School of Information Technology & Engineering
B.Tech (Information Technology)
ITE 1901 : Technical Answers for Real World Problems (TARP)
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Abstract Submission / Literature Survey **(Latest Date: 05.08.2022)**

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Project Title: Fire detection and Alerting System

Abstract : Internet of Things (IoT) is basically a network which consists of physical systems that are embedded with sensors connected to a cloud where data is exchanged with the help of a gateway, which facilitates to and fro communication of data connected over the internet. Fire detection systems are designed to discover fires early in the development when time will still be available for the safe evacuation of occupants. Early detection also plays a significant role in protecting of safety of emergency response personnel.Property loss can be reduced and downtime for the operation minimized through early detection because control efforts are started while the fire is still small. At present the application of IoT based systems is extended to real time detection and warning system. However, cost has been a major factor for development and implementation of IoT systems. Considering the cost, ease of implementation, the proposed system proposes a low cost yet efficient IoT system for warning and alerting fire incidents. The proposed system has sensors which gathers data from the physical world and is continuously sent to the cloud platform. When the temperature increases the preset threshold, the http webhook will be triggered and the notification is sent to the fire department. The amount of equipment to be taken by the fire departments can be moderated with the help of the displayed number of people in the affected area which has been added in the proposed system.

Objective: Setting up fire control system for domestic use.
Innovation component in the project: Use of Applet
Technologies: Think speak is used for the cloud storage and data visualization

Literature Survey:- (Min of 10 papers per team member)

i) Title of the paper - FireDS-IoT: A Fire Detection System for Smart Home Based on IoT Data Analytics.[1] Authors - Sourav Kumar Bhoi, Sanjaya Kumar Panda,Biranchi Narayan Padh,Manash Kumar Swain. Brief Summary of the paper - Designed to prevent people from fire by providing an alert message in the emergency.Classification is performed using the K-Nearest Neighbors (K-NN) and decision tree machine learning algorithms. Source - 2018 International Conference on Information Technology (ICIT). Inference/Limitations - Nitrogen oxides, acid gases and aldehydes are also released are not considered.Limited dataset is considered for the algorithms.

ii) Title of the paper - Computer Vision and Smoke Sensor Based Fire Detection System. Authors - Nahid Chowdhury, Dewan Ruhul Mushfiq, AZM Ehtesham Chowdhury. Brief Summary of the paper - Hybrid model that incorporates computer vision and smoke sensor-based fire detection into a single system.Utilizes colour and motion attributes of fire combustion.After performing a visionbased analysis, the proposed algorithm uses the MQ-2 smoke sensor to detect environment smoke and gas caused by fire combustion. Source - 1st International Conference on Advances in Science, Engineering and Robotics Technology 2019 (ICASERT 2019).2 8 Inference/Limitations - Real life experimental data shows that our system can detect fire with 86.67% of accuracy.

iii) Title of the paper - Design of a smart fire detection system.[3] Authors - KB Deve, GP Hancke and BJ Silva. Brief Summary of the paper - A smart fire detection system using a Wireless Sensor Network (WSN) and Global System for Mobile (GSM) communication to detect fires effectively and reduce false positives, using the wisdom of crowds, which was a voting system. Source - IEEE Xplore. Inference/Limitations - There were some difficulties due to the testing environment in proving this. Autonomous calculation and secure verification of node location were not considered.

iv) Title of the paper - A survey of Internet of Things in fire detection and fire industries.[4] Authors - S.R.Vijayalakshmi, S.Muruganand . Brief Summary of the paper – WSN node with sensors, RFID tagged device and Video node for fire and product monitoring. All things such as sensor network, mobile network are connected together in the network layer.Mobile node data, WSN node data display and graph display for the fire related parameters. Source – International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2017). 9

v) Title of the paper - IoT Based Smart Emergency Response System for Fire Hazards.[5] Authors - Ravi Kishore Kodali, Subbachary Yerroju. Brief Summary of the paper – The sensors detects the hazard and alerts the local emergency rescue organizations like fire departments and police by sending the hazard location to the cloud-service through which all are connected. The overall network utilizes a light weighted data oriented publish-subscribe message protocol MQTT services for fast and reliable communication. Source - International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC 2017). Inference /Limitations - MQTT is a message communications protocol. The broker cannot distinguish between messages that contain new or previously transmitted values, to maintain consistency.

vi) Title of the paper - Automatic Fire Initiated Braking and Alert system for Trains.[6] Authors - Sumit Pandey, Abhishek Mishra, Pankaj Gaur. Brief Summary of the paper - Here they have created a safety system for the passengers in train, if there is any fire breakout the smoke sensor detects immediatly and alerts the driver as well as guard man. Source - 2015 Second International Conference on Advances in Computing and Communication Engineering. Inference/Limitations - It has limitations such as it is a fire detection system not a fire extinguishing system still it is better in saving the precious lives of the people than the present day used trains. 10

vii) Title of the paper - An Embedded System of Dedicated and Real-time Fire Detector and Locator Technology as an Interactive Response Mechanism in Fire Occurrences.[7] Authors - Sheila Abaya, Ejay Cabico, Jonah Domingo. Brief Summary of the paper - The technology of fire detector embedded with fire locator mechanisms designed and dedicated to recognize smoke and temperature caused by fire is wirelessly connected with the main fire control alarm technology and a pre-designed interactive mapping system installed in the BFP agency or fire stations will provide fire fighters with real-time information that will inform and notify the BFP persons of a fire incident and the exact location of fire. Source - 2016 IEEE International Conference on Advances in Electronics, Communication and Computer Technology (ICAECCT) Rajarshi Shahu College of Engineering, Pune India. Dec 2-3, 2016. Inference/Limitations -With this proper equipment we can prevent much loss of life and property by

informing fire department immediately.

viii) Title of the paper -Wireless Automated Fire Detection System on Utility Posts Using ATmega328P.[8] Authors -Dyan Quel R. Elizalde1 , Rezalina Jessica P. Garcia2 , Mead Margaret S. Mitra3 Brief Summary of the paper -This is mainly for Outdoor Using temperature and ionization smoke sensors, GPS and GSM modules, ZigBee module and ATmega328P, a wireless automated fire detection system is proposed. This design will include the entire area covered by the proposed system by installing intelligent sensor nodes and servers in strategic locations of the affected area. The proposed system will be capable of detecting the presence of smoke and fire in the areas covered by the3 11 proposed system. An alert message is then sent to the proposed system's intended recipients by wireless means. Source - 2018 IEEE 10th International Conference on Humanoid, Nanotechnology, Information Technology, Communication and Control, Environment and Management (HNICEM). Inference/Limitations - The proposed wireless fire detection system has been successful in detecting the occurrence of fire smoke from fire with the use of temperature and smoke sensors. The proposed system has the capacity to generate fire alert messages to the host server through Windows application and saving the information in an Excel file.

ix) Title of the paper - Forest Fire Alerting System With GPS Co-ordinates using IoT.[9] Authors - Jayaram K, Janani K, Jeyaguru R, Kumaresh R, Muralidharan. Brief Summary of the paper - Once the fire inside deep forest starts, it burns and destroys everything and spreads everywhere within the forest. The objective of this work is to design and implement an IoT based system which is self-sustaining and would predict and detect the forest fires and sends the exact location to concerned officials which would help fire fighting personnel to extinguish the fire in the location where it starts slowly. Source - 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). Inference/Limitations - The system needs to be robust to withstand all the climate changes which may affect its functioning. However, our system will play a crucial role in curbing the forest fires which would prevent loss of huge resources and financial losses.3 12

x) Title of the paper -A Wireless Sensor Network for Fire Detection and alarm System.[10] Authors - Patrick Jason Y. Piera1 , Joseph Karl G. Salva. Brief Summary of the paper - For same traditional fire detecting system they added CAN some intelligent algorithm or methods are adopted in the system to solve these problems, which miss alarm and error alarm are two difficult problems in the current fire alarm system. By use of the new technology of CAN fieldbus and single-chip-computer technology, Hardware circuit and software design for intelligent node SJA1000 based on CAN and fire detector are given. Source -The Eighth International Conference on Electronic Measurement and Instruments ICEMI’2007. Inference/Limitations - Error and miss alarm rate is reduced greatly. Difficult problem which is error and miss alarm is solved because that intelligent fire alarm and monitoring system based on CAN bus is applied in modern times.

METHODOLOGY

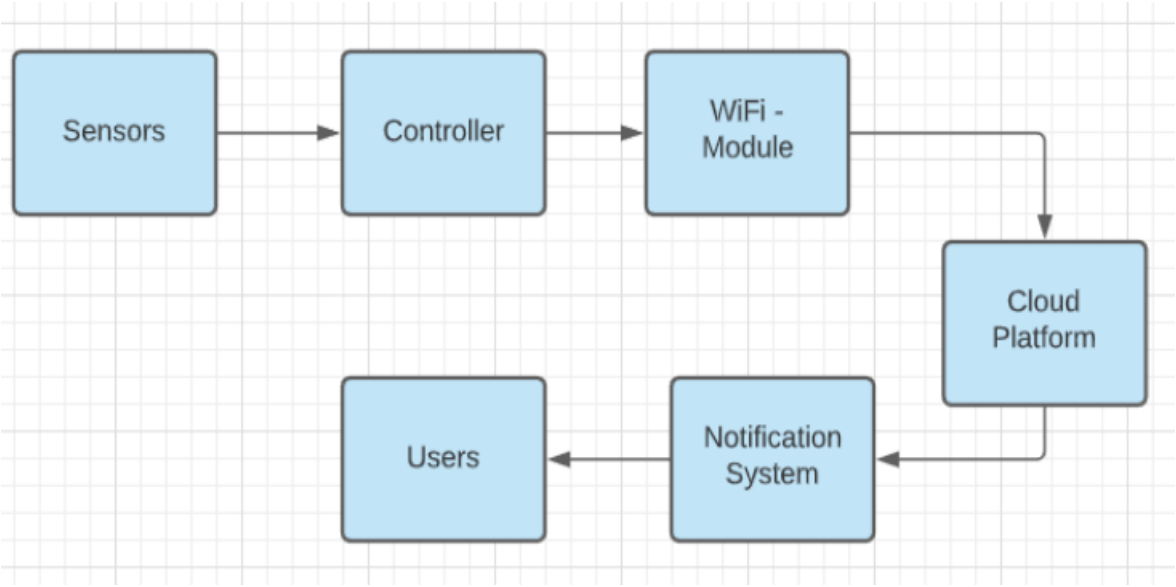
Our main objective here is to minimize the loss that happens due to fire accidents and to save people in danger as soon as possible. The proposed project, will be installed in every room of an apartment or in the rural farm, which will help us to detect the temperature at every instant and update to cloud hence, real time monitoring. Here we have setup an thermal sensor in the building or in the farms ,connected to a Arduino and wifi which is used to read the information and send the data to cloud, used here is THING SPEAK cloud platform for sending and analysing the data .

An unique API key which is generated by the thing speak channel and that key is used in our code to update the data. 17 We are also attaching IR sensors on top of every door or the boundary of farm such that when a person enters the room or farm IR sensor will increase the counter. If a person leaves the room other IR sensor will increment the count so the difference of this counts will give no of people in that room, so if we display this data which shows number of people in each room in the LCD screen, when the fire department people comes to the

building they will clearly get to know where they have to go first even if the smoke covered up entire building or farm as we know the location of a person we can easily reach there and protect them. IFTTT web applet is used for sending messages to the registered person or the fire department.

This IFTTT will work if a particular event has happened then it will be triggered, so here we have given a webhook as input event and SMS as output event, webhook is a url which we have used in react in thing speak, so if the temperature has crossed certain threshold value React will trigger this URL and this IFTTT confirms this event has been triggered so it will trigger the corresponding event which will send an SMS to the registered number.

BLOCK DIAGRAM



SWOC Analysis:

STRENGTH:

- Easy Fire detection in the household and farms.
- Accuracy is high as it is based on the predefined chart patterns.
- Works even on 2G connectivity.
- Low Setup cost

Weakness:

- Cannot optimize the Response mechanism
- May fail for new data generated on the basis of fire.

Opportunities:

- Can be used in Tier-2 and Tier-3 domestic homes and prevention can be achieved.
- Can be implemented on the farms as the cost setup is low.

Challenges:

- Difficult to convince people for the installing in the rural area.
- Fixed the parameter for the new data.