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Automated Greenhouse Monitoring System

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Abstract*— today a major problem in Kerala is its heavy dependency on neighboring states for food products. One of the main reasons for decline in agriculture in our state is the lack of availability of cheap labour in our state. This problem can be overcome by automation in agriculture [1]. The introduction of "AUTOMATED GREENHOUSE MONITORING SYSTEM" can bring a green revolution in agriculture. Introducing this system can help in increasing the cultivation in a controlled environment. Greenhouse environment, used to grow plants under controlled climatic conditions for efficient production, forms an important part of the agriculture and horticulture sectors. Appropriate environmental conditions are necessary for optimum plant growth, improved crop yields, and efficient use of water and other resources. Automating the data acquisition process of the soil conditions and various climatic parameters that govern plant growth allows information to be collected with less labor requirements. Existing EMSs are bulky, very costly, difficult to maintain and less appreciated by the technologically less skilled work-force. This project is designed using world's most powerful microcontroller PIC 16F877A where the temperature, humidity, soil moisture and illumination conditions are analysed [2].

Keywords **–Sensors, LM35, PIC16F877A, LDR, Relay**

I. INTRODUCTION

This system consists of various sensors, namely soil moisture, temperature and light. These sensors sense various parameters temperature, soil moisture and light intensity and are then sent to the PIC microcontroller. The microcontroller constantly monitors the digitized parameters of the various sensors and verifies them with the predefined threshold values and 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. An array of actuators can be used in the system such as relays, contactors, and change over switches etc. They are used to turn on AC devices such as motors, coolers, pumps, fogging machines, sprayers. For the purpose of demonstration relays have been used to drive AC bulbs to simulate actuators and AC devices. A complete working system can be realized by simply replacing these simulation devices by the actual devices.

II. BLOCK DIAGRAM

Sensors

Soil Moisture Sensor : The circuit designed uses a 5V supply, fixed resistance of 1kΩ, resistance of 10Ω two copper leads as the sensor probes, BC548 transistor . It gives a voltage output corresponding to the conductivity of the soil .The conductivity of soil depends upon the amount of moisture present in it. It increases with increase in the water content of the soil. The voltage output is taken at the transmitter which is connected to a 10kohm resistance. The two copper leads act as the sensor probes. They are immersed into the specimen soil whose moisture content is under test. The soil is examined under three conditions:

1. Dry condition - The probes are placed in the soil under dry conditions and are inserted up to a fair depth of the soil. As there is no conduction path between the two copper leads the sensor circuit remains open.
2. Optimum condition - When water is added to the soil, it percolates through the successive layers of it and spreads across the layers of soil due to capillary force. This water increases the moisture content of the soil. This leads to an increase in its conductivity which forms a conductive path between the two sensor probes leading to a close path for the current flowing from the supply to the transistor through the sensor probes.
3. Excess water condition - With the increase in water content beyond the optimum level, the conductivity of the soil increases drastically and a steady conduction path is established between the two sensor leads and the voltage output from the sensor increases no further beyond a certain limit.

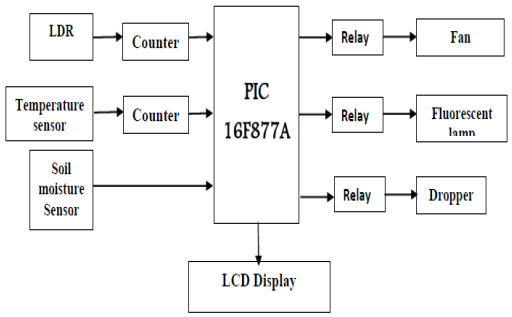

Fig. 1: Block Diagram of the System

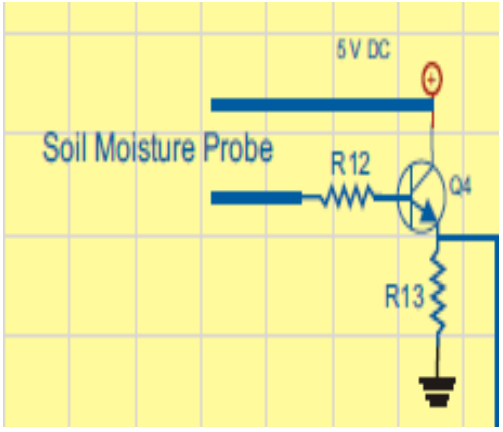

Fig. 2: circuit of soil moisture sensor

Temperature Sensor**:** LM35 IC has been used for sensing the temperature. It is an integrated circuit sensor that can be

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used to measure temperature with an electrical output proportional to the temperature (in degree centigrade). The temperature can be measured more accurately with it than using a thermistor. The sensor circuitry is sealed and not subject to oxidation, etc Calibrated directly in ° Celsius (Centigrade) Light **Sensor:** A Light Dependant Resistor is used for detecting the intensity of light inside the greenhouse [3]**.**

III. MICROCONTROLLER

The microcontroller used here for monitoring the climatic parameters is the **PIC16F877A (Programmable Intelligent Computer).** It intakes the instantaneous input signals from the sensors and compares them with the preset threshold values. If any of the parameters is not within the permissible limit, the PIC carries out necessary corrective measures.

IV. POWER SOURCE

5V Regulated power supply is required for microcontroller , LCD, Temperature sensor , buzzer and is obtained from 220V AC mains by converting it to a lower voltage with the help of 9V-12V transformer , rectification by diode D1-D4, filtering by 1000uf/50V , and finally regulation is achieved by 7805 regulator IC [4]. Circuit Diagram of programmable microcontroller based Green House Controller is shown in" fig.3".

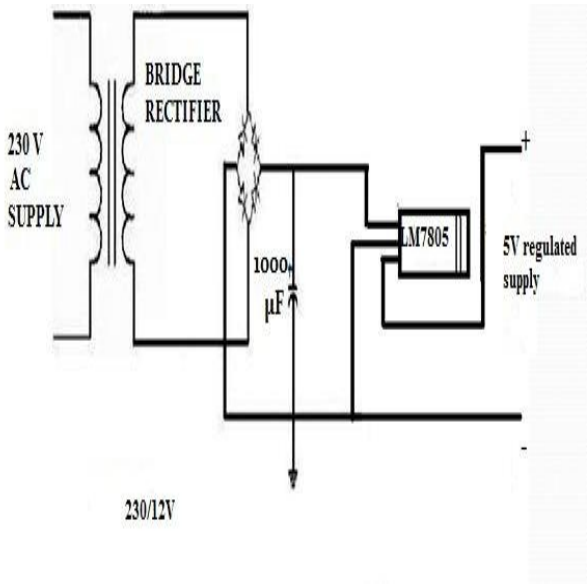

Fig. 3: Circuit Diagram of the Power source

V. OUTPUT SECTION

This section consists of various devices like cooler to reduce the atmospheric temperature, dropper to increase the water content in the soil, fluorescent lamp to compensate for lack of sunlight inside the greenhouse. These are actuated by relays controlled by the microcontroller.

VI. CIRCUIT DIAGRAM

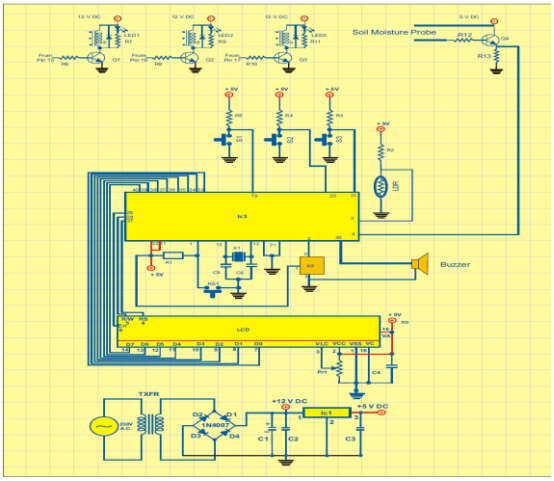

Fig. 4: Circuit Diagram of the system

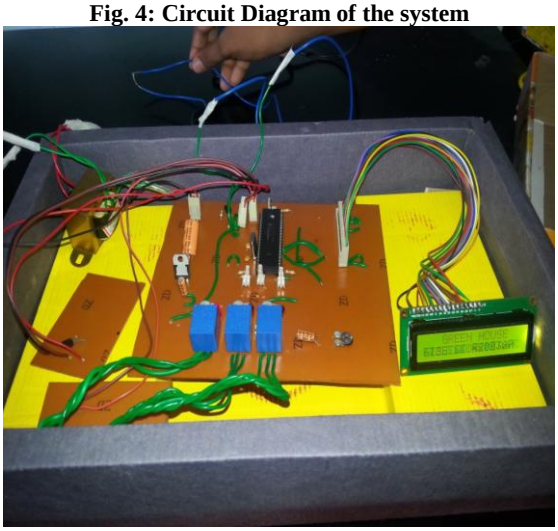

Fig. 5: A Complete hardware

VII. CONCLUSION

Automated greenhouse monitoring system consists of various sensors, namely soil moisture, temperature and light. These sensors sense various parameters temperature, soil moisture and light intensity and are then sent to the PIC microcontroller and control action taken by the PIC to compare with preset values. AGMS eliminates risk of greenhouse not being maintained at specific environmental conditions due to human error and labour cost can be reduced and it is eco-friendly. Pests are eliminated by this system and also the quality of yield can be increased.

VIII. FUTURE SCOPE

The circuit as it is can be improved in many ways and can be used in wide applications [5]. It can be placed and operated in any of the environmental conditions. Non conventional energy sources such as solar panels, wind mills are used to supply power to the automatic greenhouse equipments. AGMS has a bright scope of future in agriculture field and it will create a revolution in it.

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