IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.282

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.282|

|| Volume 10, Issue 7, July 2021 ||

| DOI:10.15662/IJAREEIE.2021.1007010 |

Realtime Fire Detection IOT Surveillance Systems Based on Wireless Sensor Networks

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ABSTRACT: Many fire situations have represented the loss of lives and material costs due to the lack of early fire detection through smoke or gas sensing, which can become complex and critical. Meanwhile, engineers worldwide develop and test multiple systems for smoke and gas detection, commonly based on sensor networks, digital image processing, or computer vision. Furthermore, the detection system must work thoroughly with alarms and warnings that aware of a risk situation for prompt evacuation of the population in the surroundings based on a reliable data network topology with adequate device deployments that will let us know the moment a fire outbreak. This paper presents a low-cost Internet of Things (IoT) prototype for fire detection in outdoor environments based on sensors and Low Power Wide Area Network (LPWAN), focused on the accuracy in the temperature and gas measurement at the moment a fire starts. For its achievement, integrated wireless components, development boards, and electronic devices, following the management of information updates through a database schema for the alarm settings based on the data gathered from the sensors.

KEYWORDS: IoT surveillance, temperature measurement, low-cost, emergency services

I. INTRODUCTION

Wildfires burn and consume everything along at fast speeds by rolling flames traveling up to 14 miles an hour, equivalent to a four-minute mile pace, affecting land populated with flora, fauna, and humans, which represents problems from a social and environmental viewpoint. They come from natural phenomenon as well as from human activities such as farming, logging, or civil constructions, leading to forest devastation and its consequences.

In the United States, the destruction caused by wildfires has increased in the last two decades, with an average of 72,400 wildfires cleared an average of nearly 7 million acres of land each year since 2000, doubling the number of acres scorched by wildfires in the 1990s. Similarly, the Amazon region has experienced a rise in fires during recent years. Based on information supported by satellite data reports from the Brazilian Institute for Space Research, more than 74,000 fires were registered between January and August 2019. As the largest rain forest worldwide, this region is a vital carbon store that slows down the pace of climate change. Also, most Latin American countries lack adequate fire aerial suppression capabilities and mainly use ground suppression techniques. Besides, many of these countries do not have professional ground crew firemen, counting with voluntary brigades from local communities with firefighter-oriented training.

False wildfire alerts result expensive due to logistic deployments. They could turn into contrariness for fire departments, because of tie-ups caused during a commotion that could lead to a panic, especially if they are the result of human actions that generate dust, pollen, fog, or smoke. Therefore, a reliable fire detection system is essential for fire protection in both indoor and outdoor
situations. Satellite-based monitoring has been a popular method for wildfire detection, but due to the long scan period and low resolution, its effectiveness is limited. For example, satellites such as the AVHRR and the MODIS, were deployed for forest fire detection. Unfortunately, they provide earth images intermittently and are susceptible to weather conditions that can affect the given image quality.

Additional technologies and devices like barcoding, smartphone, social networking, IPv6, mobile communication, radiofrequency identification (RFID), Wi-Fi, Wi Max, and cloud computing support IoT applications. Further, WSN usually deploys a large number of autonomous and resource limited nodes that cooperate to perform sensing tasks into a specified area. The sensor features include sensing, processing, and conveying of data to a central station. A suggestion to use applications based on WSN is that they are becoming attractive for monitoring, measuring, and controlling real-time situations, including prediction features. Besides, self-organized sensors approach efficiently to algorithms interfacing with other technologies aiming to protect the wildlife, human life, and assets.

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Proposals of Work

The proposed system is capable of detecting smoke, different flammable gases and fire. This system is capable of providing hazard location coordinates to the nearby fire department. This fire hazard sensing system with systematic IoT framework emphasis an application innovation to the public safety and livelihood service sector. The fire hazard sensing system with IoT standardized design method. The smoke detection sensor MQ- 2 is used to detect the smoke, the Flame detection sensor is used to sense the flame, the flammable gas sensor MQ-5 is used to detect the gases like LPG/LNG and the GPS module is to obtain device location.These sensors along with Wi-Fi micro-controller are connected to a MQTT broker via Internet through which it communicate hazard status to the nearest fire-fighting organizations.

Existing system

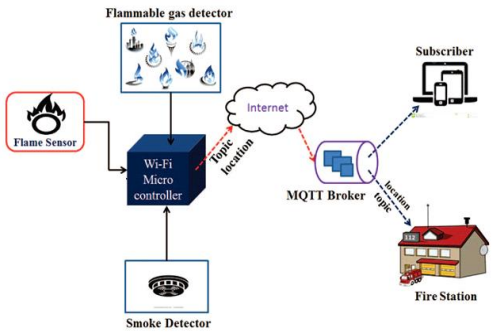
In the existing system the fire sensor and gas sensor is used with microcontroller. The gas and fire details are sensed through corresponding sensors, and fed to the microcontroller unit. These details are then displayed on the LCD. If the two values reach any abnormality, the alarm is raised immediately and the microcontroller sends the alarm message to the house owner number through the GSM Modem. The Microcontroller communicates to the GSM Modem through UART Protocol. The aim of this project is to monitor for liquid petroleum gas (LPG) leakage to avoid fire accidents providing house safety feature where security has been an important issue. The system detects the leakage of the LPG using gas sensor and alerts the consumer about the gas leakage by sending SMS. The proposed system uses the GSM to alert the person about the gas leakage via SMS. When the system detects the LPG concentration in the air exceeds the certain level then it immediately alert the consumer by sending SMS to specified mobile phone and alert the people at home by activating the alarm which includes the LED, Buzzer simultaneously.

II. PROJECT DESCRIPTION

Working Principle

The Wi-Fi micro-controller board (ESP-8266) is powered up by using USB cable. Different sensors for different measurements are used and interfaced to the micro-controller board using connecting wires. Flame sensor have 5 output pins which are connected to analog read general purpose I/O interface pins (GPIO pins) 36, 39, 34, 35 and 32 respectively. The MQ-2 gas sensor, MQ-5 gas sensor are connected to GPIO 25, GPIO 26 pins of the board respectively. And GPS module has both transmitter and receiver pins which are connected to GPIO17, GPIO18 pins of ESP-8266 board respectively. After that, the logic is structured as required to operate the whole system as desired. For the desired system programming part is done in Arduino IDE. In the part of initialization pin configurations for respective connections are necessary.

SYSTEM ARCHITECTURE



ESP8266 is the most advanced Espressif Wi-Fi micro-controller board. It is integrated with built in antenna switches, power amplifier and RF balun. Its compact design includes Flash memory and it has ESP32SoC and PCB antenna for better RF performance. ESP32 is well known for its hybrid functionality which consists of Bluetooth and Wi-Fi. It supports WPA/WPA and WEP for security aspects. For industrial environments it can give more reliability because it can adopt to environmental changes. It's operating temperature range is -40◦C to +120◦C. It can be interfaced with other devices using I2C/UART or SPI/SIDO interfaces. It has some built in sensors like Hall sensor, Ultra low noise analog amplifier and touch interface. As compared to other Espressif models it's performance is better.

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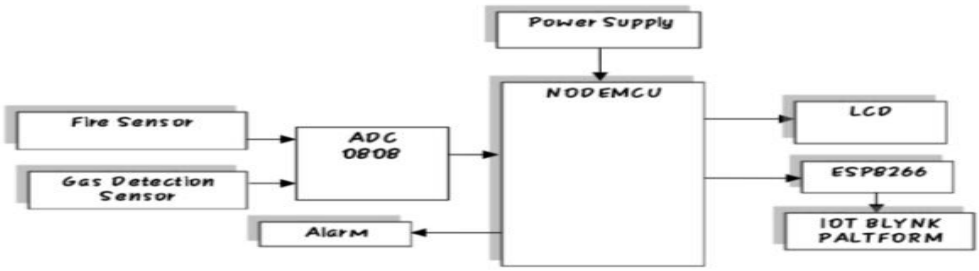
It's receiver sensitivity up to -98dBm and transmit power range up to 19.20dBm . ESP32 is mainly designed for Low power applications like IoT based electronic industrial appliances

Flame sensor:

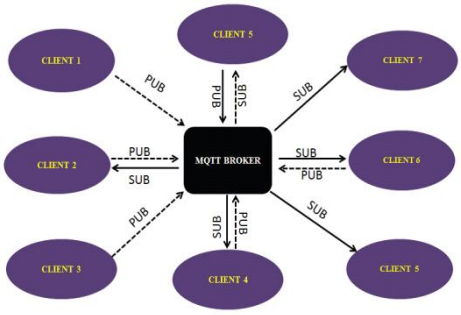
The flame sensor consists of emitter, detector with an associative circuitry. The emitter consists of an Infrared Light emitting Diode and the detector consists of an Infrared Photo diode which senses the Infrared light which is having same wavelength as that of emitted wave wavelength by IR LED. The basic principle that involved in working of the sensor is photon energy strikes out the electrons so that circuit resistance will change accordingly. Whenever Photo diode senses the IR light, the Resistance and corresponding Output voltage will be changed in proportion to the received IR light magnitude. Because of this flame detection sensor can often responds very quickly and give accurate measurement. This sensor is designed such that it ignores constant background IR radiation because it present in all environments. Instead it is designed to sense sudden changes in the IR radiation. So that it avoids false detection.

BLOCK DIAGRAM



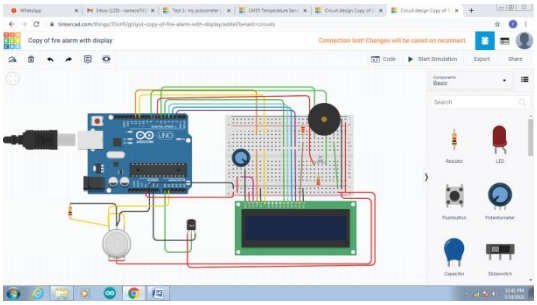
MQTT :

Message Queue Telemetry Transport (MQTT) is extremely light weight, simple and publish/subscribe messaging protocol. This is specifically designed for low-bandwidth, high latency networks which are unreliable and constrained devices. It satisfies the design principles like minimum network bandwidth and meets the device resource requirements and allows simple way of telemetry transport. MQTT assures fast delivery and ensures reliability.



MQTT PROTOCOL ARCHITECTURE

Result and Discussion



Interfacing fire alert circuit

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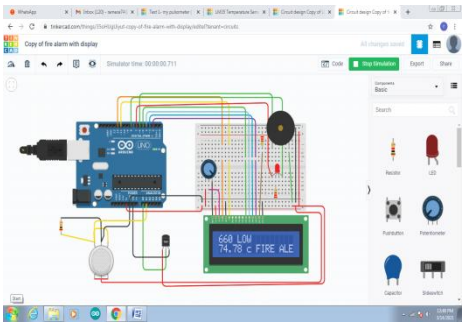


Fire Alert Using IoT Tinker cad simulation

Advantages in real time fire detection

- Low cost.
- High efficiency.
- Low complexity.
- Safe for vehicles.
- Prevent the accident.
- High speed processing technique.

Application of real time fire detection

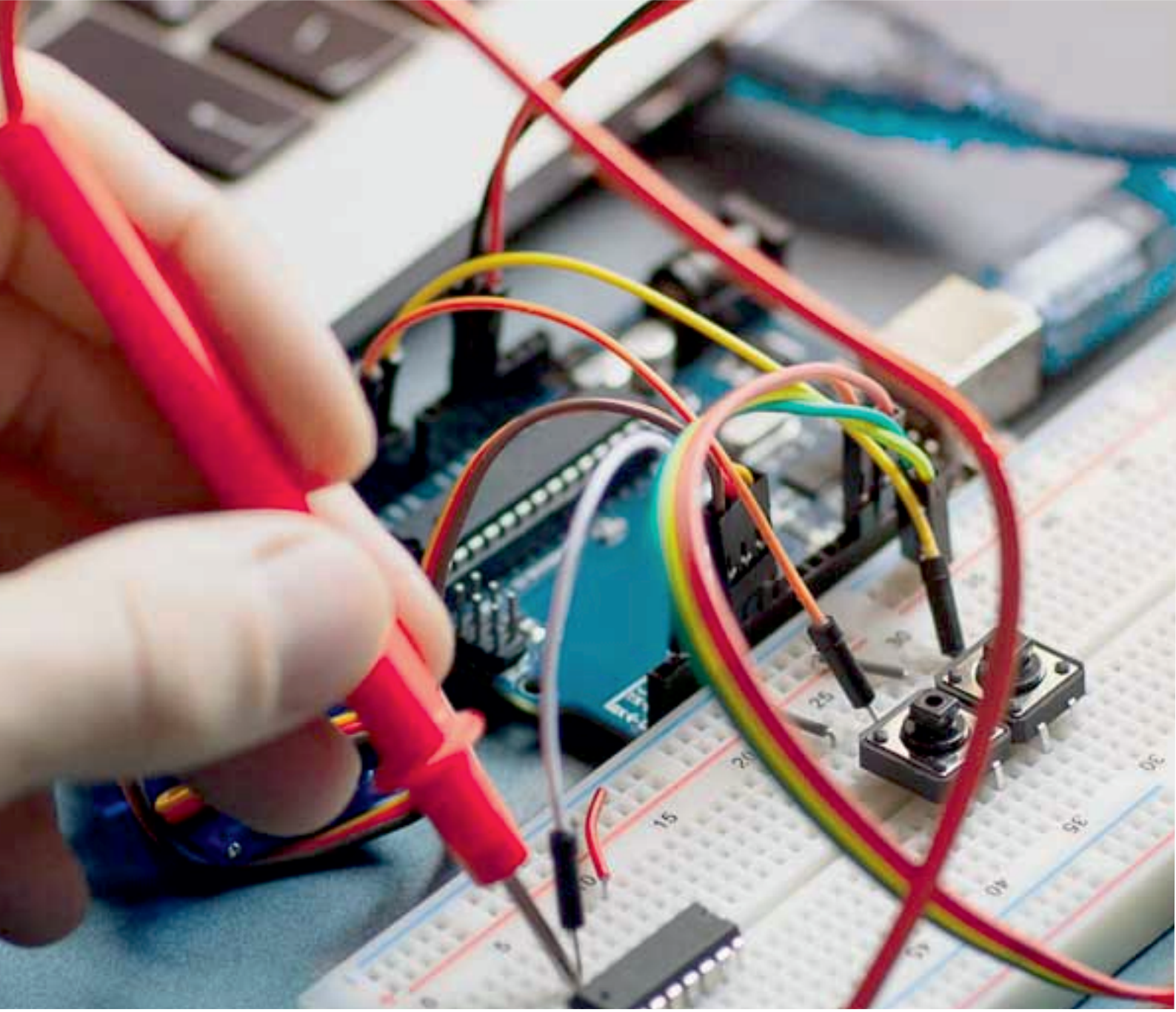
- Home
- Office
- Industry

III. CONCLUSION

In this paper, It is mentioned that Internet of Things is an emerging technology which helps in providing smart solutions in Smart city development aspect. In providing a quality public safety and security services it is very important to adopt leveraged data driven emergency response systems with urban IoT design standards. A smart emergency response system for fire hazards is designed and implemented with required IoT standards which prioritize the immediate rescue operations by pushing relevant information to the public safety managements.

REFERENCES

[1] N. Carter, M.A. Hoque, M.S. Ahmed, Simulating vehicle movement and multi-hop connectivity from basic safety messages, SoutheastCon 2018, IEEE, St. Petersburg, FL, USA, 2018, pp. 1–6.
[2] N. Naik, ‘‘LPWAN technologies for IoT systems: Choice between ultra narrow band and spread spectrum,’’ in Proc. IEEE Int. Syst. Eng. Symp. (ISSE). Rome, Italy: IEEE, Oct. 2018, pp. 1–8.
[3] M.S. Ahmed, M.A. Hoque, A.J. Khattak, Demo: real-time vehicle movement tracking on android devices through bluetooth communication with DSRC devices, 2016 IEEE Vehicular Networking Conference (VNC), IEEE, Columbus, OH, USA, 2016, pp. 1–2.
[4] M.S. Ahmed, M.A. Hoque, Partitioning of urban transportation networks utilizing real-world traffic parameters for distributed simulation in SUMO, 2016 IEEE Vehicular Networking Conference (VNC), IEEE, Columbus, OH, USA, 2016, pp. 1–4.
[5] M.S. Ahmed, M.A. Hoque, J. Rios-Torres, A. Khattak, Demo: freeway merge assistance system using DSRC, Proceedings of the 2nd ACM International Workshop on Smart, Autonomous, and Connected Vehicular Systems and Services, Snowbird, UT, USA, 2017, pp. 83–84.



INNO SPACE
SJIF Scientific Journal Impact Factor

Impact Factor: 7.282

doi cross ref

ISSN INTERNATIONAL STANDARD SERIAL NUMBER INDIA

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International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

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