Automated Fire Extinguisher

Mohammad Rafiq S, Sushmitha P, Thriveni T, Harsha Vardhan P, V. Cinnapu Devi Reddy
Brindavan Institute of Technology and Science, Department of Electronics and Communication Engineering
Pedda Tekur, Kurnool, Andhra Pradesh, India

ABSTRACT

Normally, fire causes huge damage of property and life. Detection of fire at an early stage can avoid loss. Our present paper discusses about the automated fire extinguisher. If the fire has been detected and extinguished at an early stage, one can reduce the destructions caused by it. Since robotics has gained popularity due to the advancements of technologies. Properly equipped robot can detect the fire. Once the fire has been detected, the robot is instructed to extinguish the fire by using water sprinkler and air blower systems. The usage of these two extinguishing equipments involve that sprinkling the water along with the air will increase the pressure. This leads to the fast extinguishment of the fire. The robot is equipped with the fire sensor which can detect the fire. The project what we have aimed is of industrial protocol. The GPS will recognize the location in terms of latitude and longitude values. While GSM is used to send a message to the nearby hospital along with GPS values.The ZIG-BEE provides the communication between the transmitter and receiver sections. The transmitter section is nothing but the robot which is in mobility while the receiver section is the stationary one. The message to the hospital from the GSM is for the support to the workers who had caught in the fire and got injured. The temperature sensor will check the temperature. That means, whether the temperature is high or low.

I.   INTRODUCTION

The main aim of this project is to reduce the destruction caused due to the fire accidents. whenever the fire has been detected, the ZIGBEE communicate with the receiver section where the LCD will display a message as "Fire is detected" and the buzzer will ON. Also the GSM will send a message to the pre-defined number along with the location values. The monitoring candidate gets alerted by the message and through buzzer the workers will get the intimation that the fire has been caught. If the temperature exceeds the withstanding range of the robot, then the robot will send a message as "High temperature is detected" and the functioning gets stopped. We can avoid loss of life and property by detecting the fire at an early stage. This can also reduce the delay caused when humans are involved in extinguishing the fire. That means, it reduces the human risks.
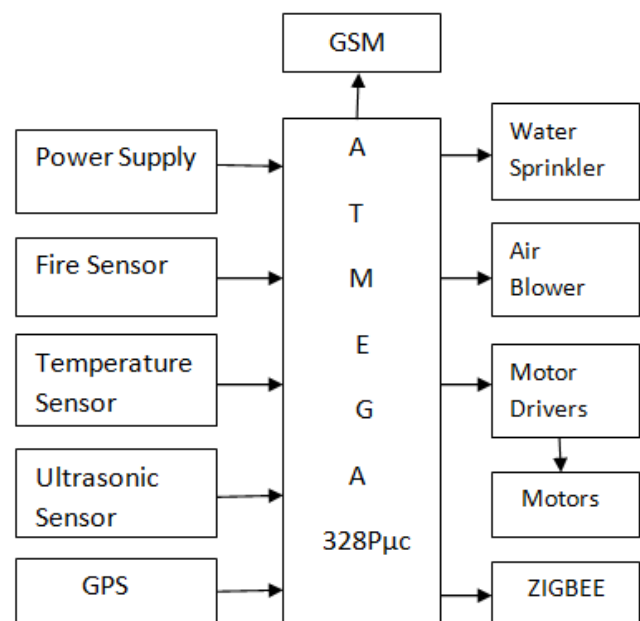
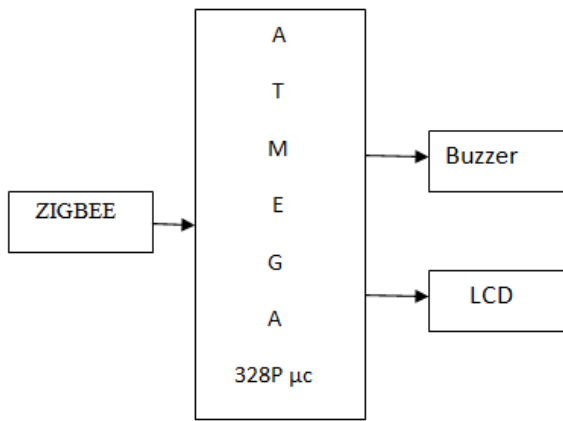## II.   BLOCK DIAGRAMS

Figure 1(a). Transmitter Section

Figure 1(b). Receiver Section

III. COMPONENTS USED

- ✓ Arduino UNO
- ✓ Fire Sensor
- ✓ Temperature Sensor
- ✓ Ultrasonic Sensor
- ✓ Water Sprinkler and Air Blower
- ✓ GPS
- ✓ GSM
- ✓ ZIG-BEE
- ✓ LCD
- ✓ Buzzer

3.01 ARDUINO UNO:

It is the basic controller used in wireless color indication system. The features of the micro controller are:

- Microcontroller : ATmega328
- Operating Voltage : 5 V
- Input Voltage : 7 to 12 v
- Input Voltage (limits) : 6 to 20 V
- Digital I/O pins : 14
- Analog Input pins : 6
- DC Current per I/O pin : 40 mA
- DC current for 3.3 V pin : 50 mA
- Flash Memory : 32 KB
- SRAM : 2 KB
- EEPROM : 1 KB

Figure 1

3.02 FIRE SENSOR:

A flame or fire detector is a sensor designed to detect and respond to the presence of flame or fire, allowing flame detection. A flame detector can often respond faster and more accurately than a smoke or heat detector due to the mechanisms it uses to detect the flame. It can include sounding an alarm, deactivating a fuel line(such as a propane or natural gas line).

Figure 2

3.03 TEMPERATURE SENSOR:

The temperature sensor detects the temperature. The LM35 series are precision integrated circuits temperature sensors, whose output voltage is linearly proportional to the Celsius temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in degree Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient centigrade scaling. This can be rated to full range of -55ºc to +150ºc.
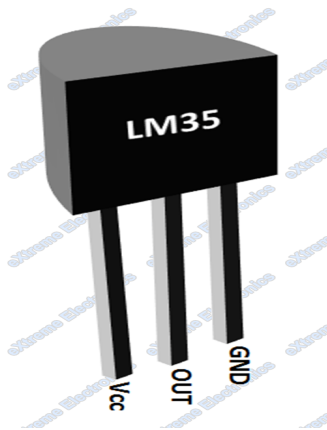
Figure 3

Figure 5

3.04 ULTRASONIC SENSOR:

Ultrasonic sensor use sound to determine the distance between the sensor and the closet object in its path. These sensors operates at a frequency above human hearing. The sensor sends out a sound wave at a specific frequency. It then listens for that specific sound wave to bounce off of an object come back. The sensor keeps track of the time between sending the sound wave and the sound wave returning.

Figure 4

3.05 WATER SPRINKLER AND AIR BLOWER:

Fans and blowers are turbo machines which deliver the air at a desired high velocity but a relatively low static pressure. A large number of fans and blowers for relatively high pressure applications are of centrifugal types. The water sprinkler used in our project is of 5V DC water sprinkler motor which can able to sprinkle the water at the respective rpm of the motor.

3.06 GPS:

When the GPS receiver is turned on, it first downloads orbit information of all the satellites. This process, the first time, can take as long as 12.5 minutes, but once this information is downloaded, it is stored in the receivers memory for future use. Even though the GPS receiver knows the precise location of the satellites in space, it still needs to know the distance from each satellite it is receiving a signal from. That distance is calculated, by the receiver, by multiplying the velocity of the transmitted signal by the time it takes the signal to reach the receiver. The receiver already knows the velocity, which is the speed of a radio wave or 186000 miles per second(Speed of light).
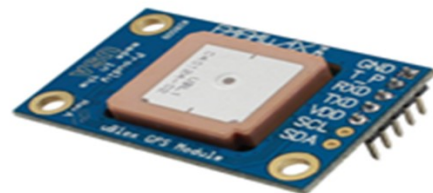

Figure 6

3.07 GSM:

Global System for Mobile Communication is a digital cellular technology used for transmitting voice and data services. GSM operates at 850,900,1800,1900MHZ frequency bands. GSM uses TDMA technique for communication purpose. It can carry 64kbps to 120mbps of data rate.

Figure 7

3.08 ZIG-BEE:

The technology defined by the ZIG-BEE specification is intended to be simpler and less expensive than other Wireless Personal Area Network (WPAN), such as Bluetooth or more general wireless networking such as WIFI. Applications includes wireless light switches, home energy monitors, traffic management system and other consumer and industrial equipment that requires short range low rate wireless data transfer.

Figure 8

Its low power consumption limits transmission distances to 10 to 100 meters line of sight, depending on power output and some characteristics of environmental. These devices can transmit data over long distance through a mesh network of intermediate devices to reach more distant places. These devices are typically used in low data rate applications. That requires long battery long battery life. It has a define rate of 250 Kbit/s.

3.09 LCD DISPLAY 16 *2:

A liquid-crystal display (LCD) is a flat-panel display or other electronically modulated optical device that uses the light-modulating properties of liquid crystals. Liquid crystals do not emit light directly, instead using a backlight or reflector to produce images in color or monochrome. Generally LCD displays are present everywhere around us. Computers, calculators, television sets, mobile phones, digital watches use some kind of displays to display the time. An LCD is an electronic display module which uses liquid crystal to produce a digital image. The 16*2 LCD display is a very basic module commonly used in circuits. This display having 2 rows and 16 columns. 16*2 translated a display into 16 characters per line in 2 such lines.
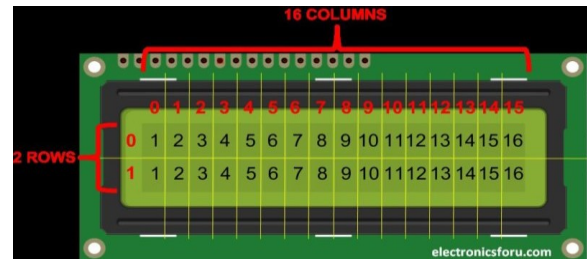

Figure 9

This LCD display has 8 bit data pins (DB0, DB1, DB3, DB4, DB5, DB6, DB7) the LCD + indicates backlight VCC (5V). The LCD- indicates the backlight ground (0V). A 16*2 LCD has two registers namely command and data registers. The register select is used to switch from 1 register to another register. The command register stores the command instructions given to the LCD. A command is an instruction given to LCD and it performs the tasks like initializing it, clearing its screen, setting the curser position, controlling display etc….The data register stores the data to be displayed on the LCD when we send data to LCD it goes to the data register and is processed there.

3.10 BUZZER:

Transistors, resistors, diodes and other small devices acts as circuit devices for driving sound generators. With the application of voltage, current flows to the drive coil on primary side and the detection coil on the secondary side. The amplification circuit, including the transistor and feedback circuit, causes vibration. The oscillation current excites the coil and the unit generates an AC magnetic field corresponding to an oscillation frequency. This AC magnetic field magnetizes the yoke comprising the magnetic circuit. The oscillation from the intermittent magnetization prompts the vibration diaphragm to vibrate up and

down, generating buzzer sounds through the resonator.

Figure 10

IV. WORKING PRINCIPLE

The main aim of our project is to reduce the destructions caused due to the fire accidents. Whenever the fire has been detected through the fire sensor, the robot will stop moving and starts its functioning such as water sprinkling and air blowing. Simultaneously the ZIG-BEE will sends a message to the receiver section as "fire is detected" which will displayed on the LCD and the buzzer will ON. And the GSM also sends a message to the nearby hospital along with location values through the GPS.

When the robot senses the high temperature. It will send a message as "High temperature detected" to the receiver section through the ZIG-BEE and buzzer will once again blown with some delay(Delay refers that for how much time the buzzer will be blown). For instance, when fire is detected, the buzzer will blown for 5 seconds and when high temperature is detected, the buzzer will blown for 7-10 seconds. This message is also sent to the predefined number through GSM. Even after the high temperature is detected, the robot continues its functioning and extinguish the fire in order to reduce the destructions caused to life and property.

V. CONCLUSION

The complete working model of this automated fire extinguisher was built with the help of Arduino UNO board which uses ATmega328P microcontroller. By this we can reduce the risk and also the destructions caused by the fire to the human beings. In the future scope, we can able to use the GSM for communication between the transmitter and the receiver sections, so that the range of communication will be more and will be efficient.

VI. REFERENCES

[1]. "Embedded System Design"by Peter Marwedel.

[2]. "Computers as Components: Principles of Embedded Computing Systems Design" by Wayne Wolf.

[3]. "Embedded System Design: A Unified Hardware/SoftwareIntroduction"by Frank vahid and Tony Givargis.

[4]. "Embedded Systems": A contemporary Design Tool" by James K Peckol.

[5]. Design and fabrication of an "Autonomous fire fighting robot" with multisensor fire detection by Tawfiqur rakib and M.A.Rashid sarkar.

[6]. Temperature Sensor Bucknell, Available: www.facstaff.bucknell.edu/mastascu/elessonshtml /Sensors/TempThermCp1.