LITRATURE SURVEY ON Industry-Specific Intelligent Fire Management System

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Abstract:

Fire outbreak is a major concern at homes, offices, industries etc. It is dangerous and requires high security and control to avoid destruction of lives and property. One of the preventive measures to avoid the danger is to install an automatic fire alarm detector at vulnerable locations, hence the Arduino based fire alarm detection and control system was proposed. It is capable of automatically detecting heat in a given environment, sound an alarm, switch off mains of the building and also spray water to reduce the intensity of fire.

The system uses a DHT 11 sensor, a buzzer, 5v DC (Direct Current) motor, a GSM (Global System for Mobile) Module sim800l to send SMS (Short Message Service) and a LCD screen 16X2 and Atmeg328p Micro controller. At the end, the objectives of this project were achieved and the system worked effectively.

Keywords:

Fire Outbreak, DHT11, SIM 800l, ATMEGA328p and LCD

INTRODUCTION

Ever since mankind first began building structures out of wood rather than stone, fire has been a part of the learning process. In fact, so common have these infernos been throughout history that nearly every major city in the world has been largely burnt to the ground at one time or another in its history. An example of such fire outbreak was in Boston 1872. While not as large a fire as the one in Chicago the year before or the fire that was to ravage San Francisco just over three decades later [2] Firefighting requires skills in combating, extinguishing, and preventing fires, responding to emergency calls, operating and maintaining fire department equipment and quarters, and extensive training in performing firefighting activities.

The earliest known firefighters were in the city of Rome. In 60 A.D., emperor Nero established a Corps of Vigils (Vigils) to protect Rome after a disastrous fire. It consisted of 7,000 people equipped with buckets and axes, and they fought fires and served as police [3].

In the 4th century B.C., an Alexandrian Greek named Ctesibius made a double force pump called a siphon. As water rose in the chamber, it compressed the air inside, which forced the

water to eject in a steady stream through a pipe and nozzle [4]

Fig. 1. Ancient Method of Extinguishing Fire, Ctesibius double force pump.

Nowadays, some factories and buildings have proper installation and fire safety and control arrangements such as fire alarm, fire extinguishers, water supply system etc. But the problem is these conventional fire extinguishing systems are not enough to take prompt action during fire outbreak and hence, save life. The best way to reduce these losses is to respond to the emergency situation as quickly as possible. So, there comes the necessity of a standalone fire detection systems. This project therefore seeks to design a micro controller fire alarm and control system that will continuously monitor the presence of significant amount of heat and activate an alarm and simultaneously switch off the mains of the building, send an SMS alert and extinguish the fire as a safety.

LITERATURE SURVEY

Elbehiery, H., 2012. Developed intelligent fire alarm system. Journal of American Science. Which helped us in knowing about the fire alarm project.

Asif .O, Hossain, Md.B. Hasan, M., Rahman, M.T. and Chowdhury, "Fire Detector Review and Design of an Automated Quick Responsive Fire-Alarm System". Helped us in knowing about the SMS alert can be sent to the user

Suvan Kumar "Gsm Based Industrial Security System" developed a fire notification system used for an industry fire accidents. Helped us in knowing not only sms we can send mail to the shops or industries. Rifat Husain "An Intelligent Fire Detection and Mitigation System Safe from Fire" Department of CSE, detects the fire and helps to safe guard the properties. This project made to think how to protect or extinguish the fire.

Karthiyayini J, Dhanya Shree, Simran Killedar, Ummadi Pawan Kumar and Kishan Kumar. Charging station for E-Vehicles using solar Using IOT. This helped to recharge vehicles using solar. We took the concepts used in IoT from this project.

Karthiyayini, J. Robot Assisted Emergency and Rescue System with Wireless Sensors. International Journal of Research and Scientific Innovation. Usage of wireless sensors to rescue devices. This project helped us in knowing different type of sensors.

Srinivasan, L., & Nalini, C.(2019).Abadent Object

Detection & IOT Based Multisensor Smart Robot for Surveillance Security System. International Journal of Scientific Research in Computer Science, Engineering and Information Technology,9(4),669677.

Vachan, B., & , Deepthi, S., & Geetha, B., Srinivasan, L.(2020).Landmine Detection using Wireless Robot. International Research Journal of Engineering and Technology. Iot used to detect the dangerous elements.

Vandana, C.P., & Aashika M Suresh, & Nikitha Nanju, K., & Sanjana V Nagvekar. Solar Energy Equipped IoT Based Vacuum Cleaner. International Journal of Scientific Research in Computer Science, Engineering and Information Technology. Used to detect the small particles using IOT.

Vandana, C. P., & Chikkamannur, A. A. (2019). Semantic ontology based IoT-resource description. International Journal of Advanced Networking and Applications. Identify the usage of product using IOT.

RELATED WORK

A number of efforts have been put recently into designing systems that can detect and control fire outbreaks.

Burchan et al. (2019). The paper examines the potential use of fire extinguishing balls as part of a proposed system, where drone and remotesensing technologies are utilized cooperatively as a supplement to traditional firefighting methods. The system consists of courtingunmanned aircraft system (UAS) to detect spot fires and monitor the risk of wildfire approaching a building via remote sensing, communication UAS to establish and extend the communication channel between scouting UAS and fire fighting UAS, and a fire-fighting UAS. One has to be very skillful in controlling drones and also the system is very complex which makes the system unreliable. [8]

Qin et al. (2018). Designed an intelligent smoke alarm system with wireless sensor network using ZigBee. The system consists of a smoke detection module, a wireless communication module, and intelligent identification and data visualization module. The disadvantage of his system is that it is very expensive and complex to design. [7] Izang et al. (2018). Designed An SMS Based Fire Alarm and Detection System. The system works when fire or gas is detected by the

sensors, the Arduino will trigger the GSM module to send SMS, sound the alarm system and trigger the servo motor. The disadvantage of this system is that the servo motor works at an angle of 170 degrees and hence cannot reduce fire outbreak as compared to using a pump motor. [11]

Jinan (2018) Designed and Implemented a Factory Security System that consist of a smoke sensor, a GSM (Global System for Mobile communication) module and a sound module. When the gas leakage is detected, an SMS will be sent to a number. The disadvantage of the system is that there is no device that can stop the gas leakage and hence, when there is fire outbreak the necessary deviceto extinguish the fire is not included in the system which may cost loss of properties. [6]

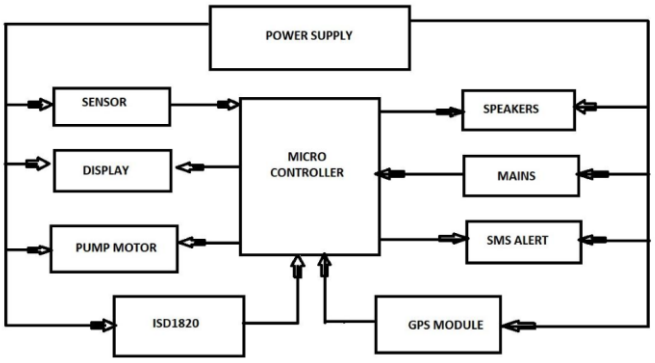
Poonametal. (2014). Designed an Intelligent Fire Extinguisher System. the features are intelligent fire detection and suppression, locate the position of fire origin, effective power control of electricity, reporting through an SMS or email and effective usage of water supply, among the sensors used is a gas sensor which detect any type of smoke, this can send a false alarm and hence not reliable.

PROPOSED SYSTEM :

This Chapter Explain about the system Design and construction through Hardware and software development. In addition, the chapter elaborates the hardware and the software stage by stage. All the operations of hardware and software are also included in this chapter System Architecture

The system architecture of the automatic Fire alarm and control system can be divided into 8 main Modules. They include:

1. Display Module
2. Micro controller Module
3. Sensory Module
4. Speakers
5. GSM Module
6. DC Pump Motor
7. Appliance Module
8. Power Supply Module



9. ISD1820
10.GPS Module

1. Display Module.

LCD (Liquid Crystal Display) 16X2. As explained earlier, a LCD is an

electronic display module. In this project, the LCD is used to display the current temperature of

the environment at a temperature less than or equals to 40 degrees Celsius, and when the temperature is greater than or equals to 40 degrees Celsius, it displays the message “Attention pls” then “High Temp detected”.

Fig. 4. 16X2 Liquid Crystal Display 2. Micro Controller Module Atmega328p.

The micro controller is a compact microcomputer, designed to control the operation of embedded electronic systems in various applications. Here, it is used to read the environment temperature from the sensor module, display the characters on the display module and switch on or off the necessary pins as per the program uploaded on the micro controller.

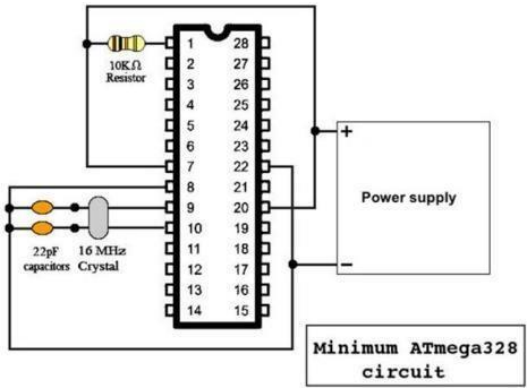


Fig. 5. Atmega 328p Micro controller

3. Sensory Module.

The DHT11 is a basic, - lowcost digitaltemperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analogue input pins needed). i t is used to measure the environment temperature and sends it to the micro controller.

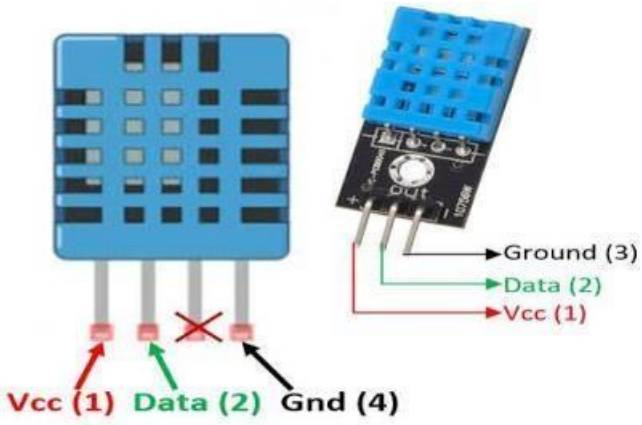


Fig. 6. DHT11 Sensor 4. Speakers

5. Buzzer. The buzzer in this circuit is used when micro controller provides high signal, i.e. when a temperature is greater than or equals

to 40 degrees Celsius, the circuit will be completed and the buzzer will start alarming.

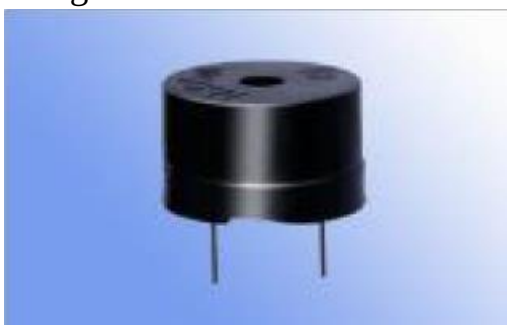


Fig. 7. Buzzer

6. GSM Module. The Module communicates with the micro controller via MAX232 driver, activated using AT commands. it is used to send a SMS message to a mobile number. The GPRS is configured and controlled via its universal asynchronous receiver transmitter, UART using simple AT commands.

The alert message is sent to distant remote locations using wireless networks (RF Tx /Rx pair),

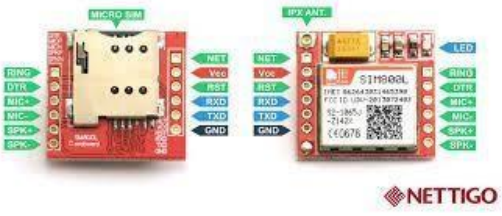
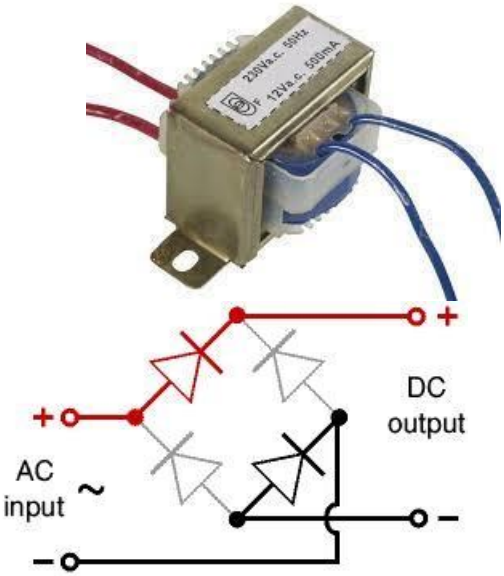


Fig. 8. GSM Module 7. DC Pump Motor. The pump motor is used to generate water from a tank and sprinkle it to the affected area caught on fire. This is done so when a high signal is sent to the pin the motor is connected. The motor is powered through a 12-volt relay

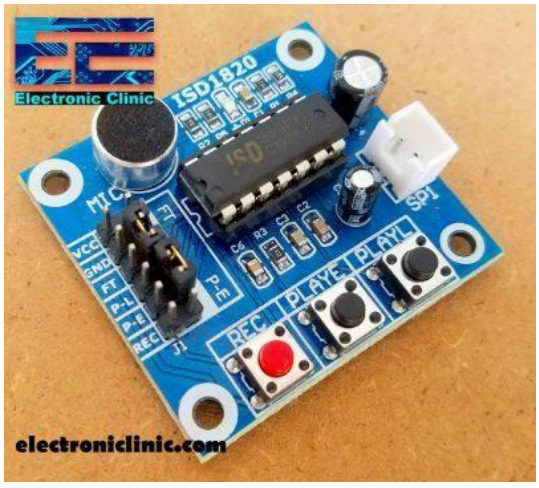
Fig. 9. 5v DC pump motor 8. Power Supply Unit The power supply module was required to supply regulated 5V dc to the circuit while plugged to the mains. The components include Step down transformer, Voltage regulator, Capacitors and Diodes



9.ISD1820:

This is the ISD1820 Voice Recorder and Playback Module. This voice recorder module comes with a non-volatile storage and playback capability for 8 to 20 seconds. The recording time can be changed which I will discuss in a minute.

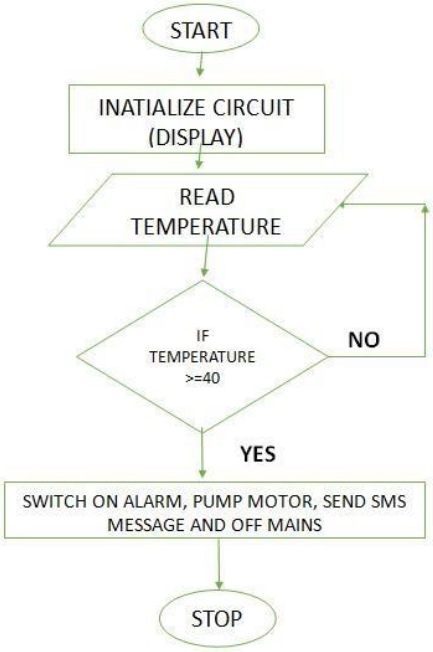
As you can see this voice recorder module is provided with push buttons which means you can directly or manually control this module. This voice recorder module is also provided with male headers due to which it can be interfaced with different types of controller modules such as Arduino, STM32, 8051 family of controllers, PIC micro controllers and so on. This module is also provided with an On-chip audio amplifier that can drive a .5W 8ohm speaker directly without the need for any external amplifier circuit.



10. GPS Module:

- GPS stands for global positioning system and can be used to determine position, time and speed if you are travelling.This module has an external antenna and built-in EEPROM.
- Interface: RS232 TTL
  Power supply: 3V to 5V
  Default baud rate: 9600 bps
  Works with standard NMEA sentences

Software Design : The whole system is controlled by a firmware which is implemented in embedded IC which was built by a compiler (Arduino). Then the program is downloaded to the 8-bit
Atmega328P micro controller.



RESULTS :

Extinguishers are applied directly to the flames or heat, which prevents the combustibles and can cool the combustion process. In the early stages of fire growth these extinguishers are most effective, when the fire is manageable. After user receives a message when the fire is caught, He will send a message to the gsm modem to turn on the extinguisher. These Extinguishers will control the fire growth in minutes after activation message is sent which results in less damage than what occur otherwise . Extinguishers have the following potential advantages: 1. A developing fire must be identified and controlled as soon as possible. Extinguishers are activated at all times, including when there is little or no occupancy. In most cases, control is instantaneous. 2. Immediate action is required. Automatic extinguishers may detect with a small fire. Hence a temperature is set in programming. And for confirmation a message is sent to the user and he will turn on the extinguisher to safe guard the products.

3. Heat or Fire damage has been reduced. When a fire is extinguished at an early stage, significantly less heat and smoke are produced.

4.Increased life safety. When fire growth is slowed, staff, visitors, and fire fighters will be in less danger.

6. The pre recorded voice reduce the panic situation by guiding a people to the nearby exit.

7. GPS Module send the location to the fire station and police department.so,that the rescue team will arrive at exact location.

CONCLUSION :

The project explains low-cost, user-friendly residential and industrial alarm systems. It is a real time notification and extinguisher system built with basic software and hardware that facilitates the chance of an error-free secure platform..

The system is simple to install and maintain, and the highly secured at a minimal price is a substantial improvement over original alarm systems.

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