LITERATURE SURVEY

Name of the paper : Review of Recent Development in Fire Detection Technologies

Published year : 2003

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Topic : Industry based Fire Management System

Disadvantages :

Fire detection technology still faces challenges related to reducing false alarms, increasing sensitivity and dynamic response, as well as providing protections for highlyexpensive and complex installations to better safeguard the public and meet evolving regulations.

Limitations :

1. The distributed fiber optical temperature sensors have been introduced to provide fire protection for those applications with difficult ambient conditions such as tunnels, underground railways and stations
2. Techniques are available now for measuring almost any stable gaseous species produced prior to or during combustion
3. More than one fire signature detected by a multiple sensor, such as smoke, heat and CO signatures, can be processed at the same time through an intelligent algorithm to intelligently discriminate between fire and non-threatening or deceptive conditions
4. In addition, fire detection systems are integrated with other building service systems to reduce false alarms, speed building evacuation and assist in fire fighting
5. Advances in fire detection technology has effectively reduced the loss of property and life by fire. The National Fire Protection Association (NFPA) data showed that in the USA, a decline in the

number of significant “home” fires - from 723,500 in 1977 to 395,500 in 1997, representing a decline of 45.3 percent over 21 years, in part because low-cost fire detectors have been introduced in residential houses

Overall inference

Many new fire detection technologies developed over the last decade have strong potential to reduce false alarms, increase sensitivity and dynamic response to a fire and improve fire safety. The Brillouin scattering-based distributed fiber optic sensors has a long sensing range, responds quickly to temperature fluctuation and is immune to all kinds of interference emission. It has the potential to provide fire detection in applications where small fires might be encountered (e.g., telecommunication facilities), and areas with restricted access or with difficult ambient conditions (e.g., tunnels, underground railways and stations, nuclear and petrochemical plants). However, further research efforts are needed to improve its spatial resolution, and establish a cost-effective and reliable distributed fiber optic system for fire detection.

Video fire detection systems have also demonstrated great advantages for use in sensing and monitoring a fire as well as on multi-function applications. Cameras and corresponding facilities required in the video sensor system are already standard features of many buildings. With further development in microelectronics and information technologies, video information can be sent out or accessed via Internet or a wireless network. It is expected that the video sensor system will play a more important role in providing cost-effective fire safety and other building management and services.

In recent years, fire detectors tend to be more intelligent in discriminating between fire and non-threatening or deceptive conditions due to the introduction of artificial 16 intelligent techniques as well as the development of microelectronics technology. Multiple sensors that combine smoke and thermal sensors or CO sensor are capable of overcoming the drawbacks of single sensor in fire detection, and provide better fire detection by discriminating many nuisance sources and extend detection capability for many fire sources.

The use of advanced control panels with advanced fire signal processing and sensor-driven fire model would substantially reduce false alarms and provide more accuracy information on fire and smoke spread in the building. This will allow

building operators and firefighters to make a more accurate and responsive evaluation of any fire related incident in the building and to control fires and supervise the evacuation from the building more efficiently. The use of real-time control via the Internet or wireless network will extend the monitoring and control of fire safety systems outside of the building. The status of the fire safety system and other building systems can be monitored at anytime and from anywhere via the Internet or wireless network. The fire safety systems located in many buildings will be controlled from one central facility office. This will increase the efficiency and reduce costs for building management operations, more efficiently discriminate between fire and non-fire threats, and increase the time available for property and life protection. However, Internet-based monitoring and control of building service systems will need security protection to prevent false fire information being provided to building owners and fire brigades.

The integration of fire detection and alarm systems with other building systems should increase fire safety in the building. The fire detection system will be able to communicate with other building systems, correctly discriminate between fire and non-fire threats, identify the exact location of a fire in the building and provide continuous estimates on smoke and fire spread in the building. However, the integration technology may also create new risks. Sensor technologies, for example, will need to be robust enough to prevent false alarms, and ensure that vital information such as the location of occupants is not lost due to data overload during a fire. Integrated building systems will need to be designed not only to give fire safety priority over other building activities but also that fire emergencies do not crash the building service system.

Name of the paper : Design and Implementation of Automatic Fire Alarm System basedon Wireless Sensor Networks

Published year : 2015

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Topic : Industrial based Fire Management System

Disadvantages :

There are many concerns in automatic fire detection, of which the most important onesare about different sensor combinations and appropriate techniques for quick and noisetolerant fire detection. Researchers have been studying fires taking place in variousplaces such as residential area

Limitations :

1. Due to use of R.F. transmitter / receiver pair, communication between nodes is onlyunidirectional.
2. Due to use of microcontroller limitations in use of multiple nodes.
3. Range limitation in fire detection to use of fire detector
4. Need of repeaters for long range.

Overall inference

Fire disaster is a great threat to lives and property. Automatic fire alarm system provides real-time surveillance, monitoring and automatic alarm. It sends early alarm when the fire occurs and helps toreduce the fire damage. Wireless sensor network has become the most important technology in environmental monitoring and home or factory automation in recent years. In this paper, an

automatic fire alarm system based on wireless sensor networks is developed, which is designed for high-rise buildings. In order to provide early extinguishing of a fire disaster, large numbers of detectorswhich periodically measure smoke concentration or temperature are deployed in buildings. Those scattered detectors report their monitoring information to the surveillance center via the self- organizing hierarchical wireless sensor networks. Test results from the prototype system show that the automatic fire alarm system achieves the design requirements.

The main objective of our proposed system is to safe guard people's life and government property. This paper will focus on the system that will detect and control the fire accidents on running train. In-house parameters such as temperature and humidity in the each coach can be monitored in real time. From the information collected by the sensor system, decisions for firefighting, alarming, and automatic water sprinkler system can be made more quickly by the relevant system or engine driver. After receiving the signal, the engine driver will stop the train and take necessary action. Key Terms: Fire alarm system, Fire protection systems, Wireless sensor network, Automatic sprinklers, Signal transmission.

The trains are moderate vehicles used for transporting people and goods. Mostly, the people prefer the train journey for longer distance as it is cheaper. Since induction of train for public transportation,the fire accidents are not catered seriously by the Indian Railways. The notices showing "Do not smoke", "Do not carry inflammable material" are the only precautionary warnings about the fire in each compartment. However, because of failure in routine maintenance system or by the activities ofillegal social elements, the fire accidents in train occur frequently.

An automatic fire alarm system based on wireless sensor networks is designed and developed with emphasis on the network architecture and communication protocol. Prototype system tests show that the system provides early extinguishing of a fire disaster so that damages will be reduced effectively. We must pre-arrange the installing location of each detector in this system due to localization mechanism is not considered. In order to reduce the installation workload and make thesystem more convenient, automatic localization mechanism is the focus of our future work.

Name of the paper : Assessing the Operation System of Fire Alarm Systems for Detection Line and Circuit Devices with Various Damage Intensities

Published year : 2022

Author :

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Topic : Industrial based Fire Management System

Disadvantages :

Individual FAS devices include components with varying 'lifetimes' and damage intensities. This is because these elements are operated in different internal and external environments. Probability distributions with various damage and recovery intensity values must, hence, be taken into account for the FAS operation process and todetermine the R(t) reliability.

Limitations :

1. Influence of environmental conditions on FAS
2. Diagnosing and the impact of disturbances on the functioning of FAS
3. Reliability and transmission of utility signals in FAS
4. Performance of the FAS—e.g., false alarms
5. Power Supply Analysis for Electronic Security Systems
6. Basic Information on the Damage Intensities λ of Elements, Modules andDevices Used within Fire Alarm Systems
7. Reliability and Operational Analysis of a Fire Alarm System for Detection Circuitand Line Equipment with Varying Damage Intensities

Overall inference

Fire alarm systems (FAS) are some of the most important electronic security systems (ESS) currentlyused in civil structures that are either:
• stationary, i.e., set permanently on the ground (foundations), such as critical infrastructure buildings (CIB), warehouses, airports and seaports, logistics hubs, train stations, stadiums, shoppingcenters, etc.
• non-stationary (not permanently bonded with the ground)—e.g., aircraft, ships or other vessels,locomotives, passenger and freight rail carriages, trucks intended for material transport, etc.

The FAS operation process, as well as changes to its parameters and functionalities, have beentaken into account in the actual values of damage intensity and recovery intensity that have been determined based on studying a representative group ofsystems. Based on the developed FAS reliability model, it was possible to determine the basic reliability and operational indicators—e.g., reliability or, e.g., the sole distinguishment of the basic safety state of the systems in question. They are extremely important for security reasons(fire hazards in this case) that occur within the facility and the surroundings. There are different technical and organizational solutions applied within a FAS.
These aforementioned FAS elements do not directly take part in the implementation of the main FAS task, namely, detecting a fire and triggering the suppression process; however, they constitutenecessary help for the users and service personnel during the diagnostics process—remote or on- site.

The paper presents a method for assessing operation processes for Fire Alarm Systems (FAS) appliedin civil structures, based on use analysis. Individual FAS devices include components with varying
'lifetimes' and damage intensities λ. This is because these elements are operated in different
internal and external environments. Probability distributions with various damage λ and recovery μintensity values must, hence, be taken into account for the FAS operation process and to determinethe R(t) reliability. The life cycle of elements comprising a FAS can be divided into three distinguishing time periods. The first is the so-called 'childhood'. The second, the longest, is
characterized by damage intensity λ = const, and the third period is where FAS is unfit

more frequently. Based on knowledge of actual FAS operation process data, it is possible to determine damage λ and recovery μ intensity parameters. Such data can be employed to determine FAS reliability parameters within the presented service life intervals. The authors of the article first discuss the basic issues associated with FAS, followed by analyzing the current status of the topic.They also present power supply matters and system solution examples, develop an operation process model and determine selected operational indicators for the structures in question. The paper ends with conclusions

Name of the Paper : Intelligent Fire Alert and Escaping Systems

Published Date : 2017

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Topic : Industry based Fire Management System

Disadvantages :

- Fire detection technology still faces challenges related to reducing false alarms, increasing sensitivity and dynamic response, as well as providing protections for highly expensive and complex installations to better safeguard the public and meetevolving regulations.

Limitation :

- This fire alarm system comprises of smoke detector and flame sensor with a wirelesscamera inbuilt in a robot.
- Since smoke is grayish and semi-transparent, edges of high frequency image frameslosses their sharpness and becomes an indicator for smoke.
- Also smoke is distinguished by checking the variations of background color tones, segmentation of smoke coloured pixels, blur background, illumination etc., However itis not clear though how this technique can distinguish between foggy weather and smoke.
- To overcome this problem motion analysis is also included in vision based technique todetect smoke accurately.
- But sensors based fire detection techniques are easy to install, cheap in price and system becomes much more easily deployable. In along with computer vision-basedfire detection algorithm for fire colour modelling and motion detection,

sensor networks are combined.

- These combined approaches seem very attractive however it could increase the expenses of the system and the system complexity will increase for installation and deployment.

Overall inference

- In this paper Intelligent fire alert and escape system is presented that can help in minimize losses by the fire event. Along with fire alarm this system sends an alert to fire station with location.
- To build a more responsive fire alarm system we use a smoke detector and flame sensor with a wireless camera inbuilt in a robot.
- The multiple functioning robot has more advantages than a single task robot. A movable system provides many advantages during fire.
- This system helps to escape from a fire spot by providing navigation with the help of camera inbuilt in a robot system.
- It also able to send a alert of fire to the nearest fire station with the help of a GSM and GPS module provided in the system. If fire is of small level the system is capable of extinguish it.
- If any fire accident occurs, there is a need of person to monitor continuously and alert respective department. In this process if any time delay takes place irreparable loss occurs.
- Hence a automatic system is useful for monitoring from a distant place and send alerts without delay.

Name of the Paper : Recent Advances in Fire Detection and Monitoring Systems

Published Date :

- January 2020

Author :

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Topic :

- Industry based Fire Management System

Disadvantages :

- Fire detection technology still faces challenges related to reducing false alarms, increasing sensitivity and dynamic response, as well as providing protections for highly expensive and complex installations to better safeguard the public and meet evolving regulations.

Limitation :

- Early fire monitoring and detection systems (FMDS) are based on traditional methods like human supervision either by on-site or video monitoring.
- However, these techniques present some inaccuracies and false detections caused mainly by the limitation of human capacities in supervision.
- For these reasons, researchers have been working on automating fire detection systems by taking advantage

from technological advances.

- To reduce the effects of fire, several approaches have been proposed to improve the reliability of FMDS. Vision based fire detection methods is the most usually and more interesting. Fire monitoring present the first level in FMDS.
- This level is essential to detect and localize fire in the images acquired by the vision sensors.
- Automatic fire detection has attracted the research community due to its importance yielding to an outstanding number of contributions proposed as a solution to this problem.

Overall inference

- In this paper, a widespread literature survey on fire monitoring and detection systems has been presented.
- The main objective of these systems is the detection and estimation of fire evolution in real-time.
- A comparative analysis of ground, satellite and UAV systems in terms of reliability, flexibility and efficiency revealed that UAVs have a major significance for fire detection and monitoring thanks to their low cost and reliable data transmission and the most important real-time processing.
- We have also presented an up-to-date review of vision-based fire detection techniques while focusing on the ones based on deep learning algorithms.
- Compared to classic method, the latter are showed to be robust and more efficient to solve fire detection and recognition problem.