

A Speech-Controlled User Interface for a CAFM-Based Disaster Management System

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Abstract. Due to the numerous important decisions with major consequences which have to be taken within a short period of time in case of disasters like fire, terror attacks or floods up-to-date information about the site affected as well as positions and activities of the deployed rescue teams should be available in real-time. This information can firstly be gathered from Computer Aided Facilities Management-systems (CAFM-systems), which are based on the graphical and alphanumerical base data of the building, and are used to manage large real estates and infrastructural installations in developed countries nowadays and secondly by real-time data from master control systems and security installations of the building. Thirdly data from an “inertio-tracker” based on accelerometers and gyroscopes and used for tracking rescue teams within buildings or underground constructions can be implemented to superimpose the building data with actual position information.

The Institute for Building Informatics at Graz University of Technology in cooperation with the security industry is currently researching and developing such a CAFM-based Disaster Management System (DMS). The main challenges are locating and tracking persons, the local information management and the communication between the on-site staff and the command center. This paper gives a brief introduction and description of the whole system with a main focus of outlining the special aspects of an efficient and easy-to-use user interface.

Keywords: user interfaces for CV, CAFM, indoor positioning, interactive visualization, voice user interface, HMD.

1 Introduction

1.1 Necessary Information During Extraordinary Situation

The necessary information during extraordinary situations differs greatly from those needed for the normal management of buildings and installations. Regular CAFM-Data focuses primarily on the efficient and cost-effective management of buildings and only in special areas like energy consumption real-time data is

gathered. In emergency situations on the other hand, numerous important decisions have to be taken on the spot which are influenced greatly by the current circumstances. Further, the information has to be made available to people who generally are not familiar with the building in question (such as fire brigades, police force, ambulance crews) and have no or very limited knowledge of using a CAFM-system. Such systems should further be extended to allow for the integration of sensor data (from smoke detectors, location data of emergency crews) and for processing and displaying those data in real-time. Operating the system has to be very easy so that the squad leaders and the emergency crews on-site can be trained within a very short time, and the efficient and safe functioning of the system is guaranteed. These requirements lead among other things to some special aspects to consider when developing a user interaction for emergency units.

1.2 Goals of the CADMS-Project

In the following, some special aspects of the research project ‘Computer Aided Disaster Management System’ (CADMS) carried out by the Institute for Building Informatics at Graz University of Technology will be outlined. The objective is to develop an easy to use, safe tracking system which allows the permanent real-time representation of information within a CADM-system, with emphasis on the position of rescuers in buildings and underground structures. Such a CADM-system will be based on a widely used, commercial CAFM-system together with integrated sensor data. One major focus is on the development of an efficient and easy to use user interface for the command system – not even the GUI but also the speech enabled interaction – used in emergency situations by the showcase of real-time positioning of people by a multi-sensor system.

2 Graphical and Alphanumeric CAFM Base Data

State-of-the-art CAFM-systems into which a CADMS can be integrated use two different types of base data to describe and evaluate the buildings. By base data the underlying data about the real-estate is meant which is vital to the processes within the building and is therefore absolutely necessary for an efficient CAFM-system to function (Fig. 1). The first type of data is the graphical data and the second one is the alphanumeric data. Graphical data is concerned with the visual representation of the real-estate and its contents. This type of data is particularly important for the CADMS as the process of locating emergency crews within the building is to be based on the existing floor plans of the real-estate in question.

The second type of base data utilised by CAFM-systems is the alphanumeric data. Alphanumeric data mainly describes the ‘contents’ of a real-estate and is therefore of great importance for the CADMS. The on-site emergency crews need to know for example which hazardous substances are kept on the site and where those are located. Further it is vital to know how many people are in the