MULTI-SENSOR INTEGRATED SYSTEM FOR WIRELESS MONITORING OF GREENHOUSE ENVIRONMENT

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1.ABSTRACT:

Several parameters contribute to the growth of plants in a commercial greenhouse, namely soil moisture, soil temperature, atmospheric temperature and humidity, carbon dioxide (CO2) and light intensity. Maintaining optimal levels of these environmental parameters is essential for healthy growth of the plants and to maximise yields in terms of fruits and flowers. Monitoring only a few parameters, such as temperature and humidity, while neglecting others, leads to inaccurate observations and sub-optimal yields. At the same time, increases in greenhouse sizes have forced the growers to increase measurement points (sensor stations) to accurately track changes in the environment.

Keywords- Arduino, genetic, hostile, intervention, Zigbee.

2.INTRODUCTION

As the improving new technologies in day to day life. The gathered data provide various environment factor. Greenhouse technology is an alternative solution for controlling micro conditions to plants. The change of air temperature within a greenhouse is one of the vital parameters that needs to be monitored. Recent temperature monitoring systems still use a single temperature sensor placed at one of the observation locations to detect temperature change in a relatively wide space greenhouse with uneven temperature distribution. The objective of the study is to develop a system for monitoring the temperature in the greenhouse by placing multiple temperature sensors at several observation positions. The proposed system allows more representative and comprehensive observations for conducting an analysis of the temperature changes using wireless communication.

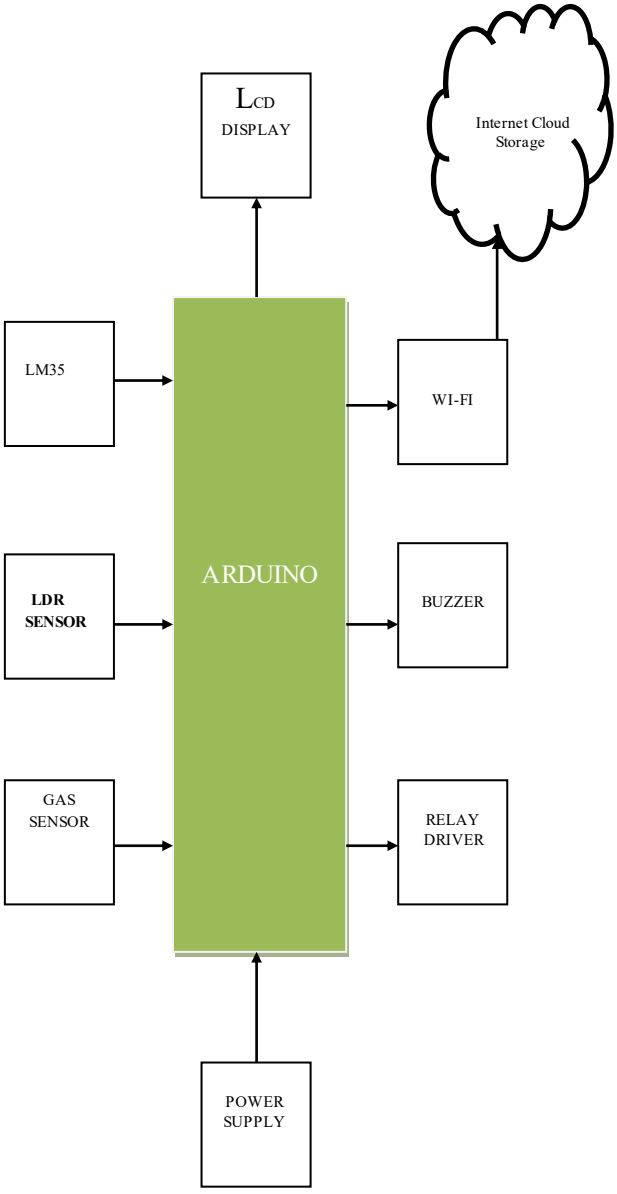
3.LITRATURE SURVEY

The existing system, conventional greenhouse climate monitoring system has been detailed with high cost with least accuracy which leads us to an automatic wireless greenhouse climate monitoring which emphasis on the programming aspects and testing of a temperature and humidity sensor. The proposed system consists of three units- Sensor Station (SS)[1], Coordinator Station (CS) and Central Control Station (CCS). The backbone of the wireless network is based on ZigBee modules[2] for communication between the SS and CS whereas the communication between the CS and CCS uses a XStream proprietary RF modem[3]. Field trials conducted have established the functionality and reliability of the designed wireless sensor network.

4.PROPOSED WORK

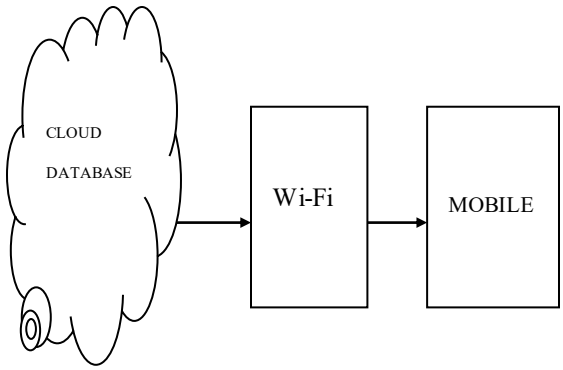
In this project, parameter monitoring and control of greenhouse environment play an important role in greenhouse production and management. This paper involve a design and implementation of an X Bee based Wireless Sensor Network (WSN) that is used to monitor and control the essential greenhouse parameters, such as, temperature, humidity and light intensity. This implementation supports the farmers to increase the crop production. The standalone X Bee module, i.e., without microcontroller, is integrated with

specific small size sensors. All monitored parameters are transmitted through a wireless link to computer via coordinator to be analyzed, and then initiate suitable commands to the specific devices to overcome the drifts in an environmental parameters inside greenhouse.



Arduino is intended for an artist, tinker, designer or anyone, interested in playing with electronics without the knowhow of complex electronics and programming skills. Arduino is an excellent designed open source platform. It has specially designed boards which can be programmed using the Ardunio Programming Language (APL).

The open source nature of Arduino has been the main reason for its rapid horizontal growth. Since it is an Open Source project, all the files related to hardware and software is available for personal or commercial use. The development cost of the hardware is very small as against the costly similar proprietary products by the industrial giants. The open source nature doesn't require any licenses to develop, use, redistribute or even sell the product. But the Arduino name is trade mark protected (Arduino™) i.e., you are free to sell the Arduino board.



The Arduino hardware uses a microcontroller IC which needs to be programmed to perform any desired task. This program is written in the Arduino software using the Arduino Programming Language (APL). After compiling the program it is loaded into the memory of the microcontroller on the board using a serial or USB connection.

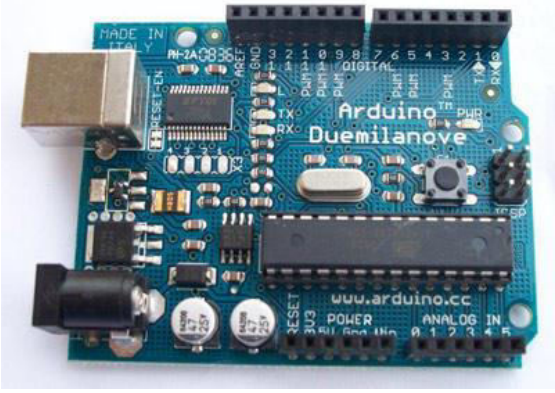
The program can be downloaded to the memory of the microcontroller using the Arduino Software itself, thereby avoiding the need of any other external programmer. Writing codes for non professionals is a difficult task. This was the key goal of the Arduino to reduce the complexity in writing codes and allow non-professionals and creative people to foster their thinking with the help of Arduino.

5.HARDWARE USED:

5.1. ARDUINO MOTHERBOARD:

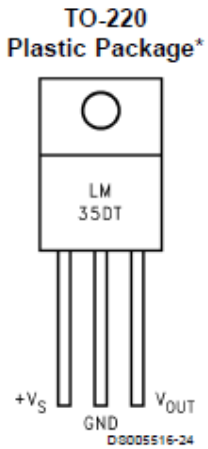
The Arduino hardware was very skillfully designed to reduce the complexities arising in the circuitry. It has an In System Programmer (ISP), which allows users to transfer the software inside the microcontroller without removing it from the circuit.

The basic model of an Arduino board consists of an 8-bit AVR micro-controller along with some other necessary components like a 5 volt linear regulator IC, a 16 MHZ crystal, ceramic resonator, output connectors, direct adaptor input, etc.



5.2. TEMPERATURE SENSOR (LM35):

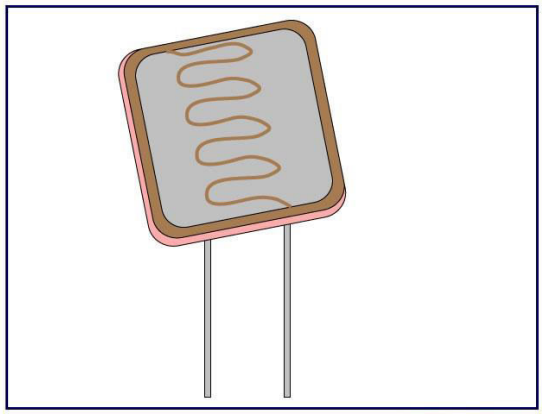
The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in ºC). The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified.



5.3. LDR SENSOR:

An LDR (Light dependent resistor), as its name suggests, offers resistance in response to the ambient light. The resistance decreases as the intensity of incident light increases, and vice versa. In the absence of light, LDR exhibits a resistance of the order of mega-ohms which decreases to few hundred ohms in the presence of light. It can act as a sensor, since a varying voltage drop can be obtained in accordance with the varying light. It is made up of cadmium sulphide (CdS).

An LDR has a zigzag cadmium sulphide track. It is a bilateral device, i.e., conducts in both directions in same fashion.

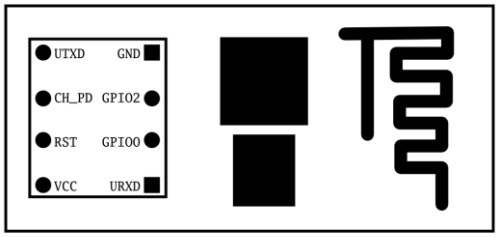


5.4. RELAY DRIVER

Relay is one of the most important electromechanical devices highly used in industrial applications specifically in automation. A relay is used for electronic to electrical interfacing i.e. it is used to switch on or off electrical circuits operating at high AC voltage using a low DC control voltage. A relay generally has two parts, a coil which operates at the rated DC voltage and a mechanically movable switch. The electronic and electrical circuits are electrically isolated but magnetically connected to each other, hence any fault on either side does not affects the other side.

5.5. LCD DISPLAY

Liquid crystal cell displays (LCDs) are used in similar applications where LEDs are used. A liquid crystal display (LCD) is an electronically-modulated optical device shaped into a thin, flat panel made up of any number of color or monochrome pixels filled with liquid crystals and arrayed in front of a light source (backlight) or reflector. It is often utilized in battery-powered electronic devices because it uses very small amounts of electric power. LCD consists of two glass panels, with the liquid crystal materials sandwiched in between them.



ESP8266 WiFi Pinout
Top View (Not to scale)

5.6. POWER SUPPLY

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others. Power supplies for electronic devices can be broadly divided into linear and switching power supplies. The linear supply is a relatively simple design that becomes increasingly bulky and heavy for high current devices; voltage regulation in a linear supply can result in low efficiency. A switched-mode supply of the same rating as a linear supply will be smaller, is usually more efficient.

5.7.Wi-Fi MODULE

ESP8266 is an impressive, low cost WiFi module suitable for adding WiFi functionality to an existing microcontroller project via a UART serial connection. The module can even be reprogrammed to act as a standalone WiFiconnected device–just add power!

The feature list is impressive and includes:

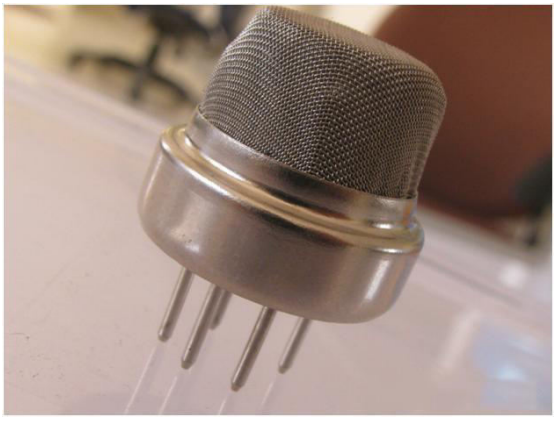
- 802.11 b/g/n protocol
- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack

5.8. PIEZO BUZZER

Piezo buzzer is an electronic device commonly used to produce sound. Light weight, simple construction and low price make it usable in various applications like car/truck reversing indicator, computers, call bells etc. Piezo buzzer is based on the inverse principle of piezo electricity discovered in 1880 by Jacques and Pierre Curie. It is the phenomena of generating electricity when mechanical pressure is applied to certain materials and the vice versa is also true. Such materials are called piezo electric materials. Piezo electric materials are either naturally available or manmade. Piezoceramic is class of manmade material, which poses piezo electric effect and is widely used to make disc, the heart of piezo buzzer. When subjected to an alternating electric field they stretch or compress, in accordance with the frequency of the signal thereby producing sound.

5.9. GAS SENSOR

In current technology scenario, monitoring of gases produced is very important. From home appliances such as air conditioners to electric chimneys and safety systems at industries monitoring of gases is very crucial. Gas sensors are very important part of such systems The gas sensor module consists of a steel exoskeleton under which a sensing element is housed. This sensing element is subjected to current through connecting leads. This current is known as heating current through it, the gases coming close to the sensing element get ionized and are absorbed by the sensing element. This changes the resistance of the sensing element which alters the value of the current going out of it.



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5.10. MOTOR:

Geared DC motors can be defined as an extension of DC motor which already had its Insight details demystified here. A geared DC Motor has a gear assembly attached to the motor. The speed of motor is counted in terms of rotations of the shaft per minute and is termed as RPM .The gear assembly helps in increasing the torque and reducing the speed. Using the correct combination of gears in a gear motor, its speed can be reduced to any desirable figure. This concept where gears reduce the speed of the vehicle but increase its torque is known as gear reduction.

6.SOFTWARE USED:

6.1 Arduino Software (IDE):

The Arduino Integrated Development Environment - or Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino and Genuino hardware to upload programs and communicate with them.

6.2 Writing Sketches:

Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino. The editor has features for cutting/pasting and for searching/replacing text. The message area gives feedback while saving and exporting and also displays errors. The console displays text output by the Arduino Software (IDE), including complete error messages and other information. The bottom righthand corner of the window displays the configured board and serial port. The toolbar buttons allow you to verify and upload programs, create, open, and save sketches, and open the serial monitor.

6.3. PROTEUS

It is used by electronic design engineers and technicians to create schematics and electronic prints for manufacturing printed circuit board. It is used to check coding correct or not. In this embedded designs for electronics before actual network testing simulators avoid damaging network and wrong design. In system , they are used to API to communicate software and hardware.

7.EXPERIMENTATION AND RESULT:

All hardware devices connected in Arduino board like buzzer, sensors, LCD, motor, relay driver. Where parameter like humidity, temperature, soil moisture are sensed and monitored using the hardware components.

8.FUTURE WORK AND CONCLUSION

In future we are going to propose system using cloud computing and GPS. the design of a wireless climate monitoring system has been presented which is hierarchically organised as three stations – sensor station, coordinator station and the central control station. Each station has a predefined role. A large greenhouse will typically have several sensor stations. Each sensor station is equipped with sensors to monitor the vital environmental parameters such as temperature, humidity, soil moisture etc. The data from the sensors is collected and sent to the coordinator station using Zib Bee wireless modules. In archival mode, historical data can be retrieved and plotted. This allows past data to be analysed to study the trend of the measured data.

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