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A study on IoT Technologies for Fire Safety System

Brunda N[1]
Student, Department of Electronics and Communication Engineering
Vidyavardaka College of Engineering, Mysuru, Karnataka, India.

Chandan R[2]
Student, Department of Electronics and Communication Engineering
Vidyavardaka College of Engineering, Mysuru, Karnataka, India.

Lavanya N R[3]
Student, Department of Electronics and Communication Engineering
Vidyavardaka College of Engineering, Mysuru, Karnataka, India.

Prajwal G M[4]
Student, Department of Electronics and Communication Engineering
Vidyavardaka College of Engineering, Mysuru, Karnataka, India.

Panchami S V[5]
Assistant Professor, Department of Electronics and Communication Engineering,
Vidyavardaka College of Engineering, Mysuru, Karnataka, India.

Abstract- 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.

Keywords- IoT, Image processing, WSN, GSM, Temperature sensor

I. INTRODUCTION

Fire is deadly as it causes human life and properties. Fire detection systems are required to decrease the damage of belongings of individuals caused due to fire by both man and those which are induced. The bureau of the nation crime records has indicated that there are total of 113961 deaths because of fire accidents in the year 2010-2014. Around 69 people become victims of fire accidents every day. The fire extends drastically with time hence, early fire detection is essential for preventing accidents due to fire.

The major disadvantage of traditional fire detection system is that fire in remote areas cannot be detected. Therefore, sensors are required to convey to long distance by transmission lines and also by instrumental amplifiers. Most of fire detecting systems are making use of wireless sensor networks (WSN) they have achieved popularity due to their huge applications such as localization, health care and environmental monitoring.

Internet of Things is a strategic apex in economic and development of technology nowadays. On December 8th 2011 the government issued the "Twelfth five-year plan" for the IoT development. Here IoT has its application industry for fire detection. In this IoT the transmission and also the processing of information are reliable and achievable. It matches fire surveillance alarm and also disposes that are in practice by fire management. Hence IoT could be used into firewall or security system. Any device which is connected with IoT is connected to internet. A survey says that by 2020, 26 billion to 64 billion devices can be connected to IoT.

The IoT is the best solution to problems of lines being not feasible in some cases. IoT is embedded system in which sensors and actuators are used and monitored and controlled with already present network of infrastructure. It makes way for computer-based controlling for accuracy in operation.

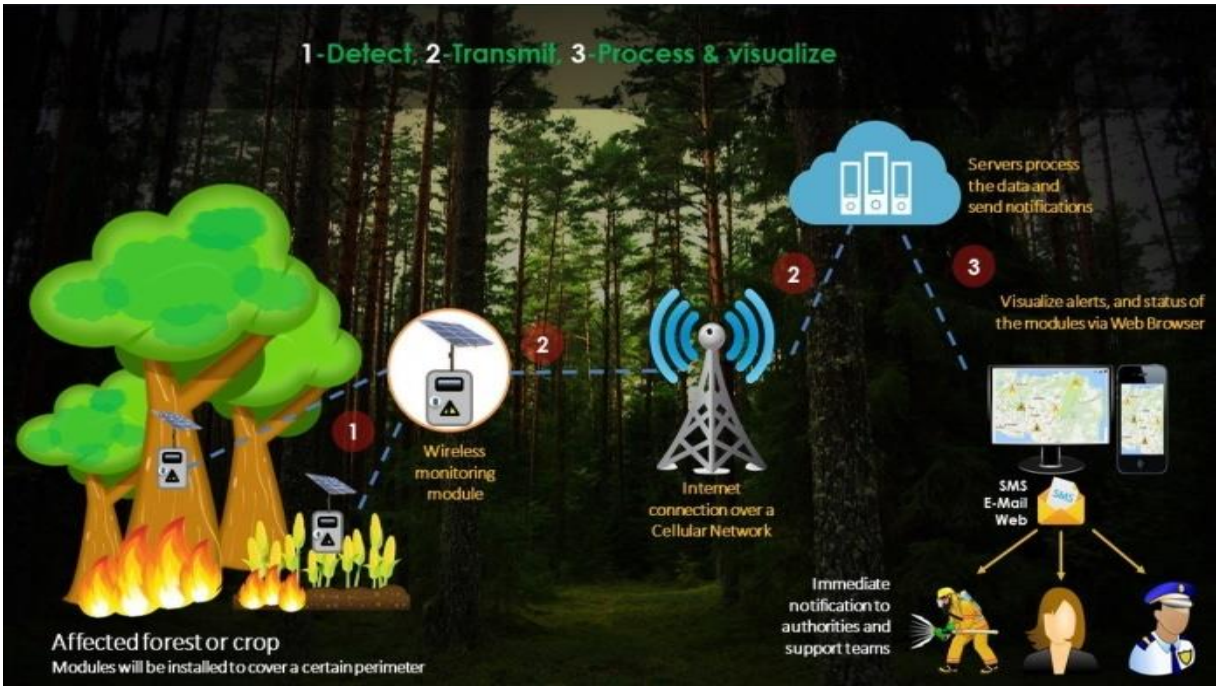

Figure 1. Architecture of fire safety system in a forest or in a crop field using IoT

As shown in figure 1 Installing of camera which is IP based in areas which are vulnerable to fire in height which allows capturing possible will lead to early fire detection. Fire in kitchen is one of the frequent accidents due to gas store. This can be solved by using camera for the detection of fire, where the user can see the live video if the gas store is off even they are away from home.

Therefore, devising of system for automatic fire detection timely and being able to send information to nearest fire station is important in safety of society.

II. RELATED WORK

Zhang Yang-cong, YU Jing discussed about the present state of the IoT and needs of fire distinguishing system. They have analyzed the improvement and the benefits of IoT fir firefighting in various conditions includes domestic firefighting, firefighting tools, maintaining the tools for firefighting, monitoring the tools of firefighting etc [1].

G. Ajith, J. Sudarshan, S. Dhilipan Arvind and Dr. R Sugumar have discussed about IoT based fire detection and safety navigation system. This system provides extinguishing of fine during early stages. This system is designed for high rise buildings. This system consists of large number of sensors which measure amount of temperature or smoke in certain periodic interval of time. The navigation system helps workers to get out of the building [2] .

R. Angeline, Aditya S, Abhishek Narayan have discussed about fire alarm using IoT. This system provides security to homes by detecting the fire using sensors and by alarming the watchman or fire officials. They have discussed wide variety of sensors that can detect firein homes. They have discussed about functionality and implementation of each module [3].

Guggilla Anusha, V.R. Sheshagiri Rao have proposed IOT based we house for safety system using ARM7. This system provides safety and protection for garment plant staff. This system not only detects fire but also gives the location of the fire place. They have used different type of sensors embedded with ARM7. This system sends message to the admin, who finally decides whether it is or it is not a fire disaster [4].

Wei-Ling Hsu, Ji-Yun Jhuang, Chien-Shiun Huang, Chiu-Kuo Liang and Yan-Chyuan Shiau discussed about application of Internet off things in a kitchen fire prevention system. This system provides for prevention system that processes various devices and functions. Smart kitchen consists of (1) sensors to turn off gas supply when fire is detected. (2) Alarm to alert people. (3) Line reporting system. (4) Internet protocol camera to monitor kitchen [5].

Faisal Saeed, Anand Paul, Abdul Rehman, Won Hwa Hong and Hyuncheol Seo proposed a system called IoT-Based Intelligent modeling of smart home environment for fire prevention and safety. They have used multiple sensors in this system for fire detection and to increase accuracy and efficiency of the system. They have also used GSM to avoid false detection of fire [6].

III. IOT BASED SYSTEM FOR FIRE SAFETY

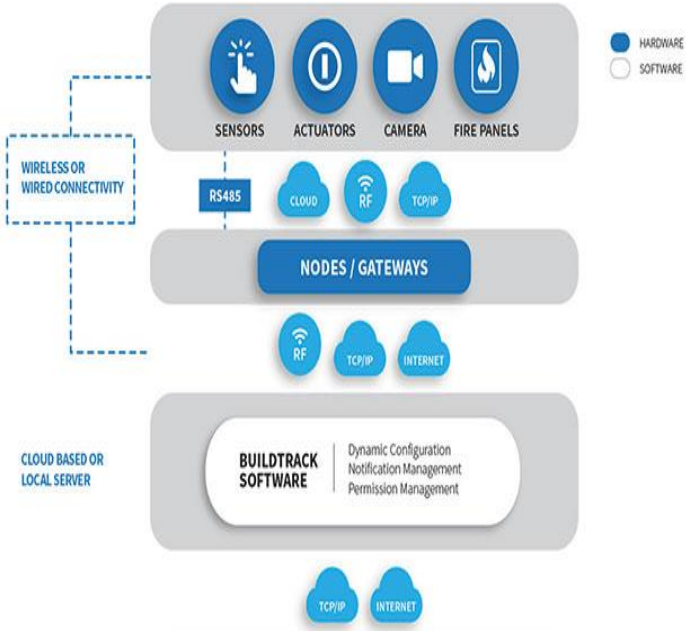

Figure 2: IoT based system fire safety system

The IoT based Fire Safety System starts with sensors that detect gas or smoke temperature. The further level consist of communicates hardware which is either by wired or wireless signals through the hardware called nodes, hubs or gateways which have the internet access this level communicates using IP protocol with the cloud application server. If any fire event is detected by the sensors linked with it. The system health is being checked in each layer and communicated to cloud server. This is important because the whole set up system is dependent on its healthy state[7]. The cloud server has information about system health and all the event and also plays information where sensor is placed. The cloud server also knows the fire lighting equipment information, fire audit information. All 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[7]. Elements which system could be linked together is shown in Figure 3.

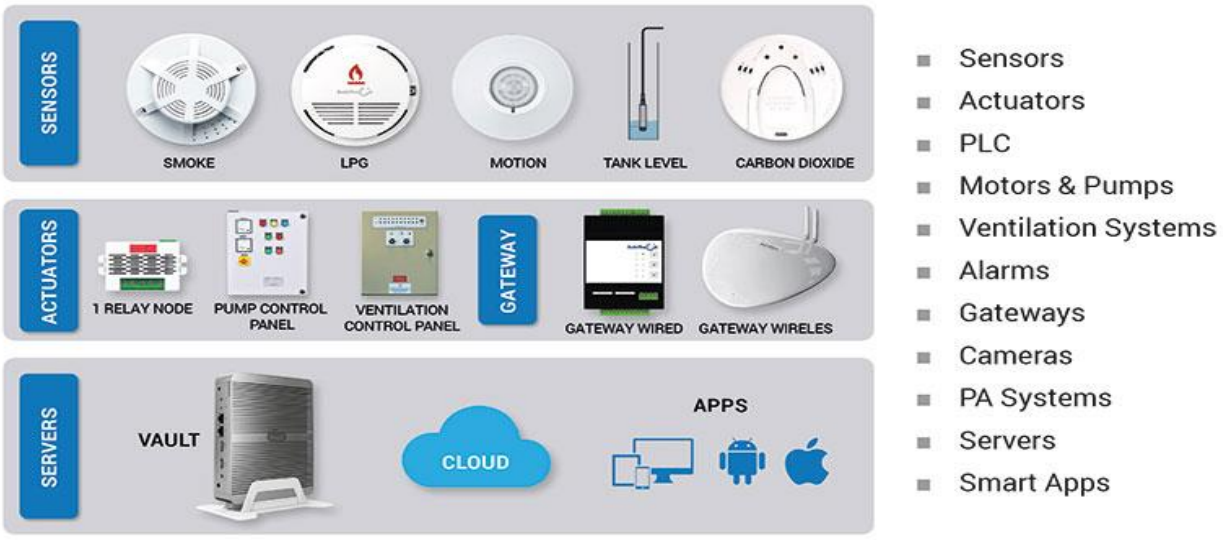

Figure 3: Elements of fire monitoring and controlling system

The architecture of IoT system enables various aspects other than sensor and fire panels [7]. The link between those aspects can be observed in the figure 3.

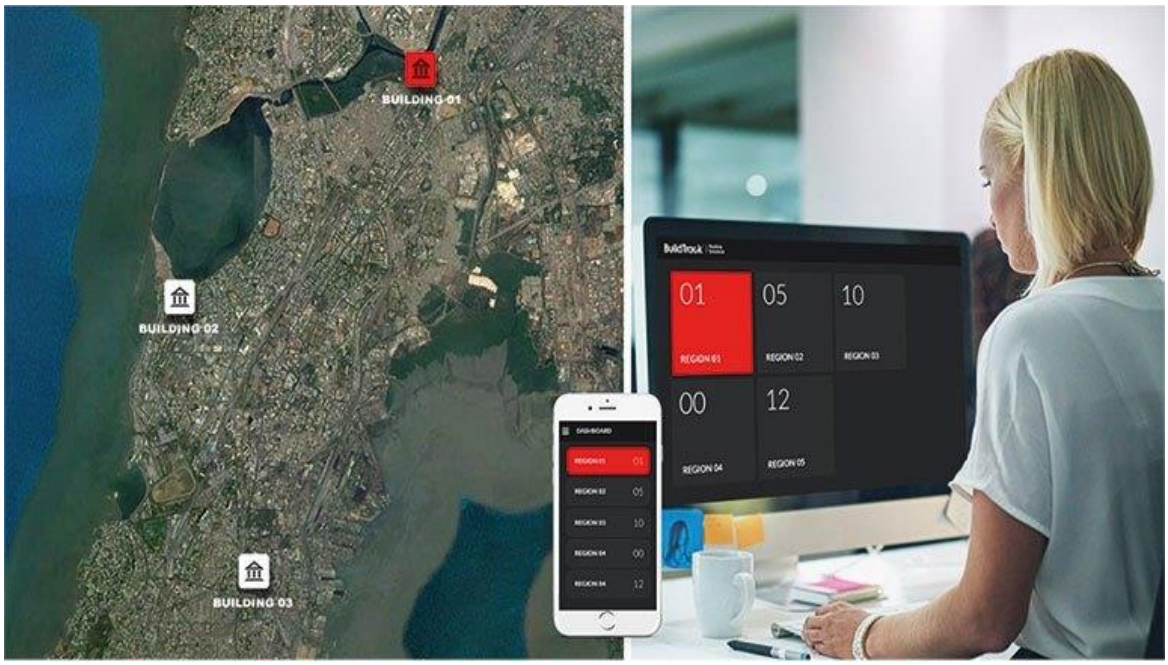

Figure 4: Centralized fire monitoring platform

Figure 4 displays an example of centralized monitoring for large geographical areas where events of emergency could occur. The system is efficient enough to serve at different levels and also ensure fire safety across different areas.

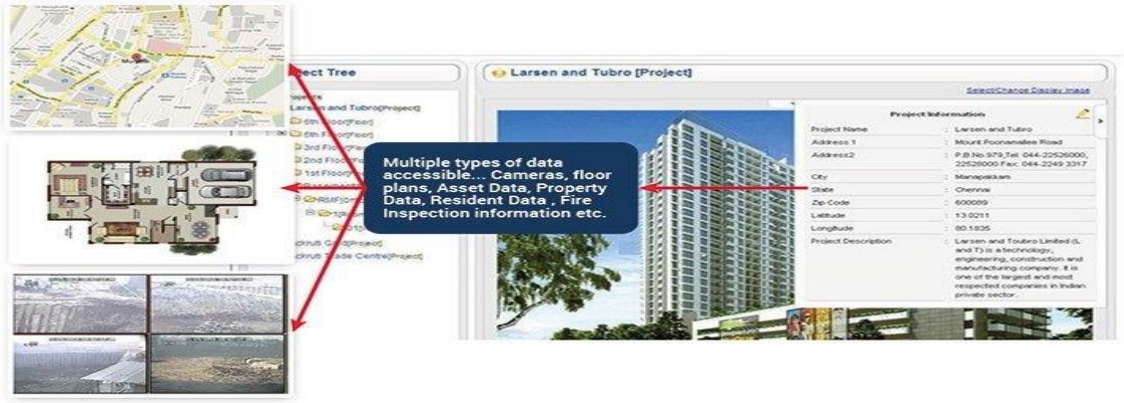

Figure 5: Platform enabling variety of actions during emergency events

Figure 5 displays example as to how events of emergency occur and communications are made by sensor to system. This platform is beneficial as it addresses emergency effectively in an organization [7].

A. Advantages and disadvantages

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. An IoT system helps in building social bodies in technology and ensures that the

fire security in urban areas and also control social stability. IoT systems cancel the temperature and also flames which can send it to nearby fire station by GSM model. It can effectively decreases the fire accident in kitchen due to gas stored as user can monitor the store at any time and turn it off by clicking in their phones. Energy and power consumption by the proposed system are in acceptable limits.

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.

B. Applications

Fire detection system is useful in high rise building during early stages of fire disaster. A fire detection alarm in all houses during kitchen accidents is more helpful. Fire detection in ware houses like garment plants, packing warehouses etc. monitoring and prevention of disaster in kitchen. Fire detection in open spaces as it covers large area. Placing the cameras on towers in forest area can be used to monitor larger forest area and also can detect forest fire/bush fine at early stages as shown in figure 1. Discussed Fire detection system can also be used in workshop, garage, road and railway tunnels.

IV. CONCLUSIONS

Quick response to the warning due to fire breakout is the great way to avoid huge losses to environment and cultural heritage. IoT is a wireless system that can be made use for efficiently differentiating between fire and non-fire warnings which avails more time for fire extinguishing. IoT enables technology of sensing along with gateways which have connection with software and apps that are backbone cloud based. IoT is the major concept and project is made to build on the already existing techniques and overcome hurdles present in all previous systems. System based on IoT improves the speed and has quick response ability.

In the discussed systems if the sensor technology is enhanced then the system can be more effective..there are limitations which needs rebuilding to achieve effective model. Time required for the procedure needs to be decreased for practical purpose.

In the future, efforts are to be put in system which also involves preventing the carbon monoxide poisoning inorder to assure safety of the home and the residents. As multi -sensors are being used for fire detection and the data to be created by sensors when there is fire is high , work has to be done inorder to discover a procedure that decreases the need of high amount of data data

References

[1]. G.Ajith, J.Sudarsaun, S.Dhilipan Aravind, Dr.R.Sugumar, “IOT Based Fire Detection and Safety Navigation System”, International Journal of Innovative Research in Science, Engineering and Technology , Volume:7, Issue:02, March 2018.
[2]. ZHANG Ying-Cong, YU Jing, “ Study on the Fire IOT Development Strategy”, Shenyang Fire Research Institute of Public Security, Shenyang 110034, China Shenyang Institute of Engineering, Shenyang 110136,China, 2019.
[3]. Guggilla Asnusha, V.R Seshagiri Rao, “IOT Based Ware House Fire Safety System Using ARM7”, International Journal of Engineering and Technology.
[4]. Wei-Ling Hsu, Ji –Yun Jhuang, Chien-Shiun Huang, Chiu-Kuo Liang and Yan-Chyuan Shiau, “Application of Internet of Things in a Kitchen Fire Prevention System”, Applied Sciences, Published: 27 August 2019.
[5]. R.Angeline, Adithya S, Abishek Narayanan, “Fire Alarm System Using IOT”, International Journal of Innovative Technology and Exploring Engineering (LJITEE), ISSN:2278-3075, Volume:08, Issue:6S3, April 2019.
[6]. Faisal SAEED, Anand Paul, Abdul Rehman, Won Hwa Hong and Hyuncheol Seo, “IOT-Based Intelligent Modeling of Smart Home Environment for Fire Prevention and Safety”, Journal of Sensors and Actuator Networks, March 2018.
[7]. https://ifpmag.mdmpublishing.com