



Microcontroller-Based Monitoring and Control of Greenhouse Parameters

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Abstract:

The increasing need for space due to a growing population has resulted in the reduction of forests and farms, leading to global heating with adverse effects on human life. The importance of plants and trees is thus increasing, making it essential to create a controlled environment for growing plants. In this project, we designed a microcontroller-based prototype model to monitor and control greenhouse parameters such as humidity, temperature, and light. We used LM35 as temperature sensors, PHS220 as the humidity sensor, and LDR as the light sensor to measure these parameters. The signals measured were of very low value, and hence their amplification was necessary, so LM324 was used as a non-inverting amplifier. For analog-to-digital conversion, we used ADC0808 as a 3:1 multiplexer, and IC 555 was used as a timer IC to provide a clock signal to the ADC0808. The heart of the project was the AT89S52 microcontroller, which we chose because of its larger memory. Display was done through a 16×2 line LCD, and MAX232 was used for interfacing purposes. For storing data for future use, we used EEPROM IC 24C16. The power module consisted of IC7805 for 5V supply and IC7812 for 12V supply. For the controlling action, we used sugar cube relays, and BC557 transistors were used for gain purposes. The project's success demonstrated that microcontroller-based greenhouse monitoring and control is an effective method of managing greenhouse parameters.

Keywords: greenhouse, microcontroller, monitoring, control, LM35, PHS220, LDR, LM324, ADC0808, AT89S52, LCD, MAX232, EEPROM, IC7805, IC7812, sugar cube relays, BC557 transistors.

Introduction:

With the rapid increase in the world's population and the need for more space, there has been a significant reduction in forests and farms, leading to global heating. This has adverse effects on human life, making it essential to create a controlled environment for growing plants. Greenhouses are an effective method of managing greenhouse parameters to ensure that the plants grow in a suitable environment. In this project, we designed a microcontroller-based prototype model to monitor and control greenhouse parameters such as humidity, temperature, and light.

Materials and Methods:

For the temperature sensors, we used LM35, which is a precision IC temperature sensor. For the humidity sensor, we used PHS220, which is a high-precision, high-reliability humidity sensor. We used LDR as the light sensor. To measure these parameters, we used ADC0808 as a 3:1 multiplexer. We used LM324 as a non-inverting amplifier to amplify the signals measured, as they were of very low value. IC 555 was used as a timer IC to provide a clock signal to the ADC0808, operating as an astable multivibrator with a 50% duty cycle for 220 KHz frequency. The heart of the project was the AT89S52 microcontroller, which we chose because of its larger memory. The display was done through a 16×2 line LCD, and MAX232 was used for interfacing purposes. For storing data for future use, we used EEPROM IC 24C16. The power module consisted of IC7805 for 5V supply and IC7812 for 12V supply. For the controlling action, we used sugar cube relays, and BC557 transistors were used for gain purposes.

