International Journal of Applied Engineering Research ISSN 0973-4562 Volume 15, Number 7 (2020) pp. 631-633

Mobile Fire Evacuation System for Buildings

Ms.Anju V John

Computer Science and Engineering (of Aff.) St.Joseph College of Engineering and Technology (of Aff.), Palai, India.

Abstract

Nowadays fire tragedies are increasing in a vast rate.The need to find a solution for this is vital.We have been supplied with a lots of systems to reduce the amount of loss or rate of fire accidents like fire extinguishers,fire sprinklers.But these all willn't give a dynamic path to exit from the fire environment.So this system will detect fire at the early stages and give a dynamic evacuation path to exit from a buildings.System uses Arduino to connect with sensors to detect fire and with the help of artificial intelligence they provide the dynamic evacuation path.Blynk app provides the interphase to connect Arduino with mobile.

Keywords: Artificial Intelligence, Sensors, Blynk app, Arduino.

I. INTRODUCTION

Development is occuring in each of the field today. As every sector is utilising newly developed technologies the need to keep them safe and secure is more important. If there is no security measures available accidents will arise and ends in a big tragedy. Fire accidents is among one of them, as systems are there to control the spread of fire in each sector but it doesn't give a dynamic evacuation path.Countries like Australia, Canada, New Zealand, USA have provided a specialist group for unified, better conceptualized approach to fire safety engineering[1].In some places mining is an occupation for most of the people, but deeper the mining occurs the chance of workers in protecting from fire disasters become less. So there developed a system that uses sensors, IoT, smartphones, detectors addition with two-way communication and 3D visualization for fire safety[2].Another problem for increasing fire accidents are lack of knowledge on fire safety. In America 75percent have a home evacuation plan. For this they developed a mobile evacuation having a fire safety plan informing them of the dangers of house fires[3].In most of the cases there lack a good dynamic path. This paper proposes a mobile fire evcuation system that utilises the dijkstra algorithm to find the safest path and a mobile view that gives alarms during fire. Mobile terminal also gives the map view of safest path so that person can reach the safest exit on time.

II. PROPOSED SYSTEM

A. System Architecture

System comprises the use of Arduino UNO, sensors, detectors. The cost of making the system is an important part. Inorder to solve the problem system utilizes Identify applicable funding agency here. If none, delete this.

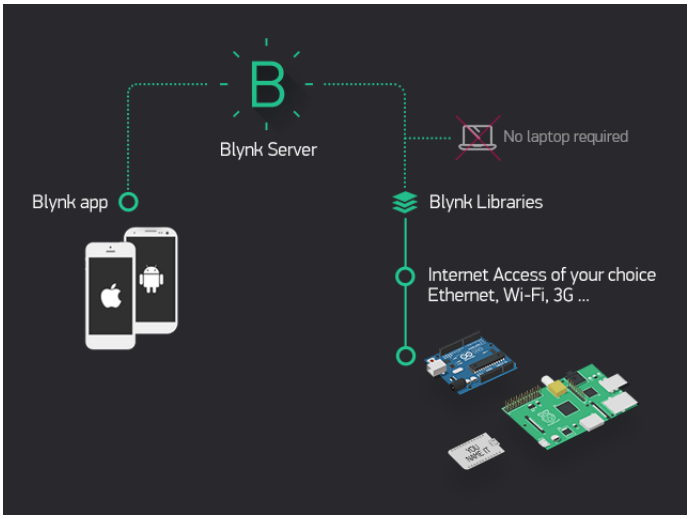

Fig. 1. System Architecture

The hardware part with Arduino UNO.The connection to the Arduino UNO can be given in a digital board.As the system is using Arduino UNO,it can replaced with Raspberry Pi.The system architecture contains the connection to different sensors and detectors.An important part of the system is the Blynk app interphase that connects the Arduino without the use of a laptop.Blynk is designed for the Internet of Things in which it control the hardware data seperately.

B. Components Identification

1) *MQ-7 Sensor:* MQ-7 can detect CO-gas concentrations anywhere from 20 to 2000 ppm.It make detection by method of cycle high and low temperature, and detect CO at low temperature.It is widely used in domestic CO gas leakage alarm, industrial CO gas alarm and portable CO gas detector.

2) *TGS3870 Sensor:* TGS3870 is a residential gas detector.It is a CO+Methane dual gas detector.They have a low power consumption with high sensitivity and selectivity to both methane and carbon monoxide (CO).Addition to this they have a low sensitivity to alcohol vapor providing a long life and low cost.

3) *NO2 Sensor:* Nitrogen Dioxide sensor designed to mea- sure low ambient levels of NO2 associated with the irritation of the eyes, nose, throat, and lungs.

Fig. 2. Blynk interphase

4) KE-25 Sensor: It detects the O2 measurement in medical application, food industry, biotechnology, flue gas monitor- ing,fire.It have a hexagonal top,virtually no influence from CO2, CO, H2S, NOx, H2.Lifetime of 5 years.Providing a stable output signal.

5) Power Supply: A 12V battery is connected in which providing a good power supply.The entire sensor circuit can be fueled by 9V or 12V connector or battery. Here, IC1 and IC2 have been utilized for driving different parts of the circuit.

6) Ethernet Shield: Ethernet Shield allows internet connec- tivity to Arduino board by using its Ethernet library. We can use this Ethernet library to write sketches (Arduino program written in IDE) that configure this shield to connect to internet. This shield is compatible with almost all versions of Arduino boards.

7) Blynk Libraries: Blynk Library is an extension that runs on top of the hardware application.Controlling all the connec- tion routines and data exchange between your hardware, Blynk Cloud, and your app project.No coding is required.

III. ESTABLISHING DIJKSTRA ALGORITHM

Before explaining about the Dijkshtra algorithm, we have to take the internal structure of a building.Finding out the exit on each floor.The algorithm can be applied by follows:

i) Assume variables as current node,infinity.

ii) Mark the minimum distance as 0.

iii) Each floor of the building have different distance to the exit path.Calculate the distance of current node to next node.

iv) If the distance is smaller than the current node distance then take that node as the new one.If not check the other path.

v) Repeat this steps until getting a dynamic evacuation path.

A. GPS Tracker

To implement the algorithm firstly,system needs to locate the position of each person in a building.By using the Blynk app, system can make a map interphase by connecting it with NodeMCU. After making connection with NodeMCU system can provide the location of each person in a building.Whenever a panic situation occurs system suddenly gives alarm to each person in the building along with the map to escape from the bulilding.

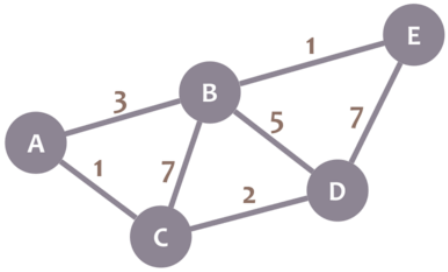

Fig. 3. Example for Dijkstra graph

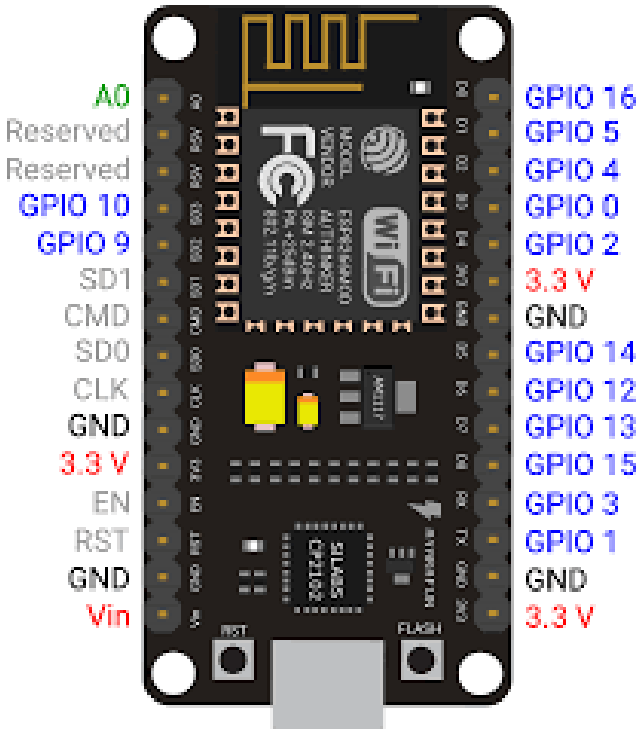

Fig. 4. NodeMCU

Connection of NodeMCU to arduino is as follows:

i) Connect NodeMCU to the computer.Need a USB micro B cable to connect the board.

ii) Open Arduino IDE.Need to have at least Arduino IDE version 1.6.

iii) Make a LED blink using NodeMCU.

B. Database

IV. CONCLUSIONS

The system deals with the finding of dynamic evacuation path using artificial algorithm.It focus on the finding a path with less difficulty.

According to the results,whenever fire breaks out sensors will suddenly detect the spread of gases.Thereby giving alerts giving to the user along the map interphase to exit from the building safely.Persons in the building will seperately get map to the location where they stand to the safe exit.Server is providing the map interphases to each persons in that building.

REFERENCES

[1] V. Adjiski, Z. Despodov, and D. Seramovski, "Prototype model for fire safety system in underground mining," Amer. J. Mining Metall., vol. 4,no. 1, pp. 6267, Nov. 2017.

[2] E. Bickel, "The effect of a mobile application on fire safety education,'J. Acad. Sci., vol. 15, no. 2, p. 10, 2017.

[3] Y. Xin, J. Ma, Y. X. Shen, and L. Y. Lin, "Suppression effect of sprinkle system on fire spread in large commercial buildings," Procedia Eng.,vol. 135, pp. 455462, Jun. 2016.

[4] Z. Yan, Y. Tian, and H. Zhu, "Tunnel fire dynamic early-warning, evacuation and rescue system and its application," Mod. Tunnelling Technol.,vol. 53, no. 6, pp. 3135, 2016.

[5] Z. C. Grigoras, and D. Diaconu-Sotropa. "System and subsystems used in the engineering approach of human evacuation in case of fire," Adv. Eng.Forum, vol. 21, pp. 108115, Jun. 2017.

[6] M. X. Li, S. B. Zhu, J. H. Wang, and Z. Zhou, "Research on fire safety evacuation in a university library in Nanjing," Procedia Eng., vol. 211,pp. 372378, Mar. 2018.

[7] E. Ronchi and D. Nilsson, "Fire evacuation in high- rise buildings: A review of human behaviour and modelling research," Fire Sci. Rev.,vol. 2, no. 1, p. 7, Nov. 2013.