Chapter 5

A Mobile Augmented Reality System for Enhancing Electrical Machine Supervision

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ABSTRACT

Electrical machines are used almost everywhere, and our daily life depends on them. For this reason, it is important to articulate mechanisms to control, supervise, and perform proper maintenance of these machines, especially those used in critical industrial process. The SCADA protocol is one of the technologies that eases the operation and supervision of electrical machines. However, the absence of a spatial connection between the SCADA signals and the machines being supervised suggests the use of augmented reality (AR) to fill this void. This chapter describes SIMARA: A Mobile AR application based on a dual computer-vision system (QR-codes and fiducial markers). SIMARA provides a robust client application for the integration of AR and SCADA signals by means of virtual panels shown on top of real SCADA machines. An authoring tool is also provided in order for users to customize the application to their particular needs, allowing to create, by means of web services, customized virtual panels, and links between SCADA signals and the virtual information shown in the AR application.

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INTRODUCTION

Electrical machine supervision is a crucial task, since our daily life depends heavily on machines. This dependency is likely to grow in the future. For this reason, it is increasingly important to articulate new mechanisms to control, supervise and perform proper maintenance of these machines. These mechanisms need to be fast, safe, reliable, non-invasive (Sheikh, Nor, Ibrahim, & Bakhsh, 2017), easy-to-use or even unsupervised, when possible (Sheikh, Nor, Ibrahim, & Irfan, 2017), especially for those machines used in critical industrial processes. In this regards, Augmented Reality (AR) may be one of the technologies that enhance electrical machine supervision.

The possible applications of AR are very diverse and the potential of this technology is enormous, since AR is now a rather mature field. Not surprisingly, AR is a technology that has been applied to many different scientific, social and industrial environments. A substantial amount of research can be found dealing with the application of AR for different purposes in different areas. However, not many of these applications are used beyond an initial research or prototype phase and become successfully applied in real environments. Electrical machine supervision, and industrial application in general, is a good example of this, since there is a lack of AR tools in this area that are successfully and productively used in industrial applications outside a laboratory environment.

AR is a computer-based technology by which virtual information can be added to the user’s perception (typically a view) of the real world. Most of the AR applications deal with visual information by merging virtual images, computationally generated in real time, with an interactive view of the real world. The image of the real world comes usually from a camera and it is visualized on a screen with the virtual information added. Nevertheless, special displays can also be used to depict only the virtual information while the user sees the real world through the display (see-through displays) or reflected on it (Augmented Reality Mirrors (Giner Martínez & Portalés Ricart, 2005; Portalés, Gimeno, Casas, Olanda, & Giner, 2016)). Sometimes, even the real-world itself can be used to project synthetic images on top of it (Spatial Augmented Reality).

As a result of the rapid development of mobile technologies, AR systems based on mobile devices (Mobile Augmented Reality) represent the most common setup since the cameras of regular smartphones or tablets can be used to create AR scenes. This makes the AR paradigm almost ubiquitous, and it is one of the reasons why AR has become so popular in recent years. However, this popularity does not cause that all the AR applications be successfully used in real environments, especially in
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