Geographical information system of fire incidents data monitoring

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Abstract. This geographic information system is built as a tool to monitor fire incidents data, taken from the reports of the fire department. The purpose of this study is to monitoring fire incidents data, so that it can facilitate firefighters to monitor areas that have high occurrence of fires. Therefore, they can prevent fires from occurring. The information system is expected to have benefit in decreasing the rate of fire incidents, mostly by socializing to the publics the prevention of fires in areas where it often occurs. This research was conducted by using the Unified Software Development Process methodology; starting from the analysis model stage, design model, deployment model, implementation model, and testing model. The design model used in this research is Unified Modelling Language which is tested by using the black box method. The result of this study is the implementation of geographic information system that can monitor fire incidents data through the location of the incident. Moreover, this system can improve the performance of firefighters in anticipating and preventing the incidents.

1. Introduction
Geographic Information System is an information system that is used to enter, store, manage and produce data geographic or geospatial reference, to support decision making in a plan [1-6].

Fire incident data is an element of data collection of fire events involving a rescue or problems that occur in the fire department. Monitoring is one of the processes in the organization's activities that are very important that can determine whether or not an organization's goals are implemented. The purpose of monitoring is to ensure that the main tasks of the organization can run according to the predetermined plan [7]. The fire incident review process still uses the recording on the recap of the fire event, after which it is inputted to Microsoft Excel. To view data from a computer when searching for fire data, one has to search one by one from the fire data book recap, in addition the information covers the location of the fire and the cause is not informed to the public, even though this information is useful so that people can be careful in areas that occur a lot Fire. Dissemination of ways to prevent fire can be directly conveyed through this system. The purpose of this article is to design a geographic information system monitoring fire incident data in the fire department.

Some of the studies related in this study are the first research on the geographic information system used in the tracer study [2], the Second study on mapping water erosion uses a geographic information system in the Algeria region [8], the third study regarding automatic registration uses social media with location information [9], the fourth research regarding monitoring vehicles using geographic
information systems [10], fifth research on modeling to look at response times in fires [11], sixth research on developing fire monitoring and warning systems using Arduino [12].

The analysis gap from previous research is that there is no geographic information system for monitoring fire events in Indonesia. The purpose of this Study is to design a geographic information system monitoring fire incident data that is in the fire department to improve the performance of the fire department.

2. Methodology

At the stage of developing geographic information systems monitoring fire department official fire data using the Unified System Development Process design method [13-15], limited to only the design model stage. The stages of the design method are presented in the Work Breakdown Structure found in Figure 1 as follows.

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| Stage | Purpose | Activity           |
|-------|---------|--------------------|
|       | Analysis Model | Preliminary Analysis, Identification Actor |
|       | Design Model   | Activity Diagram, Sequence Diagram, Class Diagram, Interface Design |
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![Figure 1. Work breakdown structure.](image)

The stages of the work breakdown structure are carried out:

- Stages of the analysis model. At this stage it is carried out to determine the needs needed for the development of geographic information systems monitoring fire data. The process of data collection is done using the interview method.
- Stages of the design model (design). At this stage is done by processing from the data from the previous stages by drawing any conclusions that can fulfill a system, modeling using a unified model language [16].

3. Result

3.1. Model analysis

3.1.1. Preliminary analysis. In the development phase this article is adjusted to the needs contained in the fire data management section in the fire department carried out by interview. Future system facilities needed [2].

- Login facility to enter the system
• Front end facilities for information on fire data to the public
• Admin back end facility for firefighters
• Advance search facility for searching fire data information in the system
• Facility search for locations where fires are connected to google maps
• Chat facilities so that people can directly interact with the fire service

3.1.2. Identification actor and usecase. In identifying actors there are people who will use this application. The several actors involved are as follows:

• Admin
• Public

At the stage of identification the actor produces activities related to the system, from the identification of the actor can be known the activity of the actor in the use case. The following are the results of the use case diagram found in Figure 2.

![Use case diagram](image-url)

**Figure 2.** Use case diagram.

Use case diagram in the picture above describes admin activities and the general public in the system, where the admin can login, input fire incident information, chat and logout. While the general public can carry out activities view fire incident information and doing chat.

3.2. Design model

At this design stage consists of several Unified Modeling Language models, namely class diagrams, activity diagrams, sequence diagrams. The first stage is to make an activity diagram to find out what activities will be found on the system in the application to be made, the activity diagram is in Figure 3.
After the activity diagram stage is complete, the next step is to make sequence diagrams at this stage describe between the interaction of the actor and the system, the use case diagram is in figure 4.

Class diagram stages that function to describe the database design in the system. In the design there are several entities, namely admin, community, fire data, fire data details. The following is the class diagram in Figure 5.
By paying attention to the stages of design that have been carried out, the application interface display design will be generated which will be built with features and functions provided following the previous stages. The design of the counseling application interface is in Figure 6 as follows:

The interface in the picture above shows what menus are on the website, such as login menu, search, home, contact, about, fire incidents, latest fire incident, fire incident news, maps and chat.

4. Conclusion
With this system the fire department can monitor fire incident data. In addition, it can make it easier for officers to estimate locations prone to fire based on existing data that are visualized by using digital maps with markings from the location of the fire data with detailed data from the fire incident data mark where there are many points from the location of the fire incident data along with the information. While the public can see information on fire event data, the consequences of the fire, how to prevent and prevent fire events.

Acknowledgment
Thank you to the Sekolah Tinggi Teknologi Garut who has fully supported the writing of this article, so that this article can be completed and published.
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