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GEOGRAPHICAL DAMAGE SURVEY (GEODAMSUR)

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ABSTRACT: The quality of life of the people affected by flooding may be decreased due to this type of threat and need to have a system to record the damage caused by the disaster to restore the lives of those affected. For this it is necessary to know the damage to the homes in which these people live, in which they may have been evacuated because of the unfavorable conditions found after the disaster. Also it is necessary to register the losses that occurred in the productive activities of people, as well as damage to health. In this paper, we introduce the GEODAMSUR system, an implementation of a prototype of a geographic information system, allowing the entry of the data gathered in the recovery phase. The system provides a mobile interface to accomplish the damages survey and all the information gathered is centralized in a main System which allows the display of the damages presented in form of tabular data and maps. GEODAMSUR is integrated with other systems such as flood forecasting and early warning systems to perform different types of analysis of this data to help in the decision making.

Key Words: Flood Management, SIG, ICFM6

1. INTRODUCTION

Uruguay is frequently affected by floods, mainly in the departments of Durazno, Soriano and Treinta y Tres. The quality of life of people affected by flooding may be diminished due to this type of threat and need to have a system to record the damage caused by the disaster to restore the lives of those affected as soon as possible in a satisfactory way. For this it is necessary to know the damage to the homes in which these people live in what may have been evacuated by the same unfavorable conditions found after the disaster. Also is important to know the losses that occurred in the productive activities of people as well as damage to health.

This article GEODAMSUR presents the system that was developed as a final project of the "Systems Engineering" degree at (University of the Republic), lasting two years. The course was designed in coordination with architects Adriana Piperno and Pablo Sierra, who work for the MVOTMA (Ministry of Housing, Spatial Planning and Environment of Uruguay) and are involved in disaster management, specifically in the damage assessment and needs that arise during and after flooding. The system focuses on the assessment of flood damage and is integrated with two other systems, one needs assessment and other flood early warning. GEODAMSUR is a prototype geographic information system, which allows survey the damage caused by the flooding of geospatially and in real time to aid in decision making after the disaster . Also allows for a record of information that can help prevent future problems.

2. THE SYSTEM

Is a geographic information system that can be used from any mobile device with Internet access. With the mobile application survey floodplains that were previously surveyed on paper in a special form. The system maintains all the information about the disaster centralized and receives information about households surveyed from mobile devices. It also allows geographically display all the information about the disaster. Here are described the features of the application, not all features listed were implemented due to development time. The system was developed with free software tools.

2.1 Application for mobile devices

The mobile device has the following features:

- User authentication to control access, verifies that the user belongs to one of the relay system equipment. There is also an administrator user can modify all data including surveyed by other relays.

- Through the use of graphical tools, the system allows to sketch standard units from one areal view with comments associated with geo references and see how flooding affects each unit.

- Take and save pictures of the unit to photographically record the damage to the unit.

- Complete survey forms of units. Data describing the current state of the property and damages caused by the flood are entered.

- Complete survey form of people within the home. Personal data of people entering.

- Complete health record for each person in the house, stating that health problems were caused by the flood.

- Views of maps with the standards and units surveyed so far for selecting a unit, display the data gathered from it and edit as appropriate.

- Ability to add new options automatically form questions depending on the options entered by other users. These options will be approved by an administrator before appearing on the form. This allows the form automatically grow without modifying the database.

- Information provided to the relay that tells the form what questions remain to be completed and priorities thereof and control the time it takes to replace the elements.

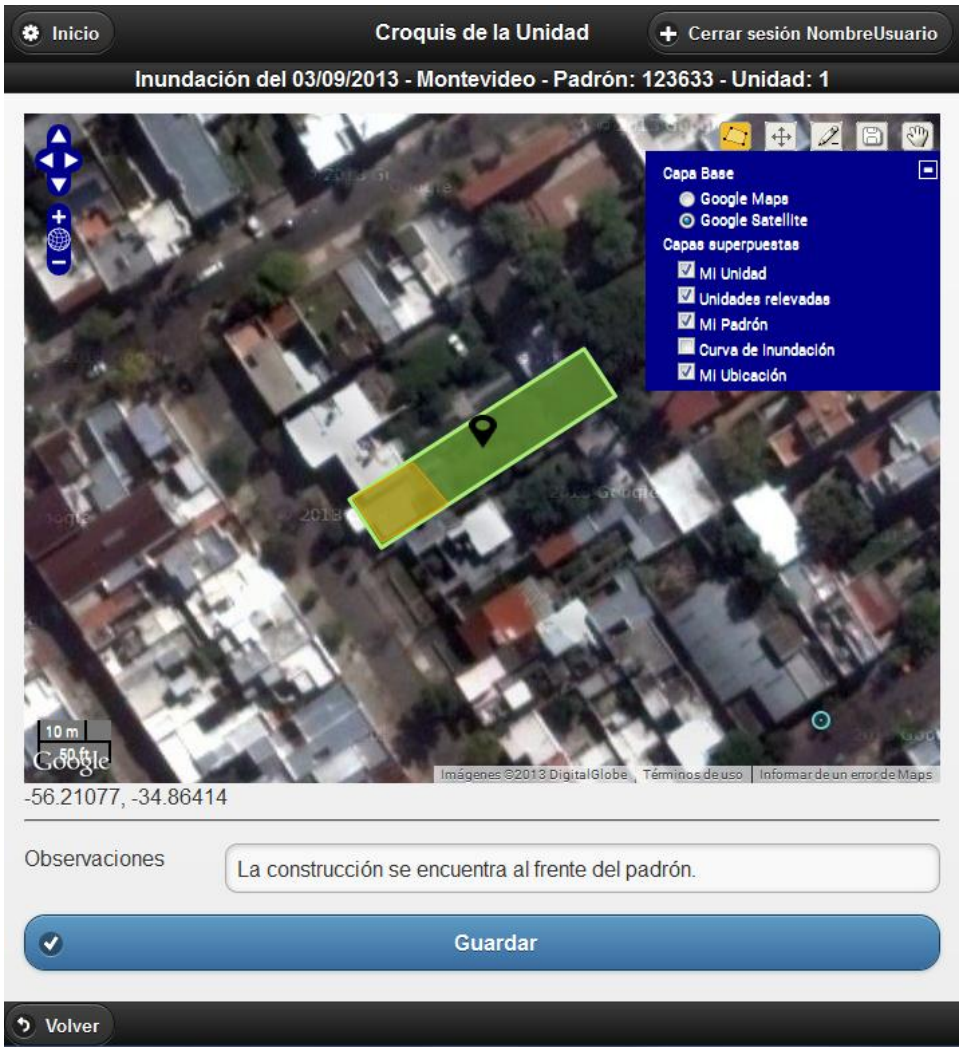

Figure 1: Mobile Application - Screen sketch of the unit.

2.2 Centralized system of damage disaster

The central system has the following features:

- User Authentication. It has an administrator who accesses and modifies the information. Furthermore users only have permission to view the information but not changing it.
- Viewing information in different ways. Through maps, tables or graphs that are being updated during the survey.
- Display of maps with various layers of information such as emergency centers, standards and units for each pattern. Allowing access from the map to the information gathered on the state of the houses and the people within it.
- View map of the historical record of flood-affected areas and access to the information gathered in previous years.

- Support decision making by calculating costs repossess homes, based on the vulnerabilities of these taken from the data gathered.
- Integration with the simulator flood homes that predicts damage to them.
- Integration with real-time information needs survey.
- Views of significant figures in the map such as the number of people affected (morbidity and mortality), number of affected households, number of households surveyed, relief time data, etc.
- Repository of useful documents for consultation and advice.
- Registration Form Flood general data on same such as date, number of evacuees, affected locations, etc.
- Generating reports about every disaster which allow aid in future decision-making.
- Ability to be approved by a supervisor the forms surveyed.

Figure 2: Central Application - Screen showing the units surveyed affected by the selected flood.

2.3 Architecture

The system has a three-tier architecture. The presentation layer which provides an interface to allow communication of information between the system and the user. The business layer which acts as an intermediary between the presentation layer and data. Contains the processes to be performed with the information received from the presentation layer and processes the information returned by the data layer. The data layer, the business layer manages the database that is stored in this layer.

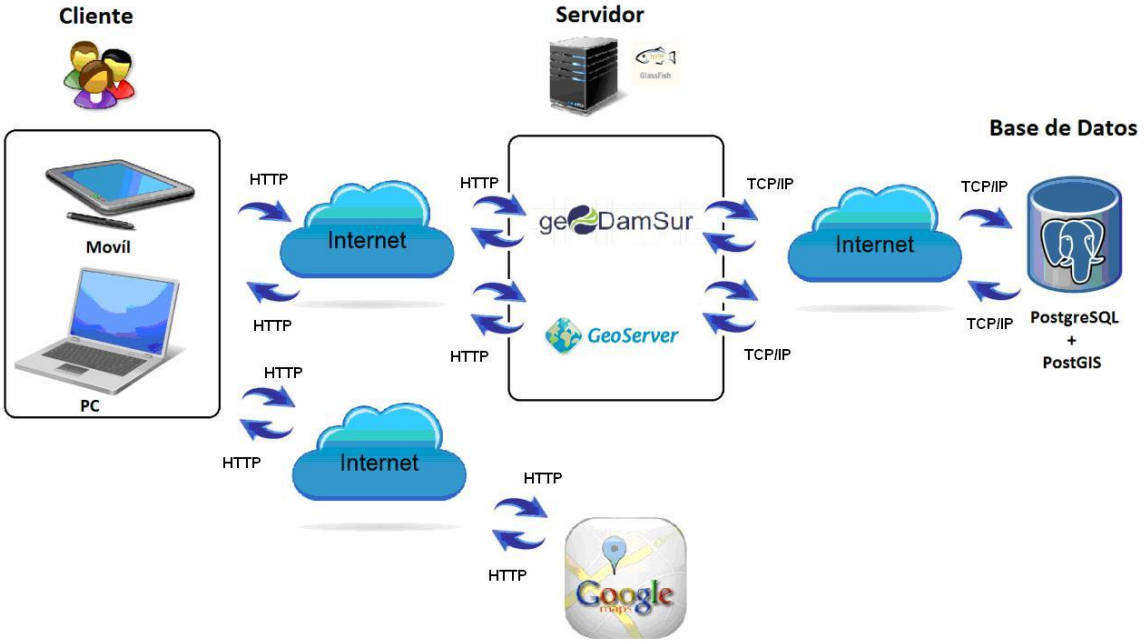

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Figure 3: System architecture.

The client accesses the web pages through the browser on your personal computer or mobile device application GEODAMSUR housed in the Glassfish application server. Also in the Glassfish server is the server which GeoServer can display maps through the OpenLayers library and base map layers are provided by GoogleMaps Web server. The database allows storing geographic data that are consumed by GeoServer.

2.4 Technologies used

As Java programming language and was used as Glassfish application server. JavaServer Faces is also used as a development environment interfaces together with PrimeFaces libraries for interface and OpenLayers to display the interactive maps on the Web browser.

Mobile application for an extension of PrimeFaces optimized especially for mobile interfaces called PrimeFacesMobile was used. As GeoServer map server was used.

The database engine used was PostgreSQL with PostGIS extension for geographic data.

3. CONCLUSION

This project's main objective was to develop an application system which should have an interface for mobile devices that would relieve the units affected by floods and a web administration interface which should be allowed to have centralized information for later reference.

As a result it was implemented a geographic information system that allows a mobile device to survey in real-time data of affected units and by the flood along with the sketch on the actual location on the map. This represented a considerable improvement in the optimization of the time since the drawing is performed on paper and then drawing the polygon is made on a geographic information manager. To survey units in real time enables action and decisions making over the surveyed damages information at

the moment, administrators can go to work , by viewing the damage on the map and through consultation available with all types of filters from centralized application on the information gathered at the time it is loaded from the devices.

Special emphasis was placed on the requirement to allow flexibility in the form of surveying damage, allowing this evolve on its own without the need to hire a technician to perform maintenance entering the new options in the system. Allowing that the alternative options that are not in the form to be entered by the relays themselves and then they can be approved by a supervisor from the centralized application enables the form to suit new situations as they arise without maintenance technician.

From the development of this system, now exists a centralized database that is used from GEODAMSUR and from two other distributed systems, one from early warning of flooding and other from the assessment needs, thus allowing to keep in one place all the information on the floods and recovering persons surveyed by other systems without having to re- enter them .

4. ACKNOWLEDGEMENTS

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