# Design and evaluation of a prototype of augmented reality applied to medical devices.

## Summary

The study was aimed to incorporate all information regarding a medical device through augmented reality. This was done through a mobile application. The method of study had three stages; firstly, assessing user’s requirements through surveys and questionnaire and finding out any important information which will be included in the app such as what medical devices will be used, secondly, prototype development, and finally Software evaluation. The project was based on “Rapid Application Development” (RAD) methodology.

The application was usable on three medical devices and developed by qualified professionals. The human centred model was applied to develop the software taking into consideration the users, the environment in which they will use the application in, user requirements, design features and user assessment.

Results obtained were the following; firstly, 11 nurses and 280 healthcare professionals took part in the questionnaire where the majority agreed t include instructions, indications of use as well as descriptions of the medical device being seen in the AR app, secondly instructions and user friendly and readable description of the prototype application must be included within the app itself through text , images and videos and finally software evaluation .

When evaluating the software, the users described it as “very intuitive” since description of any medical device can be obtained very easily. The think aloud method helped in gathering only the relevant information which was needed in the prototype making it more likeable by the users. Three improvements were identified through the latter method, these were the following; virtual image vibration made the app difficult to use, no zooming function was applied in the application and finally the ability to still keep focus on device without having to keep scanning the actual device. The first problem was solved through dual aim and as a result fixing the virtual image fixed also the functionality of keeping focus on the device. The last problem was solved by including the zooming function.

The main limitation of the application was the process of updating information of medical devices without making use of any databases which in Spain (where the research was carried) did not exist. This results in having to manually updating the application through continuous maintenance.

# General Requirements for Industrial Augmented Reality Applications

## Summary

Technology has been widely and successfully applied to the fields of industry such as medicine. However, the phase of taking a technology out from the laboratory into the real world takes time and constant harsh testing. This paper tries to find what Augmented Reality Applications go through in order to be able to be used in the industrial world especially in cases where lives might matter as well as when used by the general public.

Industrial AR application perform well in the following areas; product design, plant design, training, production assistance, quality assurance, production logistics and remote maintenance. The AR applications must also follow as set of requirements such as the following; cost-effectiveness, data security, applicable regulations, set-up time, system reliability, accuracy of presentation, real-team capability and ergonomic.

The paper further mentions how an Augmented Reality application assists technicians to perform maintenance on a wind turbine. It further goes on to highlights the requirements for the AR app which were cost-effectiveness, data security, applicable regulations, low set-up time, reliability, accuracy, real-time capability and ergonomic.

The second application is an augmented reality training simulator for welders. The devices involved are a computing unit embedded inside a welding equipment, a helmet with cameras and speakers as well as a display. Training involved for such an application are joint training and training for a car chassis manufacturing plant of a German car manufacturer. Requirements for this AR app are the following; cost-effectiveness, data security, applicable regulations, set-up time, reliability, accuracy presentation, real-time capability and ergonomic.

Challenges and limitations faces were a variety for such two applications. Firstly, there was a variance of products and processes to encapsulate in an application. It required gathering a large set of documentation about the wind turbines to be displayed as efficiently as possible, as well as having the welding simulation limited to a predefined set of standard workpieces. Secondly, the working environment in which these apps are applied can be harsh and dangerous. Protective equipment has to be worn by the workers to ensure their safety as well as making sure that the devices concerned with delivering the AR do not interfere with their safety. Thirdly, a limitation encountered was data connection. To solve this the app can work offline, however optical tracking can be a problem in such case.

The results found was that the technology lacks a certain kind of maturity that can ensure full safety to the workers while working or training and making use of the app.