INDUSTRY SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

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Introduction

Fire is very lethal, resulting in the destruction of human life and property. Fire detection systems are important to mitigate the loss of personal items caused by both man-made and induced fire. The National Crime Statistics Bureau reports that during the years 2010 to 2014, there were a total of 113961 deaths related to fire injuries. Every day, fire injuries claim approximately 65 casualties. Around 2010 and 2014, there were a total of 1.21 LAKH fire injuries. Thankfully, the number of fire injuries has been gradually decreased with the use of more intelligent fire warning devices. One of the most dangerous characteristics of fire is that it grows rapidly and will propagate uncontrollably with the right medium. To prevent a fire threat, timely identification of fire is therefore necessary, the rapid development of science and technology, late-model fire monitor and alarm systems are merged new semiconductor technique and artificial intelligent theory for fire detect and alarm system may be satisfied. Intelligent fire detection and alarm control system is of fire signal detected, transmitted, processed and controlled system. And smoke fog, temperature, and flame of fire detect and alarm system is proposed based on IOT. This results in fire being attended and leading to lot of loss of property, human and so also in developing countries like India we do not have strict laws pertaining to installation of Fire Alarm system So there is an urgent need towards developing an automated fire monitoring and warning system.

Abstract

In this paper, we propose a user friendly intelligent fire alarm management System. Taking into account all the features available in the present model we propose a new model for monitoring fire incidences and reporting them. The features of the proposed model are Effective safety system Systematic approach for monitoring and control . Transferring messages through wireless technologies . Easy way of sensing structural damage and Health monitoring of buildings.Therefore , we are proposing an IOT based wireless fire alarm system which is easy to install. The proposed system is an ad-hoc network that consists of several nodes consists of a microcontroller which is connected to smoke, temperature humidity, flame, methane and carbon monoxide sensors, which is used to sense the environment to detect the present of fire. Once fire is detected by a node, it sends a signal to a centralized node that is triggered to send an SMS to the fire department and alert the user.

Advantages:

- Reduced installation cost
- They monitor 24/7
- Improved security in homes, industries,Offices
- It pin points location of the fire

Disadvantages:

- Heat detectors are not considered as life saving devices because they are sensitive only to heat
- High battery or current consumption will need for these detectors
- Control pannel may need to be replaced if it becomes damaged.

Literature Review

[1] Fire identifiers are utilized to recognize the fire or smoke at a beginning time and can help in sparing lives. Right now, IOT based alarm has been planned utilizing temperature and smoke sensor. It would not just flag the nearness of fire in a specific reason yet will likewise send related data to portable through IOT. By utilizing the temperature sensor, smoke sensor and there is a simple to advanced convertor, which changes over the simple signs got at the sensor end to computerized and afterward transmits them to a smaller scale controller and to the Arduino. The small-scale controller is modified to turn on the ringer, when the temperature and the smoke arrive at an edge esteem. Simultaneously, Arduino sends the information to the Wi-Fi module ESP8266. ESP8266 will then the accompanying information to the IOT site, where, approved individuals can take fitting measure so as to check the fire. The gadget id is the one-of-a-kind id given to a gadget, which would enable the work force to get data identified with the area, where the fire is detected.

Advantages: As far as fire alarm installers go, a wireless system is ideal because they are much easier to install. A wireless system essentially involves mounting the devices to the appropriate locations around a building or room, setting up the actual system and syncing it to WiFi. Compare this to a wired system, which requires fire alarm installers to connect the system to power supplies and ensure cables are connectedproperly.
Another great advantage of a wireless fire alarm system is it operatesoff of a battery. This frees up a wall outlet and you can feel safe knowing the system will still work in the event of a power outage. And adding a second or subsequent wireless device is easy if you add on to your home or office.

Disadvantages: The one thing most fire alarm against with wireless systems is having to replace the battery. The system is essentially useless if the batteries aren’tcharged, since it won’t work properly. There is a bit of a burden to homeowners or business owners to always remember to keep the batteries fresh so the system operates properly when you need it most.

[2]The Fire Detection System consists of four main parts: Multiple sensors, communication system (Bluetooth, GSM, Node MCU), motion planning (Manual patrolling), and Android application for manual patrolling of the system. This Fire Detection system can be used in college, school, office, and industry for safety purposes.

Advantages:

- Reduced installation cost
- Early detection , reduced damage property
- Increase flexibile
- Ease of use

Disadvantages:

- Smoke from a smoldering fire will not activate a heat detector
- Heat detectors are not considered as life saving devices because they are sensitive only to heat
- High battery or current consumption will need for these detectors

[3]Fire safety is one of critical thing where monitoring and detection should be done continuously in real time, in this paper we have discussed a smart IoT system with its hardware and software design and how it operates in a view of a city or a building with its advantages and disadvantages and applications. By above study we can come to conclusion that an IoT based fire system has its own pros and cons based on need of a user and environment, it can be customized and can be used accordingly.

These information should be linked to particular sensor information so when the fire disaster occurs the people in that place being made aware of it. Figure 2 shows such a type of IoT system where at top end, hardware equipments which detects the fire are placed next level consists of hardware which communicates with its previous layer either by wired or wireless medium

Advantages:

Wireless systems are simple, flexible structures and are of low cost with short delay improvement noticed in reliability is also seen as merit of wireless system. The building will use one central office to control operation which reduces cost and enhances the efficiency of the system leading to quick detection with localization as suppressing of fire is easy when initial point of fire is known.

Disadvantages:

The time taken in process is needed to be decreased for practical application. When only one sensor is applied and if that sensor fails to detect fire it causes huge loss. There are still some modifications required in the modeling to acquire an efficient model for fire detection.

[4] Most of the fire detection are performed by sensor-based systems which have perceived the temperature and smoke by themselves and utilized in various type of industry after combining with the fuzzy theory. This kind of methodology is useful for many spots of fire occurrences. However, it could not satisfy the requirement of accuracy and reliability on some environment. For example, large spaced factories, common area of electric power facility, communication facility are vulnerable to the sensing accuracy and too expensive to cover the entire place. Thus, fire might spread widely over the spots and hard to extinguish even though those sensors detect the fire. For the more it could be worse in the area that causes high temperature, humidity, dust, vibrations. In this study, we tried to improve the problems by using camera image processing instead of sensors. We designed the prototyped system and implemented it after suggesting some type of fire detection algorithm.

Advantages:

- Detects products of combustion
- Sensitive enough to detect level of gases
- Detects prior to reaching the lethal Levels
- Produced between the occurences of detectable levels and heat detectable levels

Disadvantages:

- Can be prone to false alarm
- Must be mounted at low level
- Not suitable for Co and Co2 produced function area
- Cannot be considered as a universal replacement and thermal detectors.

References:

[1]N NMahzan, N I M Enzai , N M Zin and K S S K M Noh, ”Design of an Arduino-based home fire alarm system with gSM module”, 1st International conference on green and Sustainable computing (ICoGeS), 2017.

[2] Corresponding Author: atjeeva18@gmail.com DOI: https://doi.org/10.34256/bsr2015

[3] ZHANG Ying-Cong, YU Jing, “Study on the Fire IOT Development Strategy”, Shenyang Fire Research Institute

--Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling, US: ANSI/FMRC, pp. FM3260-2004.

[4] Public Security, Shenyang 110034, China Shenyang Institute of Engineering, Shenyang 110136, China, 2019.

Liu Yunhong Qi Meini,"The Design of

Building Fire Monitoring System Based on

ZigBee-WiFi Networks", Eighth

International Conference on Measuring

Technology and Mechatronics Automation,

IEEE, 2016, pp-733-735

[5] R.A. Sowah, A.R. Ofoli, S.N. Krakani, S.Y. Fiawoo, hardware Design and Web-Based Communication Modules of a Real-Time multisensor Fire Detection and Notification System Using Fuzzy Logic, IEEE Transactions on Industry Applications, 53 (2016) 559-566.