AR-based Smart Inspection Technologies for Railroad Industry

The recent train accidents have urged the government to enhance the safety of public transportation as a priority. In addition to supervising and auditing railroad companies, authorities have also proposed to develop smart traffic technologies for this purpose. The focus is to improve the service quality and safety of the current train operations by implementing advanced information and communication tools. Human errors are the main cause of most deadly train accidents. Therefore, this research aims to develop novel smart assistive functions for manual inspection operations in the railway environment. These functions integrate AI, cloud computing, 5G, and Internet of Things (IoT) through augmented reality (AR) interfaces for improving the efficiency and quality of manual inspections in daily operations and maintenance. First, a systematic framework will be proposed for realizing the smart assistive functions mainly including identification of flange specifications and size measurement of collecting shoe. APPs will be developed according to the framework and deployed into smart phones for real use. Such solutions will fix numerous problems existing on-site such as the need of part disassembly, hand carry of measuring devices, high mental work load, and manual data collection. Moreover, ThingWorx, an IoT integration platform, will be constructed to connect thousands of devices (or things) in a real railroad system. The purpose is to enable real-time transparency of the status and information associated with the devices, and to provide data storage, analysis, and management functions that supports the idea of smart asset management. Finally, a prototyping system will be deployed into a real railway environment for testing and validating. The results will demonstrate the practical values of our research outcomes. The sponsoring company will complete the proof of concept for smart inspection technologies designed for the railroad industry through this project. Thus, they will be able to identify the actual user needs of safety inspections in the railway environment. Such knowledge will create a technology niche for their positioning in smart traffic technologies.