

# **AUGMENTED REALITY AND SIMULATION OVER DISTRIBUTED PLATFORMS TO SUPPORT WORKERS**

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## **ABSTRACT**

This contribution presents a real life application of a content management web application for mobile devices that is able to interact with the working environment, providing in real time simulations and helpful information about risky objects and support implementation of the appropriate procedures to follow when certain risky situations may occur. This application that may assess and reduce risks connected to the working environment and improve the workers' productivity, helping them to perform their tasks safely and efficiently. The focus on the features and functions of the application are presented along with a set of real life images from selected applications using Epson Moverio™ BT-200 glasses.

## **1 INTRODUCTION**

Working environment is quite often a source of potential risks and threat even when some apparently free-risk activities are engaged. Overconfidence, poor procedure enforcement, lacks in control are the main source of industrial risk. In the proposed application some currently adopted technologies are considered in order to build a safer environment by promoting a better interaction among man and technology and among men in the working environment. Simulation of the possible outcome of an operation is here presented using augmented reality techniques as well as traditional warnings methods. After the introduction a brief outline over the possible technologies will be made, some architectural consideration will be made and the potential benefits will be presented.

An application able to support workers in an effective manner would be able to perceive the surrounding reality by using different types of technologies. Basically, there are three different ways to carry out the environment's analysis: NFC tags, geolocation and image recognition. Obviously, these identification methods may be combined together and when the software recognizes the object, it interacts with a server and accesses a database, retrieving the data corresponding to the object analyzed in the form of links to hypertext files.

## **2 SCENARIO AND ARCHITECTURAL DESIGN OF THE PROPOSED APPLICATION**

The application must be able to select the content to show the user properly, based on his demands and situations that occur. The type of information that would be possible to obtain are text files, images, audio files, movies and so on. The contents provided by the software can be used for three different purposes: descriptive, alarmist and simulation. In the first case, the user would mostly use the image recognition service, whereby he can visualize in real-time information about the scanned object (descriptions, attributes, technical features and so on) on his device. In this way, virtual data could be placed on the real image creating an augmented reality content management system, for the proposed application a Unity 3D + Vuforia application has been implemented. A further way to get data is NFC technology. NFC tags, in fact, have sufficient memory to contain different types of files and when the user approaches the device to the label, the application begins the process of reading, displaying the information inside it. The strength of this system is that does not require interaction with a server, but only a device that is equipped of the appropriate

chip. The proposed application is able, also, to detect QR code applied on the dangerous good in order to speed-up the identification process without using expensing labeling systems. The alarm function involves geolocation service, which is useful when the worker is close to a dangerous area or object and must be notified immediately. The software alerts the user when he is located within a hazardous area or even when he is close to a specific object. The information provided in this way have a high priority level and are mostly warnings and procedures. Third scenario is “simulation” in this case a simple but effective simulation of the consequences of an operation is performed in real time and results are shown superimposed to the real images. In this way the level of a liquid in a tank after a refill procedure will be shown as a mark in the tank image, the temperature of a chemical reaction after a reagent mixing procedure will be prompted over the reactor vessel.

Exploiting the database’s structure, the application can signal several levels of danger that grow in function of the distance from the area or the object and is able to provide different levels of alarm related to them. The best solution to achieve this product is the adoption of hierarchical contents, which can be shown on the device in different ways depending on their importance. Consequently, the application is able to obtain information on the user’s request (active mode) when it comes to content with a low priority level, but it can also receive notifications automatically (passive mode) for high priority level contents. The active use of the application can provide information such as use and maintenance instructions, technical specifications and safety tips (e.g. the most appropriate personal protective equipment), while passive use is useful for receiving notices regarding the risks related to a workspace and its contents (radioactive materials, flammable materials, suspended loads, etc.). Moreover, the use of both passive and active mode would allow the app to receive instant warning messages in emergencies and to obtain information about the procedures to start, by consulting a set of protocols divided according to the type of situation. The possibility to adopt wearable technologies (i.e. Epson Moverio BT-200) would make the workers experiences more engaging and efficient, because the use will be more comfortable and natural. Main benefits that may be obtained from this application are the following:

- The software is very versatile because it can be used both online and offline. In this way it supports better user needs in different situations;
- The productivity of workers who will be using the software will greatly increase, because it will be easier to find information. Understand the operation of the app will be easy, in order to make immediate use even for those less familiar with technology;
- The risks related to the working environment will be minimized, as workers will learn faster safety procedures and will follow them more easily. Thanks to the alarm function, they will always be aware of the dangers of their surroundings;
- It will be easy to update the software with modules containing additional features;

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