

# Implementation of Alert System Procedures In Emergency Situation

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**Abstract-** *With the increase in the number of complex high-rise buildings, ensuring safety is a primary requisite. In the event of an emergency such as an earthquake or a fire, the protocol followed is existing the building as soon as possible. In such modern-day complex buildings, evacuation becomes slightly more complicated as they have multiple levels, limited exits and house larger number of people. This calls for a system that evacuates people efficiently. The Emergency Evacuation System(EES) based on Internet of Things(IoTs) aims to achieve an effective evacuation process that ensures safety and minimum casualty and application for evacuee guidance and easy navigation. In the occurrence of an emergency, the EES detects it, alert the civilians in the building and provides guidance through an application.*

**Keywords-** Emergency, Evacuation, Internet of Things, Guidance Routing, Fire, Earthquake.

## I. INTRODUCTION

Locating every person in a building is very important to save people in case of an emergency. An indoor localization system can solve the problem of Wi-Fi and help to understand if a building is totally evacuated or not. Outdoor localization systems are used for years. Global Positioning System(GPS) and Global Navigation Satellite System(GLONASS) are accurate and trusted systems for outdoor localization. However they cannot be used in indoor because they use satellite and need a direct line of sight. Walls, trees and other objects prevent them to work efficiently.

Radio frequency Identification(RFID) and Wi-Fi are two common solutions for indoor localization. RFID technology is used in this project. In an RFID system, there are sensors and readers. Sensors transmit a message is received, the strength of the data can be calculated and this strength is used for estimating the data. This method is called Received Signal Strength Indicator (RSSI) and used in this project. All the sensors and the reader in the project are active which means they use a battery.

Evacuating a building is a very serious task and the system must be very secure and reliable Wi-Fi. Therefore, the important message must be encrypted. A central computer calculates the locations and decides if there is an emergency situation of the communication between the central computer and the reader is encrypted in this project.

An emergency evacuation system is a set of procedures and protocols designed to safely and quickly evacuate people from a building or area in the event of an emergency. The purpose of an emergency evacuation system is to minimize the risk of injury or loss of life during an emergency situation, such as a fire, earthquake, or other natural disasters.

The system typically includes the following components:

**Alarm System:** A loud and distinct alarm system is used to alert people to evacuate the building or area. Emergency exists.

## II. LITERATURE SURVEY

According to J.Wang.et al., The Emergency Evacuation From a Teaching Building Based on The Social Force Model 2022, Due to the frequent occurrence of stampedes on campus, a teaching building in Beijing was selected to study evacuation. The factors having little effect on evacuation time were as follows: whether people communicate in evacuation progress.

According to P.Kumar.et al., A system thinking approach for evacuation during fire incidents, 2022 International Conference on Data Analytics for Business and Industry(ICDABI), Sakhir, Bahrain, 2022,The ability to safely evacuate a burning safety. The basis of the framework system in this paper is divided into four processes.

According to H.-H.Yen,C.-H.Lin.et al. A Novel Smoke Aware Individual Evacuation and Congestion-Aware Group Evacuation Algorithms in IoT-Enabled Multi Story Multi- Exit Building, 2022 IEEE Access, vol.10,pp.119402-119418, Smoke is the deadliest factor in fire evacuation because of fast smoke spreading and smoke toxicity. SGP circumvents the congestion problem by scheduling the evacuation sequence

according to evacuee's accumulated smoke toxicity value, where higher accumulated smoke toxicity value has higher evacuation.

According to M.M.Sein.et Effective Evacuation Route Strategy for Emergency Vehicles 2021 IEEE 10th Global conference on Consumer Electronics(GCCE), pp.764-765 Rapid response and recovery and recovery efforts are critical to emergency and disaster management. It is important that rescue teams need to arrive at incident location within a short time to minimize the risk and damage. It will deploy a nearby victim area and will carry the best rescue routes to evacuate people from a dangerous areas..

According to H.Oe and Y.Yamaoka.et A discussion of damage mitigation of natural disasters: How to increase citizens preparedness 2021 Third International Sustainability and Resilience Conference :

Climate Change, Sakheer, Bahrain, 2021,pp.18-22, To enhance preparedness of citizens, a critical theme is how to utilize the benefit of information Communication Technology (ICT) in the scheme of ICT- based learning programmes to raise citizens perceptions of disaster risk and how to enable citizens to be ready for the future disasters.

### III. PROPOSED SYSTEM

In this project, a framework for efficient and effective evacuation route guidance for the occupants in an indoor environment which is threatened by earthquake or fire is proposed. The sensors connected to the NodeMCU sense the temperature, humidity and the vibration values. If either of these values exceeds the threshold value, the LED turns on as a warning.

The occupants of the building receive an alert message on their mobile phones as a notification. Furthermore, the application guides them to the nearest safest exit route indicating directions, based on their location. Thus, the Emergency Evacuation System detects, monitors, warns and also provides guidance routing to the occupants. In our future work, we will consider the case when there are a large number of occupants which might lead to areas or exists being blocked by conglomeration of evacuating occupants. The Emergency Evacuation System can also be used for evacuation in case of fire in an ocean vessel.

#### ARCHITECTURE DIAGRAM:



#### SYSTEM DESCRIPTION:

##### 1. NodeMCU:

This is a microcontroller board that is based on the ESP8266 Wi-Fi chip. It is used to control and monitor various sensors in the system.

##### 2. GSM Module:

This module enables communication between the security system and a remote device such as a mobile phone. It is used to send alerts and notifications to the user in case of a security breach.

##### 3. Vibration Sensor:

This sensor detects any vibrations or movement in the surroundings. It is used to detect unauthorized access or tampering with the security system.

##### 4. Gas Sensor:

This sensor is used to detect any gas leakage in the area. It is commonly used in industries and commercial spaces where gas leakages can pose a risk to human life and property.

##### 5. LPC:

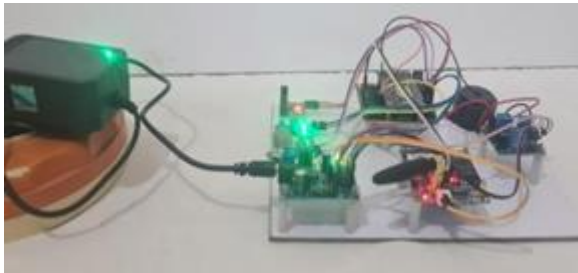
LPC stands for Low Pin Count microcontroller. It is a small microcontroller used for various tasks such as processing and controlling devices in the security system.

##### 6. Heartbeat Sensor:

This sensor is used to monitor the heartbeat of a person. It is commonly used in medical applications for monitoring the health of patients.

**IV. RESULTS AND DISCUSSION**

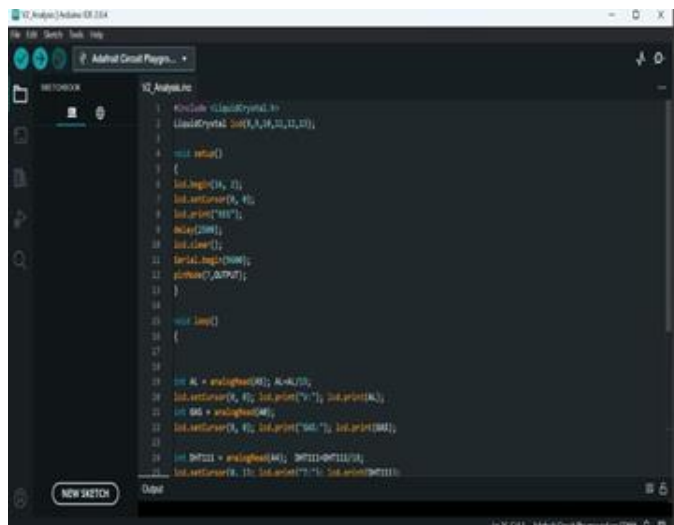
**IMPLEMENTATION OF ALERT SYSTEM**



The hardware prototype contains Node MCU, GSM module, vibration sensor, LPC module, gas sensor, heartbeat sensor, temperature sensor, power supply and buzzer. In case of a fire emergency, the vibration sensor will sense the vibration at that location and the buzzer will immediately give sound indicating some danger in that place. A message will also be sent to the people present in that location regarding the situation using the GSM module. The temperature of that place can be measured using the temperature sensor.

**IMPLEMENTATION ON ARDUINO IDE**

This is a code for an Arduino board that uses a Liquid Crystal display, an analog gas sensor, and two DHT11 temperature and humidity sensors. The code reads the analog signals from the sensors and displays the values on the LCD screen. If the voltage value from the AL sensor exceeds 40, it sets pin 7 to HIGH and sends a message to the serial monitor saying "Warning."

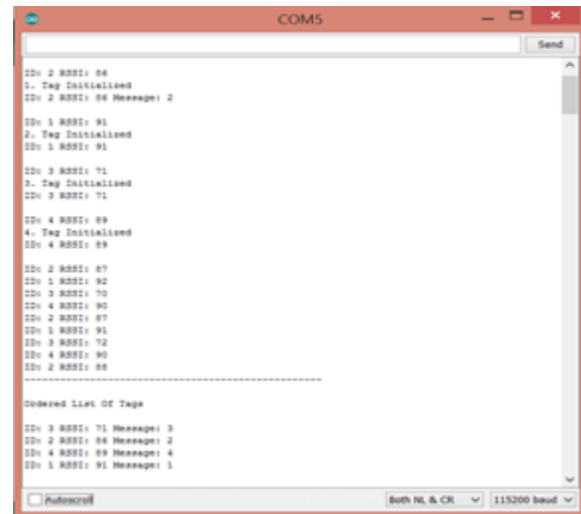


Here's a breakdown of the code:

The first line includes the Liquid Crystal library that allows the Arduino to communicate with the LCD screen.

The second line includes a new instance of the Liquid Crystal class with the pin numbers for the RS, EN, D4, D5, D6& D7 pins respectively.

**COM5**



After the sensors, reader module is initialized in the same way with the header ID of 6. The aim of the reader is to read the sensors and decide the closest 3 of them. When a message is received, its header ID, RSSI value and the message can be understood

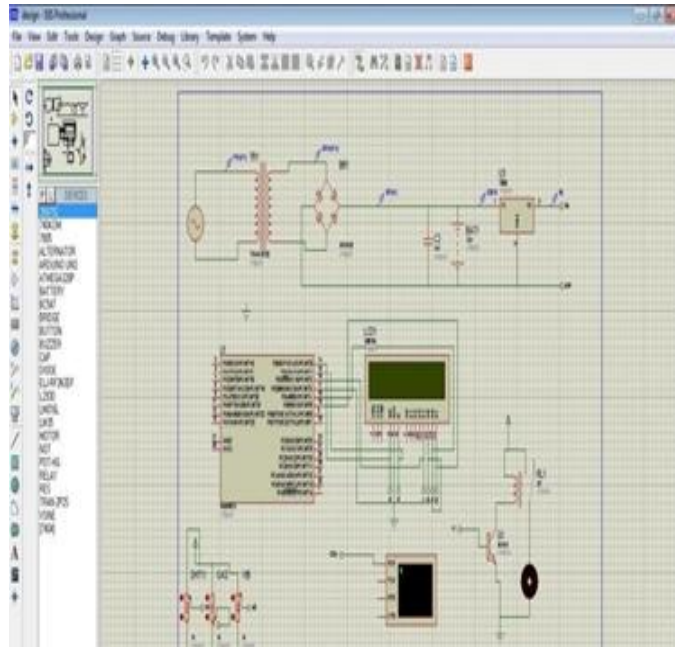
**INITIAL COORDINATES OF THE SENSORS**

Tag ID	X Coordinate (m)	Y Coordinate (m)
1	10	10
2	10	15
3	10	20
4	20	10
5	20	15

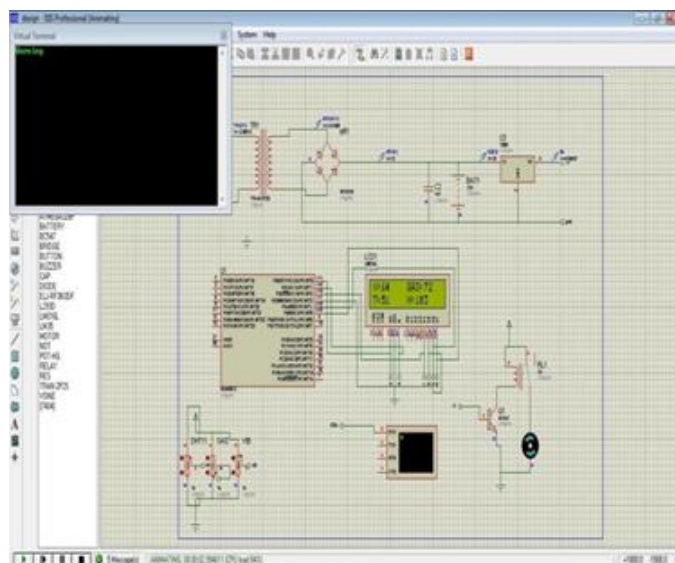
**SENSOR CLASS**



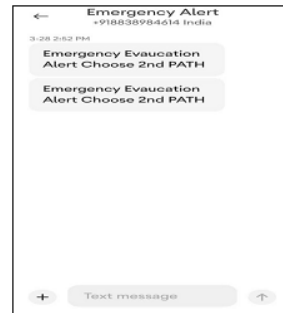
**CIRCUIT DIAGRAM USING PROTEUS SOFTWARE**



**OUTPUT USING PROTEUS SOFTWARE**



**ALERT SMS**



**V. CONCLUSION**

In conclusion, this project has been developed with the aim of providing a fast and efficient emergency evacuation process for hazardous situations. The project combines innovative technologies, such as vibration, gas, and SpO2 sensors, which send real-time alerts to the user’s personal device, such as smart phone, in the event of an emergency. With the ever growing urban infrastructure and the rise of skyscrapers in workplaces, the need for a reliable and effective evacuation system has become even more critical. Therefore, the proposed model has the potential to play a significant role in achieving sustainable development goal number 9, which focuses on building resilient infrastructure and promoting inclusive and sustainable industrialization.

In order to totally evacuate a building in case of an emergency, all the locations of the people must be known. This project combined the sub-blocks which are previous year’s graduation projects and added a graphical user interface to it. The final design aims to cover a building with GAS sensors and the people have a reader GAS module.

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