Implementation of Internet of Thing on Fire Home Information Systems for Multi Room applications

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Abstract. Leaving home without anyone monitoring for a long time will cause everything that happens like an electric device that is on fire will trigger a fire. Based on the causes of fires that occur at this time, especially in the housing, it is necessary to have a house fire information system that can provide information to the housing security officers by providing fire early warning and detailed location information of the room that has experienced a fire. This article describes how to build a house fire information system with the concept of fire location information detail of the room. The home fire information system uses the application of internet of things (IoTs) in the communication media between the client and server systems. The development of a home fire information system with the implementation of Internet of Things-based communication (IoTs) was built using several smoke sensor components and a fire detection sensor integrated with an Arduino Uno microcontroller and Ethernet as a fire detector client. While on the server side using Apache Web Server, PHP and mySQL database. Communication between client and server uses the Wireless Router. The development of the system produces a home fire detector system that is integrated with the home fire information system. The fire detector system has succeeded in sending smoke and fire data to the information system server with information is the date, time, location of the house, room, smoke and fire in the form of the web. The development of this house fire information system is expected to help the home developers in anticipating the house fire in an apartment or housing.

1. Introduction

Fire disasters have recently occurred. This is caused by various natural influences and the influence of human error itself. From the influence of nature can be caused by the influence of global warming resulting in forest fires. Whereas the influence of human error is often caused by errors in electrical installations that do not follow national standard rules and errors caused by the source of fire from a gas stove that leaks resulting in an explosion of fire from inside the house. Disasters of house fires or housing in the form of apartments are often abandoned by the occupants due to work and various things. Leaving the house without anyone monitoring for a long time will cause everything that happens like an electric appliance that is on by extinguishing it, or a gas stove that forgets to be extinguished will have a strong influence to be a source of fire if not controlled. Based on the causes of fires that occur at this time, especially in the housing, it is necessary to have a house fire information system that can provide information to the housing security officers by providing fire early warning and detailed location information of the room that has experienced a fire. This article
describes how to build a house fire information system with the concept of fire location information detail of the room. The home fire information system uses the application of internet of things (IoTs) in the communication media between the client and server systems. The development of a disaster mitigation system is one of the government programs that emphasizes various parties, both government and private parties, in supporting the creation of systems that can reduce disaster victims in the short and long term [1].

The development of the latest information system has led researchers to use technology that can provide information and control a remote measurement variable object called the Internet of Things (IoTs). The Internet of Things has the goal of building an environment that can provide users with information around it. That information can be sourced from sensors or actuator control through internet communication media [2][3]. Building an internet of thing system (IoTs) is inseparable from an architectural system that involves several supporting components that are optimized such as hardware, software, energy efficiency, network security and information and telecommunications technology [4][5][6].

There are studies that use the concept of internet of things (IoTs) in building a system such as building home security that can be monitored remotely via the internet. In this study the object detected by the sensor is the human who entered by identifying from the movement [7]. Unlike the intelligent parking system application that uses the concept of Wireless Sensor Network (WSN) in the process of storing data using a cloud system and distributing data that has been processed into actuator movements remotely using wireless communication [8].

Implementation of Internet of Thing (IoTs) not only on applications in the security field. However, its use in the field of disaster has been used, namely the use of flood monitoring systems that use information access media from flood detectors using the internet network [9][10]. And in other developments using flood information systems using maps in real-time [11]. The existence of the Internet of Things (IoTs) -based system development in the disaster category is not only the flood disaster. However, on the other hand, there is the development of a fire disaster mitigation system that uses a drone called Micro Air Vehicle (MAV) which is used in the process of monitoring over the air to find fire fires [12]. Besides that there is also a fire information system that provides information in the form of a fire location using Google Maps as a location indicator [13]. While other applications in terms of fire information systems use the concept of Wireless Sensor Network (WSN) in making communication media between sensors and fire information system servers [14]. There is a fire detection system that uses an information system using the GSM module in the process of sending information on danger signs such as gas leak information systems that can provide information to homeowners remotely using SMS media [15].

In this article the fire information system built is a development system from a system that has been built previously. The fire information system that was built aims to provide more detailed fire location information in one house location. In this case the detailed information is the location of the room in a house as a source of fire such as information on the source of the fire coming from the kitchen, living room, room and other rooms. So that information does not only provide information on the location of the house that is on fire but provides information on the location of the room in the house.

2. Methodology
The method of developing a fire disaster information system using the concept of Internet of Things (IoTs) was built using several stages of the system, namely the stage of making a fire detector system and a web-based home fire information system. Both client systems and servers are built separately. And in the manufacture of fire detector systems and fire information systems the house uses the stages of system analysis, namely describing the system use process in general. Next is the stage of the design of the house fire detection system and the house fire information system using a block diagram.

The stages of home fire information system analysis using the application of internet of things (IoTs) can be explained by using descriptions through Figure 1. In the picture it is explained that every room in one house has sensors that will detect smoke and fire. From several sensors in the event of a
fire the sensor will send data to the client system and automatically the local alarm contained in the house goes off and the client system sends fire data to the system server via the wireless router. From the system server, the officer will see the location information of the house and room details where the fire occurred while giving an alarm through the web browser.

![Diagram](image)

**Figure 1.** Description of Internet of Things-based home fire information systems (IoTs)

For the stage of the fire detector system design and the house fire information system is built using block diagram as shown in Figure 2 with an explanation of the fire detector system there is an input block with smoke sensor components and subsequent fire sensors on the processing block using Arduino Uno. Data processed from Arduino is sent to the module's Ethernet output block as the data sender. The arduino has another output which is a local alarm in the form of an electric alarm. Data is sent via a computer network through the wireless router to the home fire information system. Data received by the information system is redistributed to other computers in the same computer system network as the fire or distribution information system through internet hosting.
Figure 2. Block diagram of a house fire information system

On the server side PC-based computers that are used as servers there are several components to run a home fire information system. In the process of accessing and storing fire data, the fire detector or client system accesses the PHP engine and saves data to the MySQL database and issues sensor data from the MySQL database. While the officers access the fire information from the web server as shown in Figure 3.

3. Results and discussion
Based on the design of a house fire detector system that is adjusted to the design in Figure 2 and the house fire information system architecture as shown in Figure 3, this study has produced a fire detector system based on the space in each house as seen in Figure 4. The fire detector system was built using two constructs such as a room and in this test used two plastic containers to replace the room in one house. Each room is given a smoke sensor and a fire detection sensor that is connected to an analog port on the Arduino Uno microcontroller. And from the microcontroller as the output is connected to a relay that is connected to an electric alarm.
While the other output is an ethernet module that is connected to the Arduino Uno microcontroller. From Ethernet connected to the Wireless Router as a means of connecting data transmission to the information system server.

![Diagram of a home fire detector system](image)

**Figure 4.** Results of a home fire detector system

While the house fire information system that has been built can be seen in Figure 5. The information system shows a website built using a PC computer that is made as an information system server. To run a fire information system website, the Apache server web application is integrated with PHP engine and MySQL database.

![Table of monitoring fire early warning system](image)

**Table 1.** Monitoring Fire Early Warning System

In the process of testing a fire detector system in one room is given smoke and fire. From the test, it can be seen that the fire detector system detected smoke and fire as seen in the Arduino IDE Monitor. Figure 6. While the smoke and fire data that has been sent to the information system will produce information on the date, time, location of the house, room, fire and smoke. Information and smoke represent pictures of smoke and fire icons with fire icon images as shown in Figure 5.
4. Conclusion
Based on the results, the home fire detector system and real time home fire information system based on the application of internet of things (IoTs) in many cases have been successfully tested by providing smoke and fire data on a home fire detector system in a room simulation so the system Real-time fire information stores and updates fire data per location and room in the mySQL database and distributes web-based information. From this prototype testing it is expected to provide benefits to the field of fire disaster mitigation in anticipating more fire victims.

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