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AUTOMATIC CONTROLLED ENVIRONMENT FARM

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ABSTRACT

The main objective of our project is to construct the greenhouse which is fully automated. Green House Automation is a complete system to monitor and control the environment parameters inside a green house. It is necessary to design a control system to monitor various parameters like Temperature, Humidity, Soil moisture, Light Intensity. Here controlling process takes place effectively by automatic manner. Controlling of greenhouse can done by microcontroller via serial communication. Microcontroller communicates with the variety of sensor modules. It is the technical approach in which the farmers in the rural areas will be benefited.

KEYWORDS: *Embedded platform, Soil moisture sensor, Temperature.*

1. INTRODUCTION

In the future, agriculture is estimated will be develop into smart agriculture, thus people who work in agriculture, in 2020 will be dominated by engineering graduates. Smart agriculture has the following properties :1) using sensor which monitors the condition of the plant 2) adjusting farmland from home, 3) adjust the climatic condition as desired by the greenhouse manager, 4) estimate the best condition for the plant according to the data. A greenhouse is a building in which plant are grown for commercial or research purpose. These structures range in size from small sheds to very large buildings, with different types of covering materials such as glass or plastic roof and frequently glass or plastic walls. But, nowadays, the rising demands for crop production and quality have significantly increased the utilization of high quality and productivity of greenhouse.

The proposed system is an embedded system which will 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 the human intervention to the best possible extent using sensors, microcontroller and relays. 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 read this from the data at its input ports after being converted to a digital form by ADC. As the system also employs LCD display for continuously alerting the user about the condition inside the greenhouse, the entire set-up becomes user friendly.

This project aims at providing an automated greenhouse monitoring and control system for the farmers in a very user friendly way. All these parameters are directly related to the growth and development of plant. The greenhouse system is complex system; any significant change in one climate parameter could have an adverse effect on another climate parameter as well as the

development process of plants. Therefore, continuous monitoring and control of these parameters is required for the proper growth of plants.

Previous researchers have used sensors such as leaf temperature and leaf wetness sensor in conjunction with ambient temperature sensor and humidity sensors to investigate greenhouse's status. These methods were found to be impractical as wetness varies from leaf to leaf and by location of plant in greenhouse. Therefore, it is very essential to maintain the temperature and moisture level in the soil at an optimum level in order to keep the plant healthy. Therefore, the automation system proposed in this study is expected to create surplus value for both producers and national economy.

2. RELATED STUDIES

This chapter reviews the research work and studies that have been done in different journals of Smart Green house. It presents some of the previous work related to Automatic Controlled Environment Farm.

Kalyan et al presented a paper on the need for systems in the year 2011 that make agriculture easier and more sustainable has increased within the past few years. The ability to conserve two of the most important resources of a farmer, water and time, has been the latest challenge. A system that provides this ability - through the use of efficient and reliable methods such as wireless sensor networking, sprinkler irrigation, GSM, SMS technologies and readily available mobile phone devices – is certain to help the farmers get a better yield and on a larger scale, help the agricultural and economic growth of the country.

Priyanka (2012) proposed a system which involves some sensors, LCD display, GSM and ARM processor. All the sensors will give analog output but our processor will accept only the digital data. So we have to connect all the sensors to the ADC channel pins which are in-built to the processor.LCD will be on field display purpose. GSM module will contain a Subscriber Identity Module (SIM) user can communicate with this SIM Number. When the particular command activated or given by the user, immediately the corresponding sensor will activate and reads the present reading and immediately sends results to the same user mobile and displays in the LCD panel in the field. Immediately user will take the necessary action if required. Here we are using total seven sensors to monitor the field condition. Those are Temperature, Humidity, Soil moisture, Leaf sensor, PH sensor, Level sensor, Phase sensor. All these devices are connected to the ARM processor. GSM is used for communication purpose; with the help of AT (attention)-Commands we can communicate with the components. For soil module and level sensing applications we are using motors. One motor is used to store water and another is for releasing the stored water into the soil.

Suraj proposed a system in the year 2015 that reduces the water use because it provide irrigation as per the requirement of the crop. 2. This system is automated irrigation system so it reduces the human resources.3. This irrigation system was found to be feasible and cost effective for optimizing water resources for agricultural production. 4. The irrigation system can be adjusted to a variety of specific crop needs and requires minimum maintenance. Using this system, we can monitor the status of all the sensors (Soil-moisture, Temperature, Water level) and also the ON/OFF status of the motor and Fan.

Vidadala et al, (2015) presented a paper on the implementation of agricultural automation system using WEB and GSM technologies. This Embedded project is to design and develop a low cost system which is based on embedded platform for agricultural automation. Optimum usage of water is main objective of this system. This project uses soil moisture sensor and temperature sensor to detect the water quantity present in agriculture and water level sensor is used for detecting water level in tank. In this system we monitor status of the sensors through WEB and GSM technologies. Here temperature, soil moisture and water level can be monitored on web page through micro controller and information will be send by SMS. This page contains all the information about the status of the sensors. This information will be viewed at remote location by using GPRS technology.

3. BRIEF WORKING

Automatic Controlled Environment Farm has a microcontroller which is used for controlling various action of the Farm. There are several parameters such as Temperature, Humidity, level of the water for plant growth. When the temperature exceeds above the required condition automatically microcontroller works according to this action. First we demonstrate in simulation after Hardware of that ideas were implemented.

4. BLOCK DIAGRAM

The basic block diagram of the automatic controlled environmental farm is shown in the figure 4.1

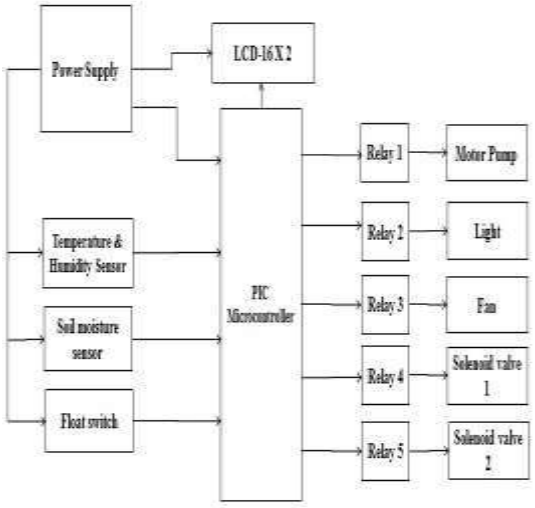

Fig.4.1: Block Diagram

4.1. BLOCK DESCRIPTION

1]**POWER SUPPLY**: It provides the supply voltage needed for the microcontrollers, sensors .it uses linear voltage regulators like 7812 and 7805 to supply the voltage 12V and 5V respectively. wherever needed.

2]**MICROCONTROLLER:** The microcontroller works based on the output given by the temperature, humidity and soil moisture sensor. We have chosen the PIC microcontroller for this project, it will control and monitor the environment inside the green house.

3]**TEMPERATURE AND HUMIDITY SENSOR:** This sensor will give the temperature and humidity as a digital data to the microcontroller.

4]**SOIL MOISTURE SENSOR:** This sensor will give the data of soil moisture content as an analog data to the microcontroller.

5]**LCD 16X2:** This LCD display is capable of displaying 16 x 2 characters We here used this display to display the temperature, humidity and soil moisture data for purpose of consumer convenience

6]**LIGHT BULB:** Light bulb is used to increase the temperature inside the greenhouse whenever the temperature goes bellow the optimum level.

7]**FAN:** Fan is used to decrease the temperature and humidity content inside the greenhouse whenever these levels go above the optimum level.

8]**MOTOR PUMP:** Motor pump is used to pump the water the into the greenhouse for increasing humidity and irrigation purposes.

9]**SOLENOID VALVES:** These valves control the flow of water inside the greenhouse used to control whether the water is needed for increasing humidity or irrigation purposes.

4.2. SIMULATION CIRCUIT:

For simulation purpose, PROTEUS SIMULATOR and CCS C Compiler. Proteus is software for microprocessor simulation, schematic, schematic capture, etc. It is developed by Lab Center Electronics.
The following are the system components of porters

- ISIS schematic Capture – a tool for entering designs.
- PROSPICE Mixed mode SPICE simulation – industry standard SPICE3F5 simulator combined with a digital simulator.
- VSM – Virtual System Modelling lets co simulate embedded software for popular micro-controllers alongside hardware designs.
- System Benefits Integrated package with the common user interface and fully context sensitive help.

Proteus virtual system Modeling combines mixed mode SPICE circuit simulation, animated components and microprocessor models to facilitate co-simulation of complete microcontroller based designs. This is very useful and user friendly to handle the components.

The version used for project design is proteus professional 8.0. proteus professional software animated design of electronic circuits. The package is a system of circuit simulation, based on the models of electronic components in Pspice.A distinctive feature of the package proteus professional is the possibility of modelling of the programmable devices such as Microcontrollers, Microprocessor, DSP and others. The simulation diagram shown in fig 2

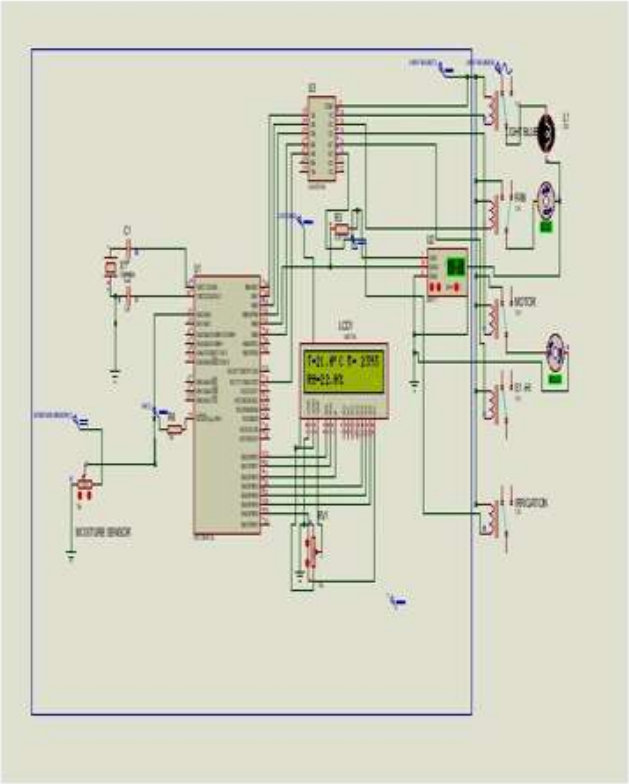

Fig.2 : Simulation Circuit

CCS stands for Custom Computer Services c compiler. CCS C Compilers are designed specifically for the PICMCU architecture, unlike competitive compilers based on a GNU or common engine with a generic code generator. Every aspect of the CCS C Compiler is specially optimized for the PICMCU.

The Pro level optimization of our PIC compilers include Standard C Constructs, numerous Pre-Processor Functions, and the largest library ofBuilt-In FunctionsThis provides developers with unique access to device hardware features at the embedded C language level. C syntax and special functions have a uniform syntax across all chip families, allowing for migration to a new chip trivial.Ready-to-Run Program Examples, andDevice Libraries, empower rapid development of applications incorporating leading edge technologies such as capacitive

touch, wired and wireless communications, motion and motor controls, and energy management.

All of their compilers are ANSI C Compliant with Pro-Level Optimization. We offer flexible software configurations to fit any project requirements. Compilers are compatible with many third-party tools such as Microchip MPLA Band MPLABX.

5. HARDWARE DESCRIPTION

5.1. POWER SUPPLY UNIT

Power supply is a very important part of electronic circuit. This circuit supplies fixed +5 V supply so to fix this voltage we need voltage regulator. In this work we used IC7805 as voltage regulator. A voltage regulator generates a fixed output voltage of a present magnitude that remains constant regardless of changes input voltage or load conditions. There are two types of voltage regulators: linear and switching.

Here we make use of linear regulator employs an active pass device (series or shunt) controlled by a high gain differential amplifier. It compares the output voltage with a passive reference voltage with a precise reference voltage and adjust the passive device to maintain a constant output voltage.

5.2. LCD DISPLAY

Liquid Crystal Display (LCD) is an Alphabetic Display it means that it can display Alphabets, Numbers as well as special symbols thus LCD is a user friendly. Display device which can be used for displaying various messages unlike seven segment display which can be used for displaying only numbers and some of the alphabets. The only disadvantage of LCD over seven segment display is that seven segment is robust display and can be visualized from a longer distance as compared to LCD, here we can use 16 x 2 alphanumeric display

5.3. DHT11 TEMPERATURE ANDHUMIDITYSENSOR

DHT11 Temperature & Humidity Sensor features a temperature & humidity sensor complex with a calibrated digital signal output. By using the exclusive digital-signal acquisition technique and temperature & humidity sensing technology, it ensures high reliability and excellent long-term stability. This sensor includes a resistive-type humidity measurement component and an NTC temperature measurement component, and connects to a high-performance 8-bit microcontroller, offering excellent quality, fast response, anti-interference ability and cost-effectiveness.

Each DHT11 element is strictly calibrated in the laboratory that is extremely accurate on humidity calibration. The calibration coefficients are stored as programmers in the OTP memory, which are used by the sensor's internal signal detecting process. The single-wire serial interface makes system integration quick and easy. Its small size, low power consumption and up-to-20-meter signal transmission making it the best choice for various applications, including those most demanding ones. The component is 4-pin single row pin package.

1 PIN - VCC
2. PIN - DATA
3. NC - NEUTRAL CONNECTION
4. GND - GROUND

5.4. SOIL MOISTURE SENSOR

The Soil Moisture Sensor is a simple breakout for measuring the moisture in soil and similar materials. The soil moisture sensor is pretty straight forward to use. The two large exposed pads function as probes for the sensor, together acting as a variable resistor. The more water that is in the soil means the better the conductivity between the pads will be and will result in a lower resistance, and a higher SIG out.

To get the Soil Moisture Sensor functioning all you will need is to connect the VCC and GND pins to your PIC microcontroller device (or compatible development board) and you will receive a SIG out which will depend on the amount of water in the soil. One commonly known issue with soil moisture sensors is their short lifespan when exposed to a moist environment. To combat this, we've had the PCB coated in Gold Finishing (ENIG or Electro Less Nickel Immersion.

1. CONCLUSION AND FUTURE SCOPE

The present study provides a reliable Greenhouse Monitoring and Control System, having wide application in agriculture. In this system the sensor side acts like a data acquisition unit that is capable of measuring different parameters like temperature, light, humidity, and soil moisture. The main part is the controller which carries out various tasks like collection, data storage, data processing and greenhouse climate adjustment. Also, the database of various plants which is already stored in our system containing the necessary climatic conditions needed for proper growth of those plants will be very useful in increasing yield of crop plants. With graphs provided and E2PROM data, analysis will be very easily done and thus required changes can be implemented in system. Thus the proposed system providing real time application and is beneficial for farmers of many developing countries like India.

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