LiveTeams: Web-based context adaptive Emergency Management

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Abstract

Mobile devices are becoming increasingly popular. This, combined with the constant improvement of mobile network infrastructures leads to growing numbers of mobile devices' users. Furthermore, the applications that are able to present, manipulate and share georeferenced data have also shown exponential growth. In emergency management, it is of utmost importance for the managers to know the exact position of their units in the field, as well as any places that pose the greatest urgency in first-aid. However, given the differences in the characteristics of mobile devices, it is necessary to apply an adaptation process before presenting the content. Both the devices' physical context and the user's profile have a major impact in this domain. Thus, we propose a context adaptive Web-based application that enables real-time information sharing between user groups. This system improves efficiency in first-aid, since the identification of the location of risk situations can thus be done with greater accuracy, while improving communication between users at the same level of the chain of command, as well as between hierarchic levels.

Keywords: Geographic Information Systems, Emergency Management, Context, Adaptation, Mobile Devices.

1 Introduction

In an emergency situation in Portugal, the communication between field operatives and management at headquarters is mainly verbal and relies on visual cues. This may lead to geographic inaccuracy and to a deficit in the effectiveness of the assistance provided.

The LiveTeams system aims to resolve these problems, given that cooperation and coordination between civil services' teams is of a crucial importance.

2 Related work

Charvat *et al.* [2] mention that, in an Emergency Management context, it is possible to create several groups of heterogeneous users, with distinct roles. Each group can be described by the list of tasks that they can perform. According to the authors, the analysis of the user requirements is essential when developing an emergency management application.

Context plays a major role in adaptive systems, describing what should be taken into account when performing the adaptation process. Sarjakoski *et al.* [3] define context as any information that can be used to define the surroundings of a person, a place or an object. On the other hand, Petit *et al.* [1] define Adaptive GIS as a GIS that is able to adapt his behavior automatically according to several contexts.

3 The LiveTeams system

The LiveTeams system consists of a website, allowing users to share georeferenced data in real-time. This system was implemented using HTML5, CSS and jQuery for the front-end and Ruby-on-Rails for the back-end. PostgreSQL was the chosen database.

Given that civil services rely on a hierarchical structure, the application is supported by a similar notion, the user profile: **Basic**, **Operative**, **Manager** and **Administrator**. The Basic profile is given by default, which limits the actions that can be performed. The Operative profile is assigned to the field users, whereas the Manager is a user in charge of management tasks. The Administrator profile gives full control of the platform.

The major implemented features are described below:

Create geo-entities.

Geo-entities can be created to represent a point of interest. Each one has a name, a description and a category. They can be associated to specific teams, being only available to them.

Aggregate users into teams.

Users that have common objectives can be aggregated into teams. Each team can be sent to a relevant geographic location.

Acquisition of the user's current position.

Each user can obtain his current geographic position, which is automatically available to all users registered in the system.

Real-time sharing of geo-entities.

This solution features an uninterrupted bidirectional communication channel, which grants that, at a given time, the data available in the map is consistent with the one in the database.

Figure 1: LiveTeams front-page UI, featuring map controls (I), array of available geo-entity types (II), vertical sidebar (III), navigation bar (IV) and some geo-entities drawn on the map (V).

Filter geo-entities.

Allows the user to filter the geo-entities by category, which reduces map's visual overload.

3.1 Dynamic permission model

One of the main features of our solution is the **dynamic permission model**, which is based on the MVC model, depicted in Figure 2.

Figure 2: System's architecture

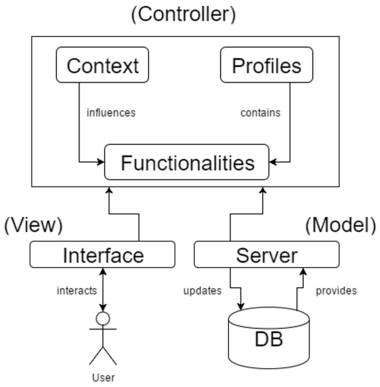
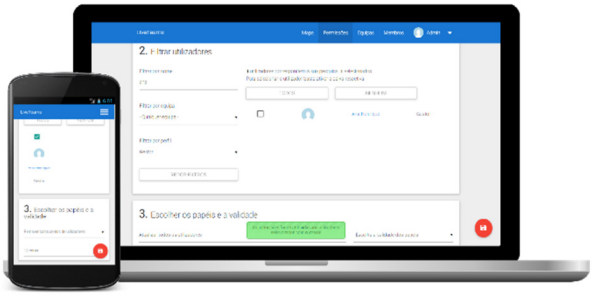


Figure 3: Assigning temporary permissions to users.



This model adds flexibility to the actions available to users by enabling the temporary extension of the profile, with additional permissions. Figure 3 shows the interface for the assignment of such permissions.

4 Evaluation

This work is part of an MSc dissertation and the testing planned had not been executed at the time of the writing of this paper.

The usability evaluation, will concentrate on a timed chain of actions to execute. The feedback obtained in the testing phase will be used to improve the user interface. The performance testing will concentrate on supporting decision of the geographic location method to be used. Finally, civil protection experts will evaluate how the designed features integrate into the routine of an emergency situation.

5 Conclusions and future work

We present a solution to improve coordination and cooperation of actors in an emergency situation, using a Web Mapping solution that reacts to several context changes. The ability to create and share geo-entities in real-time improves the efficiency of the rescue provided.

Future improvements will involve the ability to edit geo-entities, the ability for users to send messages to each other and the availability of optimal routes.

Acknowledgments

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