# GSM BASED AUTOMATIC GREENHOUSE CONTROLLED SYSTEM

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## Abstract

A scaled-down prototype of the GSM based Automatic Greenhouse Controlled system using Auduino board was build and tested. The automated greenhouse control system achieves monitoring and control of a greenhouse environment by using sensors and actuators which are under the control of a microcontroller. The codes for the controller were written in the Arduino programming language, debugged, complied and burnt into the microcontroller using the Arduino integrated development environment (IDE). The microcontroller ensures that the microclimatic parameters stay within pre-defined values as determined and set by the user. The climatic conditions of the greenhouse and state of actuators are transmitted to the remote monitoring station via a GSM (MODEM).

**Keywords** : GSM, IDE, Arduino board

## Introduction

Myanmar is a country where the economy is dependent on agricultural produce. Myanmar weather conditions are characterized by having predominantly long rainy season, hot summers, and mild winters. Such climatic conditions put a great strain on the types of crops that could be successfully grown. A greenhouse is an exceptionally outlined homestead structure building to give a more controllable environment to better harvest generation, crop security, product seeding and transplanting.

The greenhouse automatic control system will fully automate the management of a greenhouse using the latest pervasive systems and technology. The proposed system controls and monitors light intensity, soil and air humidity using a controller and GSM modules. A temperature and humidity sensor, soil moisture sensor, gas sensor and light sensor which are automatically controlled are used in this project. The concern with a lot of consumer needs and demand for the agriculture products has stimulated

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awareness among the farmer that increases their products in the market by implementing advance technologies in this industry.

This project uses sensors and Global System for Mobile Communication (GSM) and short message service (SMS) to carry out data from the greenhouse with sensors directly alert the farmers to their mobile phone. Therefore, this makes controlling plants easier by directly sending alert notification messages to farmers using GSM and SMS technology. So, this project aims to design a smart greenhouse model controlled automatically by a GSM phone. Parameters like humidity, temperature, soil, gas in air and lightning will be controlled by microcontroller. Each of these parameters is measured by a sensor that is set at a specific range, if this sensor signals any change in that range, the system will take the appropriate action required, and the system sends a daily report to the user by SMS.

Figure 1 denotes that the main system identified the hazardous condition then GSM modem activated and send the message to another modem which is connected to computer system and computer system store the lots of SMS received and send and new SMS send to first GSM and after receiving SMS, main unit can starting the operation on greenhouse system.

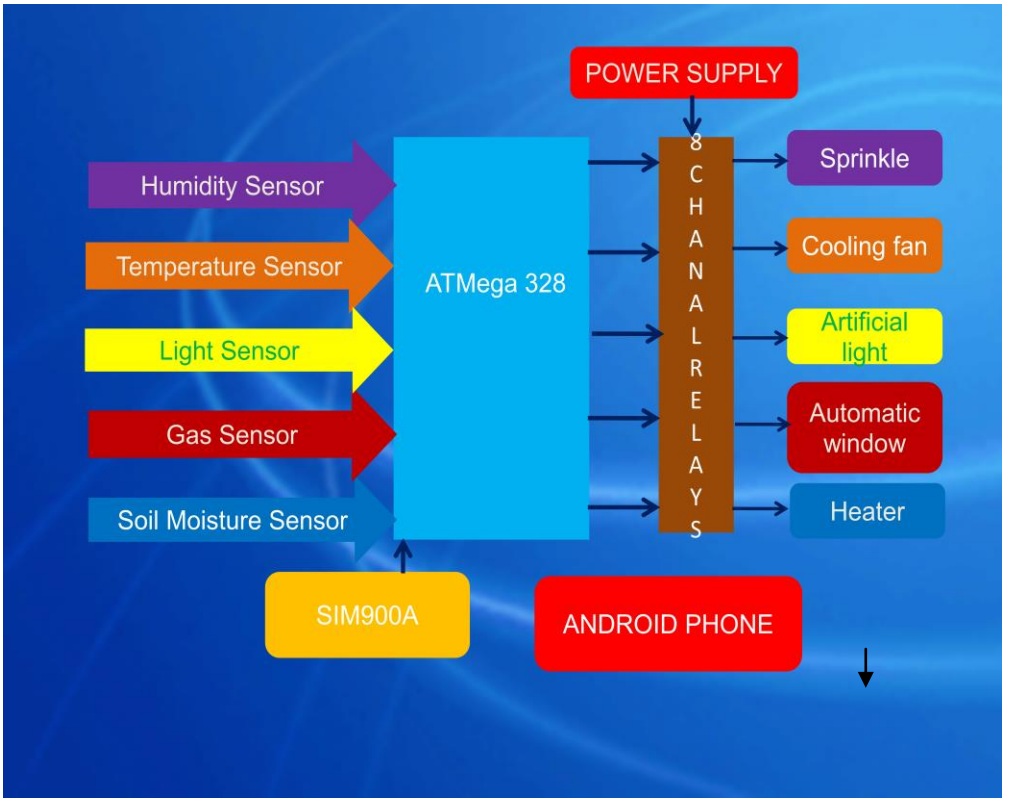


**Figure 1:** Block Diagram of Greenhouse

## Construction of Circuit

This system below measures the values of temperature, humidity, light, and soil moistures in the greenhouse by sensors and sends the data that was measured to the ARDUINO The ARDUINO processes the data and controls the water heater, cooling fan, motor and light to maintain suitable conditions in the greenhouse.

If the values of temperature and humidity are greater than optimum, it opens the cooling fan to decrease the temperature and humidity in the greenhouse.

If the value of soil moisture is less than optimum, the value opens motor and sprinkle water pipe when it is greater, irrigation will be closed.

If the toxic gas has in greenhouse, the absorbed fan absorbs the unpleasant gas from this house and also the roof opens and ventilates the fresh air.

If value of light is less than the optimum, the artificial light turns on and closes after the period is finished and when the value is grater the lamp will be turned off. The GSM model sends SMS to the user about the value that system measures.

## Circuit Explanation

This system consists of four inputs (temperature, humidity, soil sensor, gas sensor and LDR sensor) and six outputs (cooling fan, sprinkle fan, heater, and artificial light, automatic window) and PIC controller is as a main brain for this system because it controls the overall system in a greenhouse. Temperature sensor used to detect the temperature in a greenhouse. When the temperature sensor detects the high temperature, microcontroller will send the signal to the fan to stable the greenhouse condition. Then, when LDR sensor detects no light, microcontroller will be send the signal to the lamp and lamp will be on automatically. Water pump is used to supply water to the sprinkler and make sure the sprinkler watered the plants in a greenhouse. And also, gas sensor detects how many toxic in this room and then sends the data to the microcontroller. Absorbed fan and door system are used to absorb and waste the unwanted toxic air to the outside.

This ARDUINO controls circuit that will be connected to the soil sensor, humidity sensor, and temperature sensor. The ARDUINO UNO receives the value from sensor and analyses and then compares it with the threshold value stored in the ARDUINO memory, based on this value the ARDUINO takes the appropriate procedures, and also controls the output device based on these values; the ARDUINO sends the report by the GSM model to the owner's phone. The flowchart diagram of the circuit is shown in Figure 2.

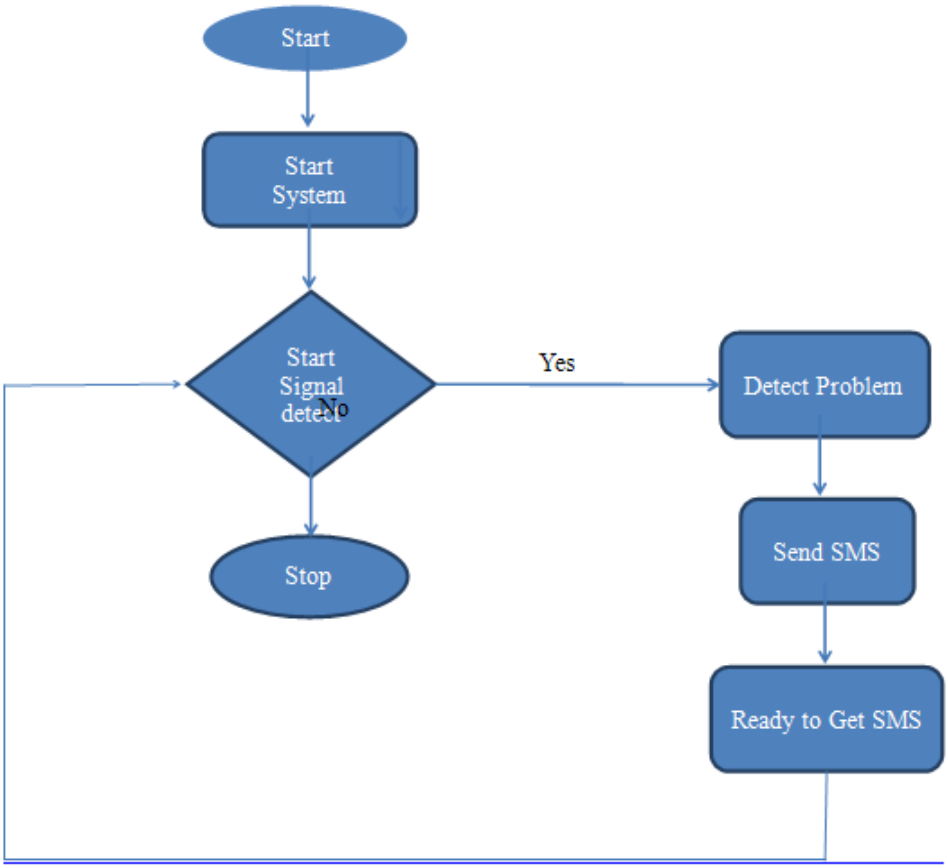


**Figure 2:** Flowchart diagram of Greenhouse Effects

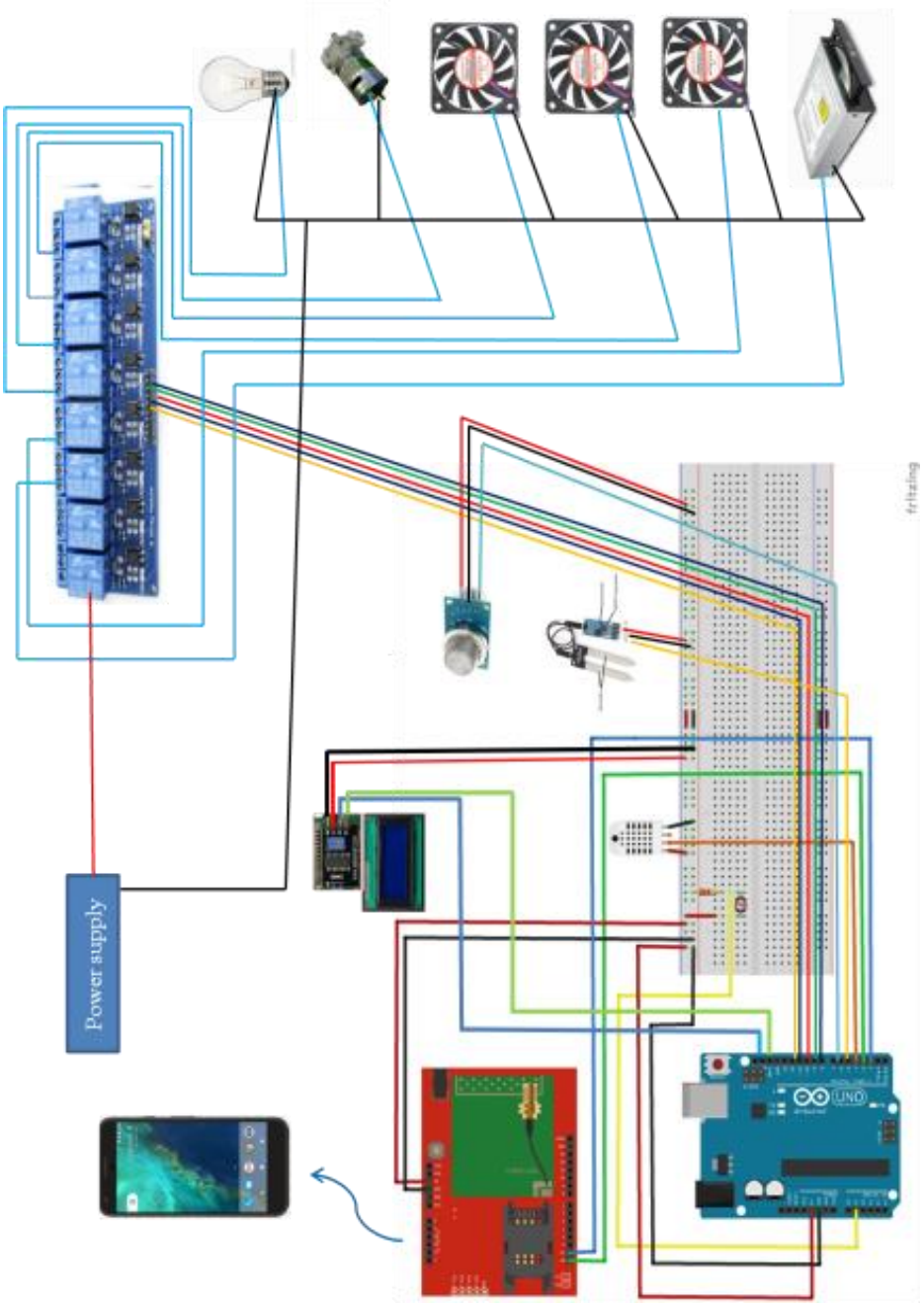
Power supply
UNO

**Figure 3:** The whole system by using ARDUINO with GSM

## Results and Discussion

Greenhouses controlling the temperature, humidity, light, water and that allow growing vegetables year round. It saves money, time, and effort.

It can provide a better environment to the plant to prevent it from damage and to increase its productivity. Some plants require a longer period of lighting than other plants; the smart greenhouse will provide the right amount of lighting. It can automatically control the amount of water needed for each plant. The photos of the Green house are shown in Figure 3 to Figure 7.

## Advantages

- Increase fertility.
- Better productivity.
- Increase in quality of crop.
- Percentage of germination of seeds is high in green house

## Disadvantages

- The tools are dealing with are very sensible, they need to be carefully and so the project may be a bit costly.
- Failure to supply the essential factors for optimum growth such as light, moisture, carbon dioxide and heat in amounts necessary for each individual crop and this problem faces greenhouses in general.
- Complete automation in terms of pest and insect detection and eradication cannot be achieved.
- Requires uninterrupted power supply.


**Figure 4 :** Photograph of front side of Greenhouse

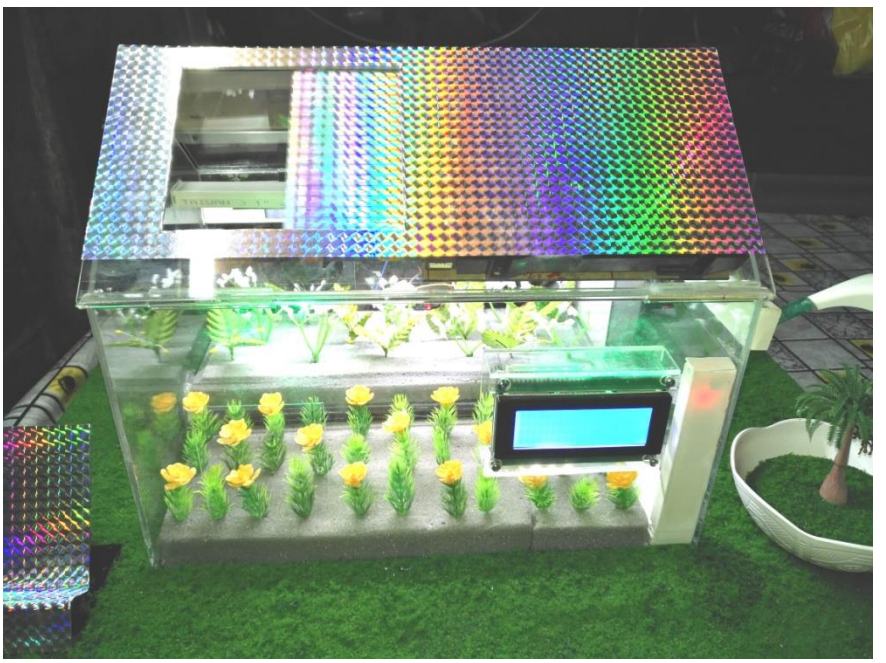

**Figure 5:** Photograph of Ventilated Door System of Greenhouse

**Figure 6:** Photograph of back side of Greenhouse

**Figure 7:** Photograph of Right Side of Greenhouse

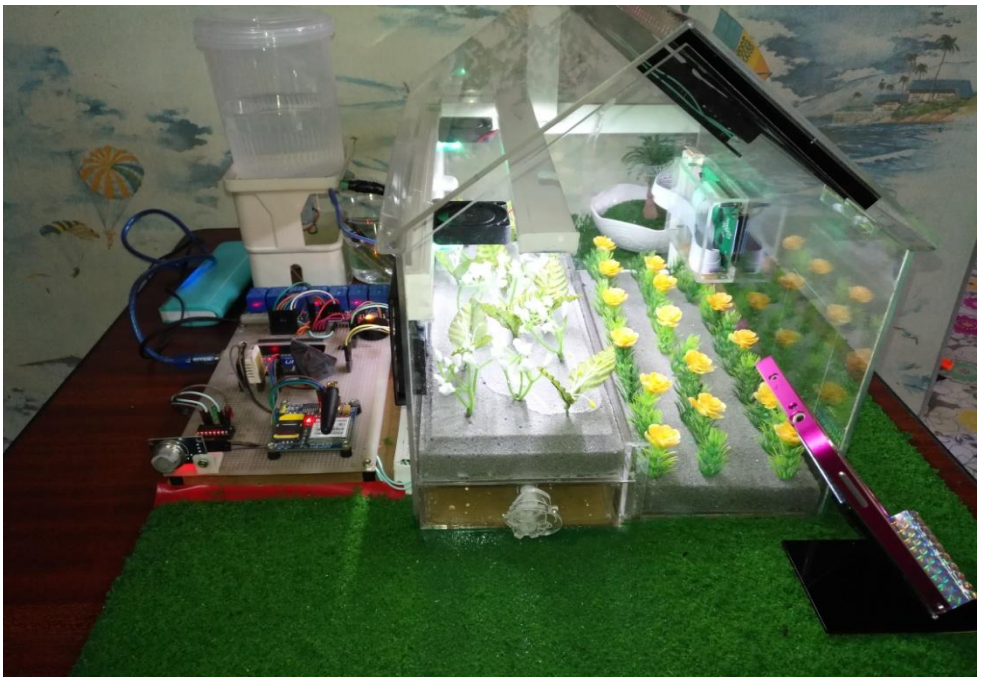

**Figure 8:** Photograph of Left Side of Greenhouse

## Conclusion

This research offers a design of fully automated greenhouse management system. From the experiment it could be seen that it is fulfilling all requirements related greenhouse monitoring. The automatic greenhouse sensor design could help in increasing the productivity of plants.

As it has been mentioned earlier, not only providing automatic control over the devices like light, motor pump but also mechanism to alert owner regarding the parameter changes in the greenhouse so that early precaution steps can be taken. Thus this construction, productivity of cropping can be continuously increased so it can handle famine problem around the world. The greenhouse monitoring system using GSM is far better than the same system using the different technologies.

## Future Work

This system can work more efficiently with present technology and may improve the existing technology in the field of wireless communication and with the wide improvement of GSM technology which can improve Short Message Service with the help of embedded technology anything may become possible and easy.

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