the water use can be reduced using the automatic irrigation. The implementation is an automated irrigation system powered with photovoltaic. The system is deployed at plant root zones with soil moisture and temperature sensors connected in distributed wireless network. Each sensor node involved a microcontroller for data acquisition, a temperature probe, a radio transceiver; a soil-moisture probe, and the measurements of sensor are transmitted to a receiver having microcontroller. When the threshold values of temperature and soil moisture are reached this gateway permits the automated activation of irrigation [8].

The sensor nodes and the data receiver is used Zigbee protocol for communication under the IEEE 802.15.4WPAN. This receiver unit has a cellular-Internet interface using general packet radio service (GPRS) protocol, which is a packet-oriented mobile data service used in mobile communications (GSM) for 2G and 3G. Here, used internet connection which allows the data inspection in on a website, where the temperature, Humidity, Soil moisture levels are shown in graphical format and stored in a database server [10].

II. SYSTEM ARCHITECTURE

Here, approach of embedded systems design a polyhouse to control various parameters automatically. The parameters temperature, Humidity, Soil moisture, are monitored and controlled using ARM processor ,transmitted through the RS232 to the VB based monitor unit and then to the android mobile phone via a Wi-Fi or internet connection.

All sensor values that are collected from the greenhouse were displayed on the LCD screen. Development process of hardware is a structure imposed on the development which including Printed Circuit Board (PCB) design using

DIPTRACE software. In this system, C Compiler software is used for programming. This program can receive data with microcontroller and stored in database. By using C Compiler software, Temperature sensor, humidity sensor, rs232 device and also LCD display were interfaced with the microcontroller. This program will start from the greenhouse where the sensors will collect the environmental data in analog form. By using KEIL software sensor data collected are in analog form and will be converted to digital form using ADC converter in the microcontroller. Then, the data were transmitted through RS232 to PC. The data received was displayed on the LCD screen shows the interfacing between the LCD display and a ARM7 microcontroller. Overall, in the polyhouse the system monitoring temperature and humidity then transmitted through wireless WIFI and the data are monitored on the LCD display. [13].

A. BLOCK DIAGRAM

All sensor data are collected in database and monitored on PC as well as web browser. Temperature and Humidity will be controlled using exhaust fan. When temperature and humidity is high then exhaust fan is on otherwise off. Then another important part is a carbon dioxide. For proper plant growth carbon dioxide is a very important part to photosynthesis process. When carbon dioxide level is too low in polyhouse then ventilation window gets automatically opened and when sufficient carbon dioxide level is maintained in polyhouse then ventilation window is closed. Soil moisture sensor is a key parameter of irrigation system. Soil moisture sensor measures the moisture of soil, if moisture is dry and water tank level is high then water will be supplied on root zone of the crop. But, if soil moisture is dry and water level is low then pump will be off.

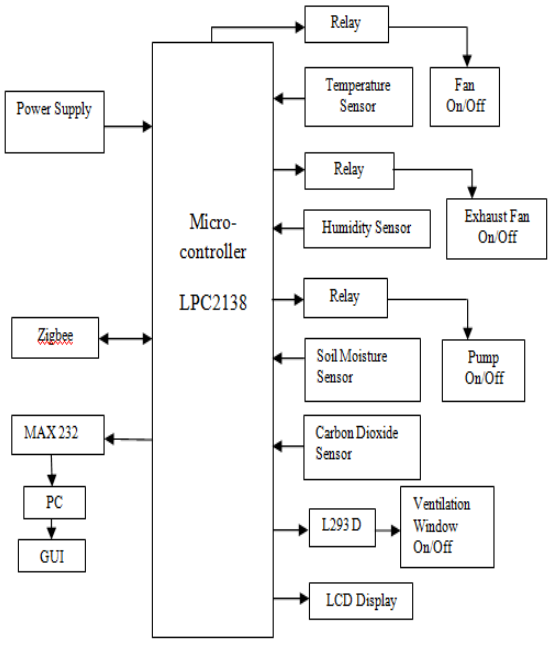

Fig.1.Block diagram of polyhouse automation

B. HARDWARE DETAILS

1. ***LPC2138 microcontroller***: This is the heart of the system. It's based on 32/16 bit ARM7TDMI-S CPU with Real-time emulation. In the system the microcontroller have an embedded high speed flash memory ranging from 32 kB to 512 kB. Microcontroller is suitable for industrial control and medical application because of 32-bit timers, single or dual 10- bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO pins. All sensor are directly connected to the microcontroller and data stored in a database. The Microcontroller performs action as per the data by using different controlling mechanism.

2. ***Temperature Sensor:*** The LM35 temperature sensor is used in the system whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. This temperature sensor can give reading more accurately than that of the thermistor. The operating temperature range is from -55°C to 150°C.When temperature sensor gives high output then fan will be on to control the temperature.

3. ***Humidity sensor:*** Here, SY-HS 220 Humidity sensor is used that gives analog output. This output feed to ADC and converted into digital form. Once output is converted into analog form, the microcontroller can process the digital humidity signal as per the application. This sensors value change in the atmosphere as per the application. When humidity is greater than threshold level then exhaust fan is on.

4. ***RELAY:*** A relay is an electromechanical switch to ON/OFF position according to the requirement. All sensor gives data to microcontroller then microcontroller perform action through relay.

5. ***LCD:*** The LCD display is used to provide all sensor value to the user in digital form. Sensor data display on LCD after every few millisecond. In LCD initialization you have to send command bytes to LCD.

6. ***Soil moisture sensor:*** Soil Moisture sensor is used to test moisture of soil. When moisture is dry, the sensor output is at high level else output is at low level. As per sensor output water pump will be ON/OFF. When soil moisture is dry then pump gets ON.

7. ***ZigBee Modules:*** ZigBee (over IEEE 802.15.4) technology is used in short range WSN because of its low cost, low power consumption and greater range in comparison with other wireless technologies such as Bluetooth (over IEEE 802.15.1), UWB (over IEEE 802.15.3), and Wi-Fi (over IEEE 802.11)and it was selected for this battery-operated sensor network..

III. FLOW CHART

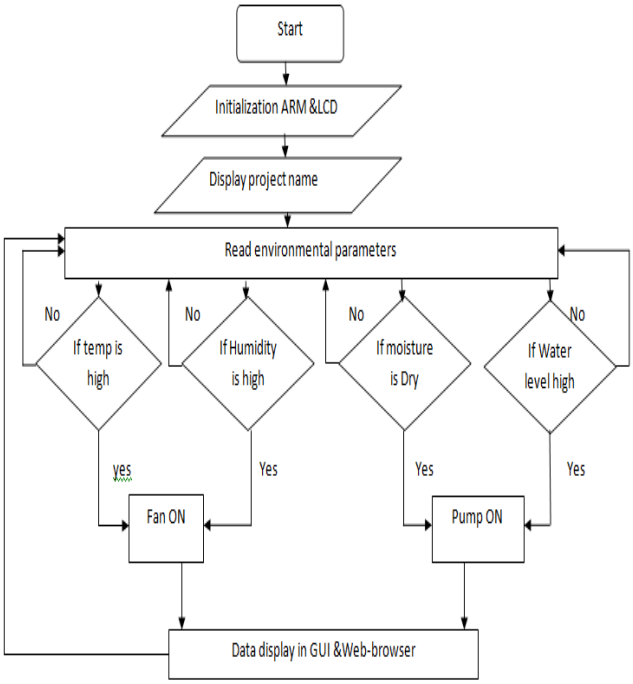

Fig 2: Flow chart of polyhouse automation

IV. ADVANTAGES

- Useful in hazardous applications
- Less time delays
- Quick response time
- Whole system is Fully automated
- Robust system, require low power
- Less water consumption

V. CONCLUSION

This system collects and automatically controls the condition of greenhouse environment by using different sensors. The existing control system monitors the temperature, humidity, soil moisture and water level in the greenhouse to solve the problem of plant disease. To make up for this weak point, this system proposes and collects the information regarding temperature, humidity, soil moisture so that the change of condition of crops depending on internal environment factors of greenhouse can be estimated.

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