School Campus Emergrncy Alert System using IoT

Dr. C.Suganthi[1] , S.Harsisan[2] , P.Stalin[2] , S.Sudharsan[2]

[1]*Assosiated Professor , Department of Computer Science and Engineering, Muthayammal college of Engineering ,*

[2]*Bachelor of Engineering, Department of Computer Science and Engineering, Muthayammal college of Engineering ,*

ABSTRACT-Lately, the reconciliation of Web Internet of Things (IoT) innovation has reformed different parts of wellbeing and security frameworks. This theoretical proposes the plan and execution of an IoT-based fire wellbeing framework custom fitted explicitly for school grounds and structures. The proposed framework plans to upgrade fire location, warning, and reaction instruments to guarantee the wellbeing of understudies, staff, and property inside instructive organizations.

I. INTRODUCTION

Guaranteeing the security of understudies, personnel, and staff inside school grounds and structures is of vital significance for instructive foundations around the world. Fire crises represent a critical danger to life and property, requiring strong fire security measures. Customary fire wellbeing frameworks have limits as far as identification precision, warning pace, and remote observing abilities. Be that as it may, headways in Internet of Things (IoT) innovation offer promising chances to address these difficulties and improve fire. This presentation presents the reasoning for fostering an IoT-based fire security framework custom fitted explicitly for school grounds and structures. It frames the inadequacies of conventional fire security frameworks and features the possible advantages of incorporating IoT innovation. Furthermore, it gives an outline of the targets and design of the proposed framework. Conventional fire security frameworks regularly depend on independent smoke alarms and manual alert frameworks. While these frameworks are compelling somewhat, they frequently need continuous checking capacities and may create deceptions, prompting pointless interruptions. Besides, the manual idea of these frameworks can bring about deferred reaction times, expanding the gamble of injury and property harm during a fire crisis.

Conversely, IoT-based fire security frameworks influence interconnected sensors, remote correspondence, and distributed computing to give continuous checking, precise discovery, and quick reaction to fire episodes. By sending an organization of IoT-empowered sensors all through the school premises, overseers can consistently screen natural circumstances for indications of fire, including smoke, intensity, and flares. This proactive methodology empowers early recognition of fire perils, taking into consideration convenient mediation and departure systems.

Moreover, IoT innovation works with consistent combination with correspondence channels like SMS, email, and versatile pop-up messages, empowering prompt cautions to pertinent partners in case of a fire crisis. Moreover, cloud-based examination calculations can break down sensor information continuously, recognizing deceptions and certifiable fire occurrences to limit interruptions and guarantee compelling reaction methodologies.

The essential target of this proposed IoT-based fire wellbeing framework is to upgrade the general wellbeing and security of school grounds and structures. By utilizing IoT innovation, instructive establishments can accomplish more noteworthy proficiency, dependability, and adaptability in their fire security measures. Besides, the framework can be tweaked to meet the particular necessities and prerequisites of various school conditions, guaranteeing a fitted way to deal with fire counteraction and crisis reaction.

II LITERATURE SURVEY

In[1] Everyday living environments concentrate a growing amount of wireless communications leading to increased public concern for radiofrequency (RF) electromagnetic fields (EMF) exposure. Recent technological advances are turning the focus on Internet of Things (IoT) systems that enable automated and continuous real-time EMF monitoring, facing however several challenges mainly stemming from infrastructural costs. This paper seeks to provide a comprehensive view of RF-EMF levels in Greece and evidence-based decision support for a spatially prioritized deployment of an IoT RF-EMF monitoring system. We applied the stratified sampling method to estimate Electric Field Strength (EFS) in the 27MHz 3GHz range in 661 schools. Three different residential areas were considered, i.e. urban, semi-urban and rural. Results showed that the 95% confidence interval for the EFS is (0.40, 0.44) with central value equal to the sample mean 0.42 V/m. We obtained strong evidence that the mean EFS value for all Greek schools is 0.42, which is 52 times lower than the Greek safety limit and equal to 1% of international limits. Mean EFS values of individual residential areas were also significantly below safety limits.

In [2] underground mining, the real-time monitoring of environmental parameters plays a pivotal role in ensuring the safety of mining operations and personnel. This article explores the integration of Long Range (LoRa) wireless communication technology and the Internet of Things (IoT) to bolster safety measures and prevent potential accidents within underground mines. The environmental parameters in underground mines include Oxygen (O2), Carbon Dioxide (CO2), Carbon Monoxide (CO), Methane (CH4), Nitric Oxide (NO), Nitrogen Dioxide (NO2), Sulphur Dioxide (SO2), Hydrogen Sulfide (H2S), Ethylene Oxide (EO), Temperature and Humidity. Currently, underground mines in India use portable multi-gas detector devices to measure environmental parameters.

In[3] Scientific society has envisioned a considerable advancement in various fire detection methods due to the development in the field of machine learning, information technology, sensors, and signal processing technology. These intelligent processing technologies help in reducing the detection time and false alerts from the sensors. Over the past few decades, there is substantial improvement in the computing power of computers and a decrease in the cost of image sensors, enabling video-based fire detection technology for real-time applications. The ability to differentiate between fire and non-fire threats is improved with the development of the Internet of Things (IoT) or Wireless Sensor Networks (WSN). Unmanned Aerial Vehicles (UAVs) are becoming a more realistic solution for monitoring and detecting fire due to their remote sensing capabilities.

In[4] the fire scene investigation, the firefighting Internet of Things (IoT) data is the key electronic evidence for event analysis and responsibility determination. However, the traditional centralized storage method leads to data easy to be tampered with and damaged. To solve these problems, this paper designs and implements a secure, reliable and low-cost distributed firefighting IoT data storage scheme based on the Fabric framework, combining blockchain technology, Interplanetary File System (IPFS) and Practical Byzantine Fault Tolerance (PBFT) consensus algorithm to provide a strong support for fire accident traceability. This scheme mainly includes the storage model, key algorithms and Fabric construction and improvement. IPFS stores the complete firefighting IoT data, as the off-chain storage system of the blockchain, and the blockchain only stores the storage address (IPFS hash) of data returned by IPFS, thus reducing the storage space overhead of the blockchain and ensuring data security.

In[5] Convolutional Neural Networks (CNNs) based approaches are popular for various image/video related tasks due to their state-of-the-art performance. However, for problems like object detection and segmentation, CNNs still suffer from objects with arbitrary shapes, sizes, occlusions, and varying viewpoints. This problem makes it mostly unsuitable for fire detection and segmentation since flames can have an unpredictable scale and shape. In this paper, we propose a method that detects and segments fire-regions with special considerations of their arbitrary sizes and shapes. Specifically, our approach uses a self-attention mechanism to augment spatial characteristics with temporal features, allowing the network to reduce its reliance on spatial factors like shape or size and take advantage of robust spatial-temporal dependencies. As a whole, our pipeline has two stages: In the first stage, we take out region proposals using Spatial-Temporal features, and in the second stage, we classify whether each region proposal is flame or not. Due to the scarcity of generous fire datasets, we adopt a transfer learning strategy to pre-train our classifier with the ImageNet dataset.

In[6] The current detection methods for grassland fires mainly rely on manual means, which are costly, inefficient, and difficult to achieve real-time and full coverage detection. Therefore, the YOLOv5m-D model and its static and dynamic characteristics are proposed to detect and identify smoke and flame throughout the entire process of grassland fires, and its effectiveness is verified. The experimental results showed that in smoke recognition and detection, YOLOv5m-D model showed slow local convergence under the condition of low Learning rate, and the mAP value of YOLOv5m-D was 86.4% when the batch size was 16. In the comparison of mAP values under the optimal hyperparameters, the Faster RCNN value was 72.34%, SSD value was 75.90%, YOLOv5m value was 86.75%, and YOLOv5m-D value was 89.28%, which was higher than the comparison model. In flame recognition detection, in the Hu1 moment, the ordinary image sequence and infrared thermal imaging sequence.

In[7] IoT deployments for smart cities and smart buildings have been multiplying exponentially in recent years, benefiting from a steady rise in the number of new technologies that deal with the underlying networking and application challenges in indoor and outdoor spaces. Due to the overlap in their specifications, we are still trying to figure out which of these technologies fits better to certain application domains, such as building monitoring. In this work, we provide a comparative study between IEEE 802.15.4 and LoRa, based on our experiences from using both wireless networking technologies in the context of indoor deployments aimed at IoT-enabled school buildings in Europe. We provide an apples-to-apples comparison between the two technologies, comparing them in some cases in the same building and application context. Although these two technologies initially might not seem to be competing in the same application space, in practice we found out that both have strengths and weaknesses in the specific application domain we have been using them.

In[8] The underground utility tunnel is a facility for installing and managing public infrastructure such as electricity, water supply, and telecommunication, which are required for managing urban life. Due to the underground structure, airflow is different compared to general buildings, so heat and smoke are not smoothly removed in the event of a fire, making it difficult to evacuate safely of occupants and enter firefighters. Therefore, it is essential to accurately detect the fire location based on the current state of fire occurrence and to remove smoke efficiently. This study derived the optimum sensor location for detecting fire and exhaust fan operation for smoke removal by considering the ventilation system in the target underground utility tunnel. In the future, these results can be used as a response manual for underground facilities in.

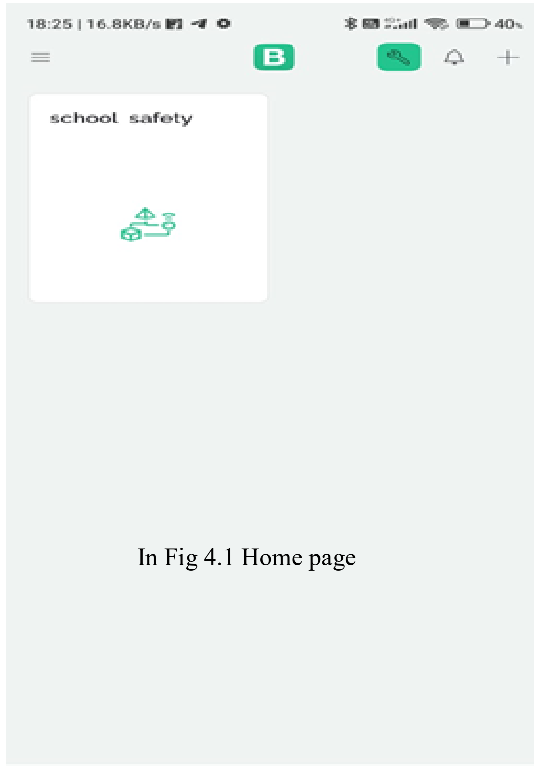
In[9] WILDFIRES are one of the most important causes of environmental degradation, with an increasing impact on a global scale driven and exacerbated by climate change, which induces prolonged drought and increasing temperatures. To contrast wildfire and limit fire incidence, current and future challenges deal with enhancing social and ecological resilience and improving timely and reliable information on the fire occurrence and caused damage. The study aims to explore the added value of the joint use of Sentinel-1 (S1) and Sentinel-2 (S2) data for assessing burn severity in heterogeneous, fragmented ecosystems. The importance of this aim lies in the fact that for both S2 and S1 (as for all the synthetic aperture radar (SAR) C-bands), the impact of fire was found to cause ambiguous effects in complex and fragmented ecosystems. For our investigation, the effectiveness of S1 and S2 fire metrics was first statistically analyzed using ISODATA coupled with field surveys conducted for a fire that occurred on 13 July 2019 in Sardinia. Later, to automatically map burn areas and categorize fire severity, S1 and S2 fire metrics were integrated through a multilevel classification performed at a pixel and feature level. Results were successful (accuracy higher than 94%) compared with independent data sets and in situ investigations. Earth observation (EO) technologies, particularly the Copernicus program and Sentinel missions can effectively support new fire .

In[10] The mechanisms based on the distributed environment have become an obvious choice for solutions, while they have not been limited only to a specific domain (i.e., crypto-currency). Rather, it has influenced other industries to develop robust privacy and security solutions, such as smart houses, smart electrical grids, smart agriculture, smart health care, smart transportation, etc. These Cyber-Physical Systems heavily depend on IoT-based smart devices that constitute a networked system of devices dependent on each other for the smooth operation of the overall system. Hence, security and privacy have become integral to all the architectural frameworks they operate in. The adoption of these architectures, such as the Internet of Things (IoT), Internet of Cyber-Physical Things (IoCPT), Cyber-Physical Systems (CPSs), and Internet of Everything (IoE), has reinforced the need to develop solutions based on a distributed environment. Distributed ledger technology.

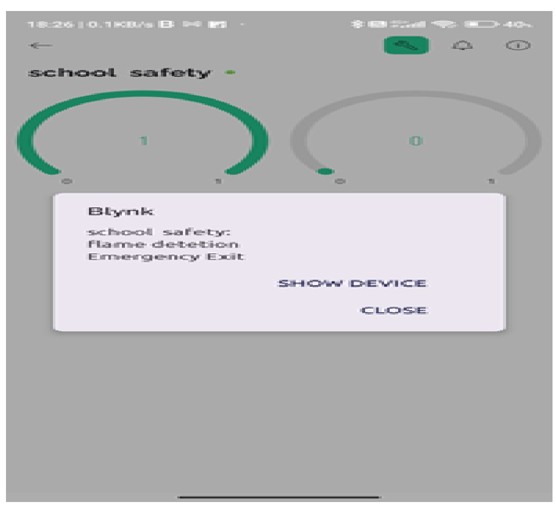
III PROPOSED SYSTEM METHODOLOGY

The proposed fire wellbeing framework plans to use NodeMCU, a minimal expense microcontroller with coordinated Wi-Fi capacity, alongside different sensors and actuators to make a Internet of Things (IoT)-empowered answer for fire discovery and warning in school grounds and structures. This framework incorporates Fire and Smoke sensors for early identification, a Ringer for discernible cautions, and a Wi-Fi module for network to an IoT application. All the while, the NodeMCU lays out a Wi-Fi association and sends the sensor information to an IoT application facilitated on a cloud stage or neighborhood server.

IV RESULTS AND DISCUSSIONS



In Fig 4.1 Home page



In Fig 4.2 Blynk alert

In Fig 4.3 Emergency Alert

V CONCLUSION

the proposed IoT-based fire wellbeing framework using NodeMCU microcontroller and Wi-Fi module, alongside fire and smoke sensors, presents a promising answer for upgrading fire identification and warning inside school grounds and structures. By utilizing IoT innovation, this framework offers a scope of advantages, including early recognition, constant cautions, remote checking, versatility, cost-viability, incorporation with IoT applications, upgraded security elements, and consistence detailing. The combination of fire and smoke sensors empowers the framework to recognize fire perils at a beginning phase, working with brief activity to relieve possible dangers. Continuous cautions through the signal and IoT application guarantee that tenants are speedily informed of fire episodes, empowering convenient clearing and reaction. Wi-Fi availability takes into consideration remote checking of the framework's status and sensor information, giving overseers constant bits of knowledge and empowering quick decision-production from any area. Besides, the versatility of the framework takes into consideration simple extension to oblige extra sensors or stretch out inclusion to numerous structures inside a school grounds. Cost-viability is accomplished through the use of promptly accessible parts, without compromising usefulness. Mix with IoT applications empowers concentrated administration, information examination, and customization of ready settings, improving the framework's proficiency and viability. The proposed framework likewise offers extra wellbeing highlights, for example, programmed entryway locks and crisis lighting actuation, further improving the security measures during fire crises. Also, consistence detailing works with adherence to guidelines and empowers proactive upkeep wanting to guarantee ideal framework execution.

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