A Multiple Sensor Data-Fusion for EFD Using IoT

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Abstract: Multi sensor data fusion allows large scale deployments for environmental monitoring applications especially in the areas like homes, other buildings and infrastructures and industries. In such areas early fire detection is of great importance as the consequences of a fire are catastrophic. This project predicts the possibility of catching fire using a multi-sensor scheme of data fusion to enhance the performance of the early fire detection process by detecting the concentration of inflammable gases in the atmosphere and by measuring the atmospheric temperature.

Key words: Inflammable, GSM, Data-Fusion, Things speak IoT

Introduction

Wireless Sensor Networks (WSN) allows large scale deployments for environmental monitoring applications especially in the Wildland Urban Interface (WUI) (i.e. in areas where forests and rural lands interface with homes, other buildings and infrastructures) and industries. In such areas early fire detection is of great importance as the consequences of a fire are catastrophic. This project predicts the possibility of catching fire using Wireless Sensor Networks at the WUI using a multi-sensor scheme of data fusion to enhance the performance of the early fire detection process by detecting the concentration of inflammable gases in the

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atmosphere and by measuring the atmospheric temperature. We are trying to use multiple sensors that to MQ2, MQ135 and MQ6 sensors which are used to measure the LPG, air quality and Smoke respectively. The multiple sensor data's can be induced to think speak iot which can plot put graph out of these sensor data values and forward us with warning of composition of value of air which is favorable to fire catching. There are many fire prone situations where if you see multiple presence of gases leads to fire . We are using multiple sensors to predict the possibility of a fire and prevent it from happening. The time is really crucial here as we are able to figure out we can either prevent the fire with taking the precation moves or just prior information to the firestation. Giving alert to everyone.

Literature Survey

There are many works related to mutisensor data fusion using IoT

[1] A Smart Fire Detection System using IoT Technology With Automatic Water Sprinkler. House combustion is one of the main concerns for builders, designers, and property residents. Singular sensors were used for a long time in the event of detection of a fire, but these sensors can not measure the amount of fire to alert the emergency response units. To address this problem, this study aims to implement a smart fire detection system that would not only detect the fire using integrated sensors but also alert property owners, emergency services, and local police stations to protect lives and valuable assets simultaneously. The proposed model in this paper employs different integrated detectors, such as heat, smoke, and flame. The signals from those detectors go through the system algorithm to check the fire's potentiality and then broadcast the predicted result to various parties using GSM modem associated with the system. To get real-life data without putting human lives in danger, an IoT technology has been implemented to provide the fire department with the necessary data. Finally, the main feature of the proposed system is to minimize false alarms, which, in turn, makes this system more reliable. The experimental results showed the superiority of our model in terms of affordability, effectiveness, and responsiveness as the system uses the Unidos platform, which makes the data exchange faster and reliable.

[2] Discussion of Society Fire-Fighting Safety Management Internet of Things Technology System.

IOT is regarded as another information industry wave following computer, Internet and mobile communication network, and has become one of strategic dominant positions of new economic

and technological development all over the world. The society fire-fighting safety management is an important application field of Internet of Things (IOT) technology. This paper combines application features of IOT technology according to fire-fighting business requirement to discuss the fire-fighting IOT systematic frame, plan society fire-fighting safety management IOT technology system, and propose priority development points of society fire-fighting safety management IOT technology, thereby providing reference for technology research and development of IOT technology in society fire-fighting safety management field.

[3] An automated firefighting system

This paper presents the implemented procedure and result of a new ceiling mount firefighting system which uses computer vision theory to detect fire in an indoor environment and subdue it in root level. A domestic home or office can be brought under constant surveillance with the aid of various nodes at different strategic positions. An Alarm can be deployed for ensuring the safety issue. The number of fire accidents which take alarming number of lives of garments workers in Bangladesh can be reduced by implementing this proposed system.

[4] Indoor Navigation Integration Platform for firefighting purposes

In Germany about eighteen fire fighters lose their lives and more than 16.000 accidents happen on duty every year. One of the main problems is the orientation in complex buildings during operations, especially if rooms are full of smoke. Route cards (printed on paper) to find fire detectors in buildings, are means, which often do not meet all requirements with regard to orientation and up-to-datedness. The aim of the presented research project “Context Sensitive Indoor-Emergency-Navigation-System for Complex Buildings” is to develop a solution for response and recovery to support rescuers in finding the shortest way within a complex building. Existing building models are exported and used for displaying plans on mobile devices and for routing purposes. The indoor navigation is based on Wireless LAN, Ultra-Wide-Band and Radio Frequency Identification (RFID).

[5] Numerical Investigation of Fire Safety of an Indoor Pedestrian Street

With the development of economy, indoor pedestrian streets have become more and more popular in large commercial architectures. The safety of such type of construction has drawn people's attention. Traditional methods for fire protection are difficult to meet the requirement in indoor pedestrian streets due to the large span of the building. Investigation is needed to evaluate and improve the fire safety level of such place. This paper adopts FDS (Fire Dynamic Simulator) to simulate fire development of an indoor pedestrian street in a most recently designed large-scale shopping mall in China. The influences of fire locations, smoke extractions, and fire-extinguishing systems on fire development were mainly studied. According to the simulation results, appropriate fire protection methods were discussed to ensure the safe evacuation, which gives reference to fire protection design of similar building.

[6] Survey on Fire Safety Measures for Industry Safety Using IOT

Nowadays safety is mandatory in every sector. In that fire safety precautions should be implemented in all areas. Many of the fire accidents that occurs in the industrial areas and it cause major damage to human as well as properties. In this survey some major cause for the fire accidents are analyzed and based on what technology they are providing safety measures are also analyzed. Through IOT many of the safety measurements are implemented nowadays. From the survey taken most of the fire detection method detects fire after it is triggered. In the proposed system the fire safety practices is going to implement for the fire crackers industry. In that the root cause for the fire is to be analyzed and prevent from the fire before it is triggered. Through this hazardous fire accidents can be avoided and many lives can be saved.

[7] Evaluation of thermal safety in fire using human thermal model and CFD simulation

The fires bring huge loss every year, a large number of firefighters and victims are seriously injured in fires and many of them even lost their lives. The aim of this work is to study on the thermal safety and discomfort of human body in fire environment using modeling and CFD methods. A transient multi-node human thermal model is developed for improving the

simulation of thermoregulation in serious condition. Coupled with the human thermal model, a real shaped model of male body with 176 curved surfaces and more than 200 thousand cells, and real physical parameters was built. The CFD computation was taken using standard k-epsilon turbulence viscous model and discrete coordinate radiation model. A virtual room with 3.0m × 3.0m × 2.6m was built and series of fire with typical heat release rate were introduced as heat resource. The simulation was taken with 0.5 second time step. The prediction of thermal injury degree was considered with Stoll's and Takata's injury model based on data from model and CFD computation. The time for heat stroke, deeply injury and degrees of thermal comfort indices were compared, the prediction of thermal safety and discomfort was made. Furthermore, a ventilated, fire-resistant enclosure including a radiator is constructed to improve the experiment.

[8] Research and Implementation of WSN in Fire Safety Applications

Applying WSN (wireless sensor networks) technology to the fire safety can actualize wireless requirement, network, and intelligent fire monitoring. A wireless fire detection system based on WSN was described in the thesis, which can acquire data of temperature and smoke concentration. Fire detection nodes using SOC CC2430 as the control unit to realize the communication between nodes, the software running on the nodes applies CSMA/CA Medium Access Control protocol and a shortest path routing algorithm for data transmission in multi-hop. The Gateway is designed an implemented based on ARM9 and Linux, which connects wireless fire detection network and the Internet, it has a strong processing, storage and network communication capabilities. Remote users may share real-time fire parameter from Internet which connects with the wireless fire data acquisition network through the Gateway.

[9] Smart Fire Safety System in a Building

In this paper will be discussing about the Smart fire safety system in a building. By using this technique, we can save the life of the people present in the building which is on fire. As we all know that in this kind of situation the first thing which will be happening is that the sprinklers

will be turned on, but when the current supply will be still on there is chance of short circuit and the fire will get more severe due to this reason. Here we have programed in such a way that the circuit in the building will be tripped and then the sprinklers will be turned on so that the fire in the building is controlled. And another danger is that in major cases people will die because to breathing problem due to the smoke which is formed in due to fire. That's why we will be using exhaust fans to remove the smoke from the building. By using this technique there is a chance of saving lot of people stuck in a building which is on fire. And another advantage is that this technique is not only for the new buildings but also easily implemented to the existing old building easily. So that you don't have to change the design of the buildings. And the implementation cost will also be less.

[10] Indoor Navigation Integration Platform for firefighting purposes

In Germany about eighteen fire fighters lose their lives and more than 16.000 accidents happen on duty every year. One of the main problems is the orientation in complex buildings during operations, especially if rooms are full of smoke. Route cards (printed on paper) to find fire detectors in buildings, are means, which often do not meet all requirements with regard to orientation and up-to-datedness. The aim of the presented research project “Context Sensitive Indoor-Emergency-Navigation-System for Complex Buildings” is to develop a solution for response and recovery to support rescuers in finding the shortest way within a complex building. Existing building models are exported and used for displaying plans on mobile devices and for routing purposes. The indoor navigation is based on Wireless LAN, Ultra-Wide-Band and Radio Frequency Identification (RFID).

Problem Definition

Multisensor data fusion is the process of combining observations from a number of different sensors to provide a robust and complete description of an environment or process of interest [1-11]. Data fusion finds wide application in many areas of robotics such as object recognition,

environment mapping, and localization. Here we are trying to predict the fire catching before even catching by analyzing the data generated by the different sensor fusion we have created.

RELATED WORK

We have collected analyzed and lot of IEEE papers to induce a refined visualization on data fusion technique's. The Program Prerequisites Determination is outlined to report and portray the assertion between the client and the engineer with respect to the detail of the computer program item requested. Its essential reason is to supply a clear and graphic "statement of client requirements" that can be used as a reference in assist advancement of the software package. This record is broken into a number of areas utilized to coherently partitioned the computer program necessities into effortlessly referenced parts. This Program Prerequisites Determination points to describe the Usefulness, Outside Interfacing, Qualities and Plan Imperatives forced on Execution of the package portrayed all through the rest of the report. The Increased Reality gives best results, precision changing for distinctive places [12-26].

PROPOSED WORK

Our project aims to predicts the possibility of catching fire using Wireless Sensor Networks at the WUI using a multi-sensor scheme of data fusion to enhance the performance of the early fire detection process by detecting the concentration of inflammable gases in the atmosphere and by measuring the atmospheric temperature. To use multiple sensors that to MQ2, MQ135 and MQ6 sensors which are used to measure the LPG, air quality and Smoke respectively. The multiple sensor data's can be induced to think speak IoT which can plot put graph out of these sensor data values and forward us with warning of composition of value of air which is favorable to fire catching. There are many fire prone situations where if you see multiple presence of gases leads to fire .

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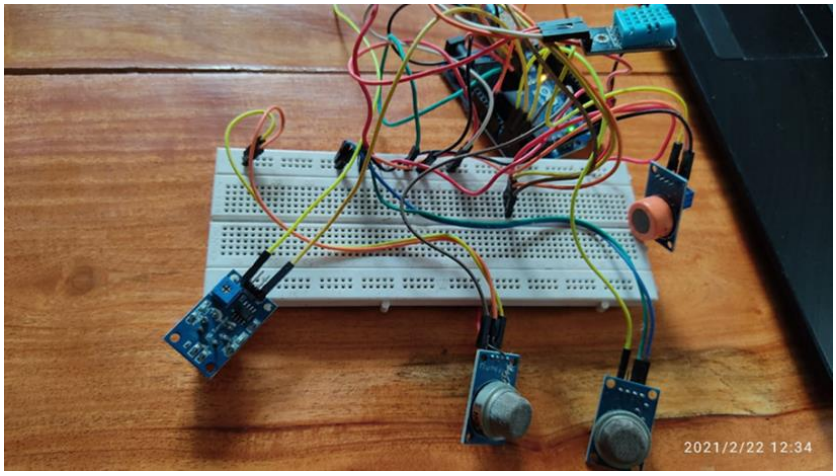

Figure 3.1 : Connection of various Sensors

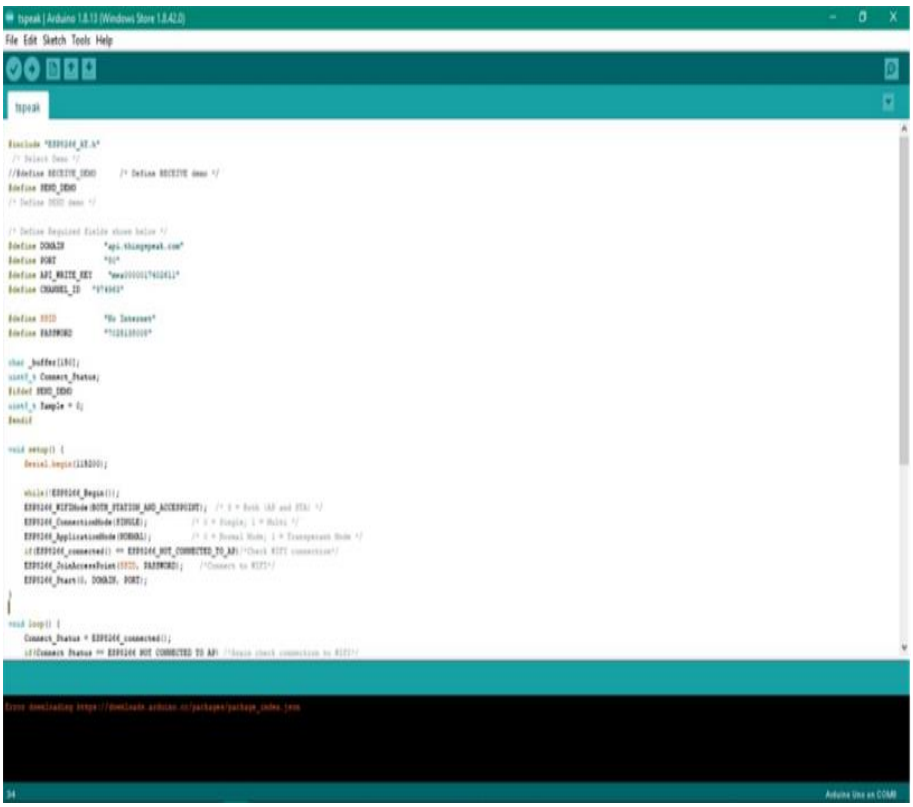

Figure 3.2 : Code to achieve sensor interfacing

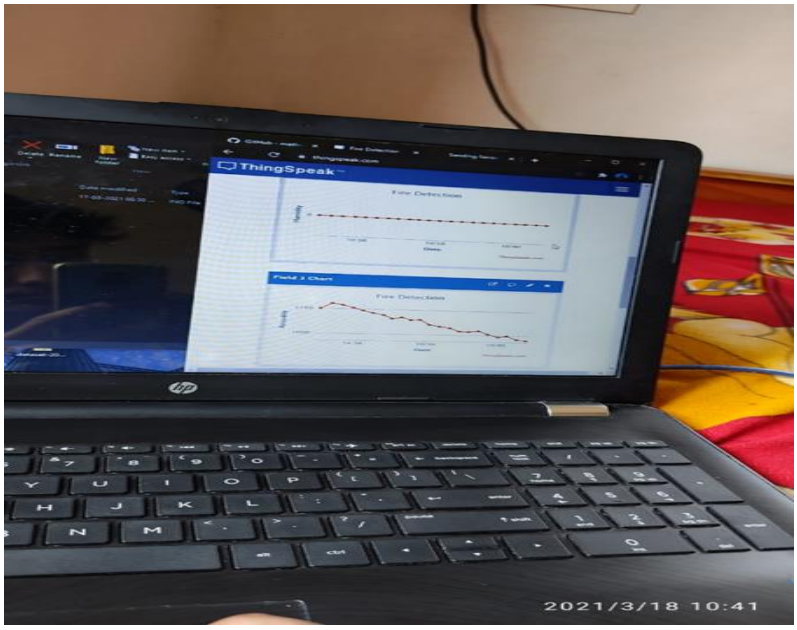

Figure 3.3 : Output on things speak IoT

CONCLUSION

Our proposed idea aims to detect the fire before it even catches. It analyses the parameter for induction of fire and warns the recipient immediately. It analyses the smoke if any fire catching is sensed then it will act accordingly. Although the design was successful there are improvements that could be made in future adaptations of this project. We can add more number of sensors to achieve better results. Image recognition could be the next thing which can evolve fire detection.

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