



## GREEN HOUSE MONITORING USING WIRELESS SENSOR NETWORK THROUGH ZIG BEE TECHNOLOGY

S.Priyanka<sup>1</sup>, D.Ponniselvi<sup>2</sup>,

M.Phil Full time Research Scholar, PG and Research Department of Computer Science<sup>1</sup>

Asst. Professor, Department of Computer Science<sup>2</sup>

Vivekanandha College of Arts & Sciences for Women (Autonomous),

Tiruchengode, Namakkal-637 205,

Tamil Nadu, India

[ammuraj22@gmail.com](mailto:ammuraj22@gmail.com)<sup>1</sup>, [gokulponnics@gmail.com](mailto:gokulponnics@gmail.com)<sup>2</sup>

**ABSTRACT-** In recent years, there are so many industries emitting the green house gases (GHG) which affect the human beings. The most harmful gases among all of them are CO<sub>2</sub>, methane gas, NO<sub>2</sub>, humidity and temperature from industries by its corresponding sensors interfaced with the ARM7 controller etc. To avoid such effects an efficient green house gases monitoring system is necessary. In this paper, an on-line green house gases monitoring system based on wireless sensor network is implemented using Zig-bee Digi modules and open source hardware platform Arduino. LM35 temperature sensor is used. LED is used to indicate the emission level. LCD is used to display the constituents of gases and temperature. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected.

**Keywords:** Arduino, Zig-bee, Wireless sensor network, sensors, Arduino Ethernet Shield, Web-server, On-line monitoring, LM35 temperature sensor, LED, LCD, GSM, ARM7 controller.

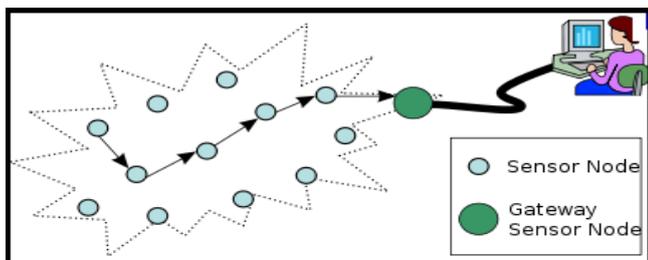
### I. Introduction:

A greenhouse is a building where plants are grown. Greenhouse protects crops from too much heat or cold, shield plants from dust storms and blizzards, and help to keep out pests. A greenhouse gas is any gaseous compound in the atmosphere that is capable of absorbing infrared radiation, thereby trapping and holding heat in the atmosphere. By increasing the heat in the atmosphere, greenhouse gases are responsible for the greenhouse effect, which ultimately leads to global warming. Wireless sensor networks (WSN) have been deployed for green house gases monitoring. The WSN is built of "nodes" – from a few to several hundreds or even thousands, where each node is connected to one (or sometimes several) sensors. Significant inputs of the heat and light may be required, particularly in the winter production of warm weather vegetables. Because the temperature and humidity of greenhouses must be constantly monitored to ensure optimal conditions, a WSN can be used to gather data remotely. The data are transmitted to a central location and used to control heating, cooling, and irrigation systems. The greenhouse gases are known

to be the major cause of global warming, as they trap heat in the earth's atmosphere. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors. A LCD is connected to the controller which displays the concentration of green house gases and the level of temperature and humidity which is emitted from the industry. To indicate this concept in simulation, motor is used as the industrial machine.



Wireless technologies have been rapidly developed during recent years. There are a few types of wireless communication technologies which is ZigBee, Wi-Fi and Bluetooth. Wi-Fi, Bluetooth and Zigbee work at similar RF frequencies, and their application sometimes overlaps [2]. Table 1 shows the comparison between ZigBee, Wi-Fi and Bluetooth.



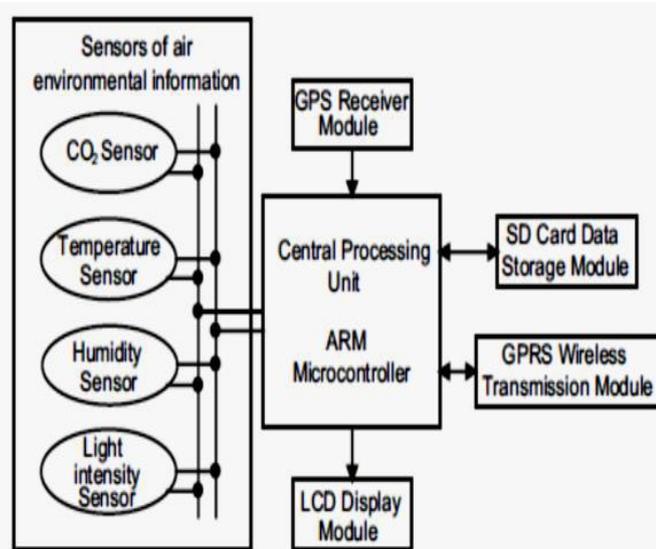
Typical multi-hop wireless sensor network architecture ZigBee is a low power wireless specification based on the Institute of Electrical and Electronics Engineers (IEEE) standard 802.15.4.2003 and was established in 2002 by a group of 16 companies. It introduces mesh networking to the low power wireless space and is targeted towards applications such as smart meters, home automation and remote controls [7].

## II.SYSTEM OVERVIEW:

This paper gives the simulation output of the monitoring system. The gas sensors, temperature and humidity sensor are connected to the ARM controller. The controller will process the values and it is displayed in LCD display. There is exactly one coordinator in each network and it is the device that establishes the network originally. It is able to store information about the network, including security keys. If there is abnormal temperature, using relay, the power supply will be shut on or off to the industries.

### Existing System:

In the existing system, a remote online carbon dioxide (CO<sub>2</sub>) concentration monitoring system is developed, based on the technologies of wireless sensor networks, in allusion to the gas leakage monitoring requirement for CO<sub>2</sub> capture and storage. The remote online CO<sub>2</sub> monitoring system consists of monitoring equipment, a data centre server, and the clients. The sensors array of CO<sub>2</sub>, temperature, humidity, and light intensity are used to collect data and the GPS receiver module is adopted to collect location and time information.



### Proposed System:

The proposed system is used to monitor the green house gas leakage in industries. The various gas sensors inside the system will have a certain emission level as its criterion. If the gases from industries exceed its emission level, then the system will indicate with an alarm to reduce its emission level. If the emission is not reduced after the indication of alarm then the power supply will be shut down to the industry using relay. The temperature sensor is used to sense the environment temperature near the industry. Humidity sensor is used to sense the moisture level in the industry. LCD display is used to display the temperature, humidity, NO<sub>2</sub> and CO<sub>2</sub> levels.

### III.SYSTEM IMPLEMENTATION:

#### ARDUINO UNO R3 MICRO CONTROLLER:

Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer (ex., Flash, Processing, MaxMSP). Arduino is an open source hardware. An Arduino board consists of an Atmel 8-, 16- or 32-bit AVR microcontroller (although since 2015 other makers' microcontrollers have been used) with complementary components that facilitate programming and incorporation into other circuits. The Arduino Uno Rev3 is a micro-controller board based on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button.



#### Zigbee Transceiver:

The (XB24-Z7WIT-004) modules are part of the XBee ZB family which provides Zig-Bee level interoperability with Zig-Bee devices from other vendors. Zig-Bee is a protocol that uses the 802.15.4 standard as a baseline and adds additional routing and networking functionality. It has various features like Wire antenna, Cross-compatibility with other ZB modules etc.



### Wiznet W5100 Ethernet Shield:

The Arduino Ethernet Shield allows an Arduino board to connect to the Internet. It is based on the Wiznet W5100 Ethernet chip. It supports up to four simultaneous socket connections. Use the Ethernet library to write sketches which connect to the Internet. The Ethernet Shield has a standard RJ-45 connection, with an integrated line transformer and Power over Ethernet enabled. There is an on-board micro-SD card slot, which can be used to store files for serving over the network.



### ARM Controller :

The ARM controller is responsible for all the operations. With their compact 64 and 144 pin packages, low power consumption, various 32-bit timers, combination of 4-channel 10-bit ADC and 2/4 advanced CAN channels or 8-channel 10-bit ADC and 2/4 advanced CAN channels, and up to 9 external interrupt pins these microcontrollers are particularly suitable for industrial control, medical systems, access control and point-of-sale.

### Gas Sensor:

Gas sensors work by having some kind of electrical transducer that converts the presence of gas into a measurable signal. A carbon dioxide sensor or CO<sub>2</sub> sensor is an instrument for the measurement of carbon dioxide gas.

### Temperature Sensor:

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature.

### GSM:

GSM (Global System for Mobile Communications), is a standard set developed by the European Telecommunications Standards Institute (ETSI) to describe protocols for second generation (2G) digital cellular networks used by mobile phones. In this system, GSM is used to communicate with the server which indicates the temperature, humidity, CO<sub>2</sub> and NO<sub>2</sub> levels.

### LCD:

The Liquid Crystal Display (LCD) is used to display the level of emitted CO<sub>2</sub> and NO<sub>2</sub> gases, temperature and humidity in the industry environment. It is interfaced with the ARM controller.

**Sri Vasavi College, Erode Self-Finance Wing**

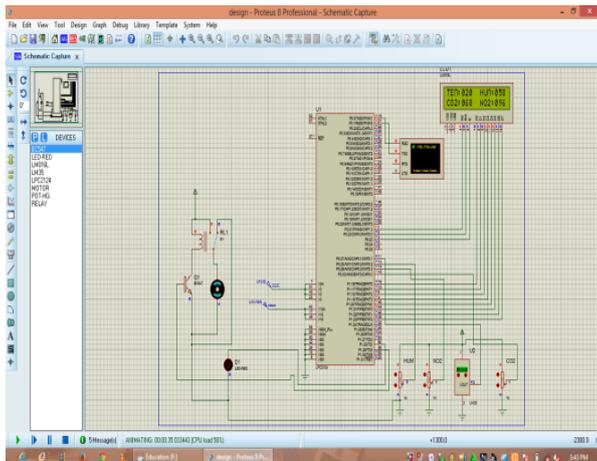
3<sup>rd</sup> February 2017

National Conference on Computer and Communication **NCCC'17**

<http://www.srivasavi.ac.in/>

[nccc2017@gmail.com](mailto:nccc2017@gmail.com)

#### IV. Result:



In Figure 4.2 and Figure 4.3, LCD is connected to the controller which displays the concentration of CO<sub>2</sub>, NO<sub>2</sub> gases, the temperature and humidity that comes out from the industry environment. When the smoke exceeds its criterion level that we specified, LCD will display as abnormal temperature. Instead of buzzer, LED is used to indicate the industry. When LED is on, the motor will be stopped. After the smoke concentration gets reduced, the LED will be off and the motor will start to run.

#### V. Conclusion:

The low cost greenhouse monitoring was successfully developed using ZigBee technology as WSN. The proposed system which is designed shows the simulation output of sensing the CO<sub>2</sub> gas, NO<sub>2</sub> gas, temperature and humidity in the industry environment. LED is used instead of buzzer. When the criterion level exceeds the

controller will induce the LED to glow. The data were sent from transmitter to receiver and LCD screen displayed the collected data and it is showing both sensor, temperature and humidity working properly for 100 meter range. The wireless ZigBee transmitter and receiver module need a higher technology device for communication system so that the system can send the data in any long distance in bigger greenhouse site.

#### VI. REFERENCES:

- [1] Ling-ling Li, Shi-Feng Yang, Li-Yan Wang, and Xiang-Ming Gao., The Greenhouse Environment Monitoring System Based on Wireless Sensor Network Technology, IEEE International Conference on Cyber Technology in Automation, Control, and Intelligent Systems, March 2011.
- [2].A. R. Al-Ali, Member, IEEE, Imran Zualkernan, and Fadi Aloul, Senior Member, IEEE " A Mobile GPRS-Sensors Array for Air Pollution Monitoring", IEEE SENSORS JOURNAL, VOL. 10, NO. 10, OCTOBER 2010.
- [3] L.Rajasekar, K.Sundaresan, "An Environmental Air Pollution Monitoring System Based on GSM".
- [4] Michael Barr. "Embedded Systems Glossary". Neutrino Technical Library. Retrieved 2007-04-21. Jump up. Heath, Steve (2003). Embedded systems design. EDN series for design engineers (2 ed.). Newnes. P.
- [5]H. Liu, Z. Meng and S. Cui., A Wireless Sensor Network Prototype for Environmental Monitoring in Greenhouse, International Conference of Wireless Communications, Networking and Mobile Computing 2007 (WiCom 2007), September 2007, pp. 2344 – 2347.



**Sri Vasavi College, Erode Self-Finance Wing**

3<sup>rd</sup> February 2017

National Conference on Computer and Communication *NCCC'17*

<http://www.srivasavi.ac.in/>

[nccc2017@gmail.com](mailto:nccc2017@gmail.com)

- [6] Jin-Shyan Lee, Yu-Wei Su, and Chung-Chou Shen, Comparative Study of Wireless Protocols: Bluetooth, UWB, ZigBee, and Wi-Fi,  
[7] Phill Smith, Comparisons between Low Power Wireless Technologies, U.S Patent CS-213199-AN. 2011