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Analysis of Geographical Information System (GIS) design application in the Fire Department of Depok City

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Abstract. Depok City is one of the cities that is vulnerable to fire disasters. The Depok City Fire Department feels the need for a system that can assist in the handling and management of fire disasters. This system must be the right system to solve existing problems. Researchers have created many new systems. One of them is Geographic Information System (GIS) is a special information system for managing data that has spatial information. This research purposes to analyze and design a Geographic Information System (GIS) aimed at assisting the Depok City Fire Department that is desktop-based using the waterfall method. With the application of this Geographic Information System (GIS) aims to help accelerate the processing of fire reports on decision making, presenting spatial and non-spatial data that is more organized and can be updated also makes it easier to find new locations of fire stations, hydrants, fire-prone points, and flood-prone points.

Keywords. Geographic Information System, Fire Fighters, fire

Introduction

A disaster is an event or series of events that threaten and disrupt people's lives as can be caused by natural factors, non-natural factors, and human factors that cause human casualties, environmental damage, property losses, and psychological impacts (RI Law No. 24 of 2007 concerning Disaster Management). We can group potential disasters that occur into two, namely the potential for major hazards (main hazards) and the potential for secondary hazards (collateral hazards). Fire hazard can basically be caused by two factors, namely natural factors (natural hazards) and human negligence (man-made hazards).

Fire is an oxidant oxidation reaction that takes place quickly from a fuel that is accompanied by a fire or ignition. The fire disaster is a serious disaster for the cities. This relates to the number of victims, and losses caused by the disaster. Fire disasters can be detrimental nationally because they interfere with national productivity and can reduce people's welfare.

Cases of fires often occur in locations with high activity density levels, so that caution is needed from the community about the dangers of fire that can cause both material and life losses. The phenomenon of fires that occur in urban areas is influenced by the correlation between buildings, the level of activity of the area and the condition of existing areas such as slums areas, squatter to industrial areas that are less organized.

These areas have a level of vulnerability to the risk of fire and will be increasingly critical if the local community awareness of the risk of fire is still low as it is not supported by infrastructure and settlement environment arrangements for fire protection efforts. Handling of

urban fire disasters that occur thoroughly and integrated starting from before, during and after the fire incident occurred. Fire disaster management covers prevention activities, preparedness, emergency response, to recovery where speed and accuracy in acting must be followed up immediately.

The fire handling effort is related to various supporting aspects such as the location of the fire station, hydrant, police station, hospital, water source and so on. By knowing the position of the supporting aspects above, handling fire hazards will be carried out more quickly and minimize the number of victims and losses caused by the disaster.

In this problem, a Geographic Information System (GIS) or often also referred to as a Geospatial Information System is an information system used to compile, store, revise and analyze data and attributes that refer to the location or position of objects on earth . Almost all work now requires relevant information on the map (digital) that can present a database analysis and can be updated easily.

Methodology

The success of achieving the optimal target of activity very depends on the method used. The method used must be relevant to the type, scope and purpose of the activity. The various techniques and strategies that will be used as an applicative form of the methodology consist of (1) data collection methods. This method is carried out to obtain the data needed in making this system, besides that at this stage we can find out the current system processes. So we can analyze the strengths and weaknesses of the current system. From this we can find out the problems that occur, then made a solution to the problem. In this data collection method comprises three stages, namely: (a) Literature Study, (b) Field Observation, (c) interview. (2) System Design Method, the method used for the design and development of the system to be created uses a structured method based on the development of the Waterfall Model, the sequence of activities is as follows: (a) system analysis, (b) design, (c) Programming , (d) Testing, (e) Operation and maintenance.

Results

System Design, (1) Process Design. Process modeling is presented in the form of Data Flow Diagrams (DFD). Data Flow Diagrams (DFD) start from the most common form of context diagrams (context diagrams), then from this context diagrams are derived into more detailed forms. Data Flow Diagrams can be seen in Figure 1.

Figure 1. Context Diagram

(2) Data Modeling. We present data modeling with Entity Relationship Diagrams (ERD). Relationship Diagram (ERD) describes relationships between data in a system, ERD uses several notations and symbols to describe the structure and relationships between data. Entity-Relationship Diagram (ERD) Geographic Information System at the Depok City Fire Department can be seen in Figure 2.

Figure 2. Entity Relationship Diagram (ERD)

(3) Implementation. (a) Dashboard Display. A functional display presents the map dashboard and location / event points.

Figure 3. Display Dashboard

(b) Login Menu. As a page enter the administrator module (data management)

Figure 4. Login Menu

(c) Location List Menu. To do location data management.

Figure 5. Location List Menu

(d) Event List Menu. To conduct incident data management

Database Geospasial Damkar

Administrator
08119211777

- Peta Geospasial
- Daftar Lokasi
- Daftar Kejadian**
- Manajemen User
- Laporan
- Logout

Daftar Kejadian

Tambah Kejadian

Menampilkan 10 data Pencarian:

No	Nama Lokasi	Kategori	Aksi
1	Penjambretan (Stasiun Depok Lama)	Titik Penyelamatan	Edit Hapus
2	Kebakaran Ringan (ITC Depok)	Titik Kebakaran	Edit Hapus
3	Kebakaran Rumah Tinggal	Titik Kebakaran	Edit Hapus
4	Kebakaran Ringan (Apotik Beji)	Titik Kebakaran	Edit Hapus
5	Kebakaran Ringan di Gedung PLN	Titik Kebakaran	Edit Hapus

Menampilkan 1 - 5 dari 5 data

Previous 1 Next

Figure 6. Event List Menu

(e) User Management Menu. To carry out user data management.

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08119211777

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- Daftar Lokasi
- Daftar Kejadian
- Manajemen User**
- Laporan
- Logout

Manajemen User

Tambah User

Menampilkan 10 data Pencarian:

No	Nama	Username	Organisasi	Email	Jns User	Aksi
1.	Administrator	admin		admin@gmail.com	Admin	Edit Hapus
2.	UPT Cimanggis	cimanggis1	UPT Cimanggis	-	Olah Data	Edit Hapus

Menampilkan 1 - 2 dari 2 data

Previous 1 Next

Figure 7. User Management Menu

(f) Report Menu. Present fire performance reports

Figure 8. Fire Graph Menu

Figure 9. Performance Recap Menu

Figure 10. Fire Map Menu

Discussion

For the next research, GIS needs to be developed further so it can contain more information such as measuring the length of the route and the area. So it can be used as needed. Future research can develop a system that is not only intended for firefighters, but can be opened by the community which functions not only as a quick button to contact the fire brigade but also information about fire rates, emergency response, hydrant locations, hospitals, fire stations, police stations, and the public can respond in the form of criticism and suggestions to the fire brigade.

Conclusion

The conclusions from the results of the Analysis Design Application of Geographic Information System (GIS) in Depok City Fire Department are: (1) With the design of GIS in the Depok City Fire Department, it can help speed up the processing of fire incident reports that can assist in decision making. (2) With the design of GIS in the Depok city fire department spatial and non-spatial data presented are more organized and can be updated under the latest developments. (3) With the design of GIS in the Depok city fire department it can assist in the

development of new locations for firefighting posts, hydrants, fire-prone points and flood-prone points by using GIS as a reference to analyze the addition of new locations.

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