

Automated Fire Detection and Alarm System using Wireless Sensor Networks

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I. ABSTRACT

Natural disasters have increased due to man recently being senseless and with the effects of the damages they caused on the environment [1].

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II. MOTIVATION

Overuse of electricity and huge consumption of power has put garments factories and other warehouses at great risk of catching fire at any point in time. Most fire departments require that a specific temperature rate-of-rise be detected before an automatic fire alarm system can notify the fire department [2]. Despite installing fire detection devices such as fire alarms for warning or carrying out research of fire detection systems, very few have been successful to save the trapped victim escape from fire or help call the firefighters at the right time. This article has been made to design a necessary project on informing the firefighters immediately once a building catches fire.

III. INTRODUCTION

A wireless sensor network can be a useful architecture for the deployment of sensors used for fire detection and verification. The network consists of IP cameras along with gaseous sensors and a central server. The central server is a computer located in the fire station. The gaseous sensor detects CO₂, CO and other Hydro Carbons emitted by the fire and sends a signal to the central server through a wireless network. The IP cameras are located inside the factories. Once the server receives the siren the IP cameras automatically turn on. This helps firefighters to trace and monitor the fire. Using the IP cameras the firefighters can locate safe routes and also find escape paths. WSNs will be popular over the next ten years [4].

Based on this system a web application can be made which access information fires in each unit of the building and trace out the path for the trapped victims to escape from fire. Such

a similar application can also be found on the internet where a simple Android device can be turned into an IP camera for demonstration purposes.

IV. RELATED WORK

Polytechnic University of Valencia, Camino Vera s/n, 46022, Valencia, Spain carried out similar research on the project to detect fires in forest and rural areas and send a signal to the central server. Gazi University, Ankara, Turkey Krkkale University, Krkkale, Turkey proposed a system to build a mobile or web application that can detect fire in household units and help trace the safest route. Such devices typically are powered by a battery or from electrical service and are designed to sound an alarm at the sight of other detection of smoky conditions [3].

V. PROPOSED PROBLEM

Their work was done solely for forest fire and rural areas. The project was vast and although it was effective, it was very costly and huge. We tried to implement a similar setup but for indoor purposes only and simplified the methods. To a minimalistic measure.

VI. METHODOLOGY

IEEE 802.11g wireless network routers are placed in the area and inside the range of the network the sensors are placed strategically in places where there is a moderate and high risk of fire hazard. The IP cameras are placed in main pathways looking over the whole room and their exits. The routers act as wireless access points and the sensors and IP cameras send the data directly to the router which then transfers the data to the central computer (inside the fire department) via the internet. Multiple routers can be used to provide a larger area. When the levels of the aforementioned gases become high, the sensors send the data and an alarm is raised inside the central computer. Only after the alarm turns on, the IP cameras

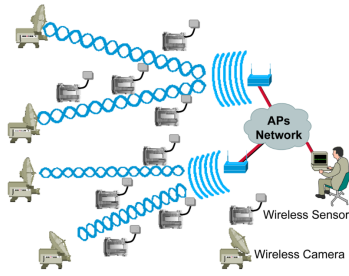


Fig. 1. A simple overview of the system.

become active and the central hub will get a clear view of the place where there is fire.

When the firefighters reach the destination and are inside the network of the routers, they can easily use any kind of smartphone and access the IP cameras. The central hub can also call the firefighters to give them the directions they need.

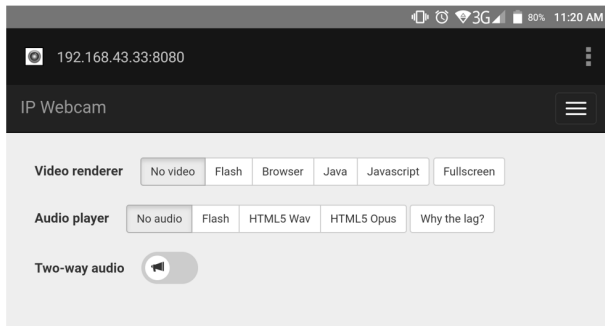


Fig. 2. The user interface of a simple IP camera software for an Android device.

VII. LIMITATIONS

Installment of IP cameras and sensors in each and every room is an expensive process.

There are possible delays in sending signals to the central server. The standard of the network system may be complex.

If the whole building is out of electricity then the sensors and cameras will turn off.

VIII. SOLUTION

Install the cameras and sensors only at the room where the probability of catching fire is high.

Using more routers or multiple gateways can help reduce delays. Moderately fireproof and rechargeable battery packed sensors and IP cameras can be used so that they can run even if the electricity turns off. They can be repaired also if damaged.

No data is sent from the IP cameras if there is no fire, that way huge data is saved and reduces lots of traffic.

IX. FUTURE PLANS

More efficient sensors can be used with more monitoring abilities, such as temperature and humidity levels.

Thermal Imagery cameras can be used for better control.

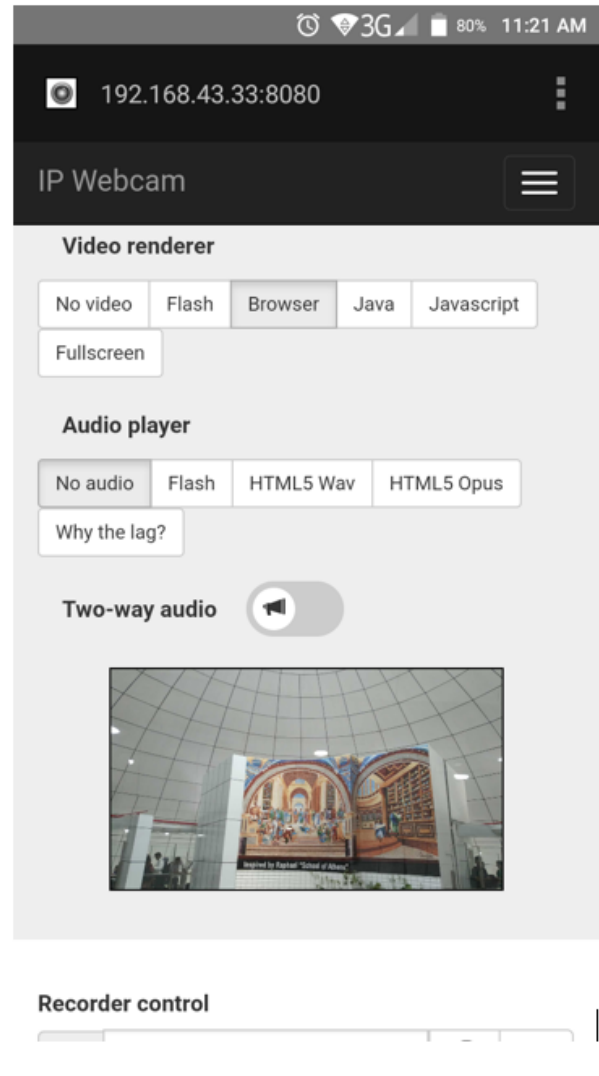


Fig. 3. A small demo of inside the new globe of our university.

X. CONCLUSION

In this study, the working principles of the fire detection systems created using wireless sensor networks have been analyzed. Thanks to these systems created using Wireless Sensor Networks whether any danger is posed or not can be determined. But there is still a lot of research needed to be done before the system can be fully functional. Cost, power and other management need to be considered. And lastly, if the process becomes successful then hopefully it will be successful in securing more lives from fire breakouts in the future. Enhanced wireless notification is provided by a wireless transceiver configured with multiple radio frequency bands and/or multiple air interface standards, and the integration of a wireless networking transceiver [5].

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