Non-Invasive Data Extraction from Machine Display Units Using Video Analytics

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Abstract : Artificial Intelligence (AI) has the potential to transform manufacturing by improving shop floor processes such as production, maintenance and quality. However, industrial datasets are notoriously difficult to extract in a real-time, streaming fashion thus, negating potential AI benefits. The main example is some specialized industrial controllers that are operated by custom software which complicates the process of connecting them to an Information Technology (IT) based data acquisition network. Security concerns may also limit direct physical access to these controllers for data acquisition. To connect the Operational Technology (OT) data stored in these controllers to an AI application in a secure, reliable and available way, we propose a novel Industrial IoT (IIoT) solution in this paper. In this solution, we demonstrate how video cameras can be installed in a factory shop floor to continuously obtain images of the controller HMIs. We propose image pre-processing to segment the HMI into regions of streaming data and regions of fixed meta-data. We then evaluate the performance of multiple Optical Character Recognition (OCR) technologies such as Tesseract and Google vision to recognize the streaming data and test it for typical factory HMIs and realistic lighting conditions. Finally, we use the meta-data to match the OCR output with the temporal, domain-dependent context of the data to improve the accuracy of the output. Our IIoT solution enables reliable and efficient data extraction which will improve the performance of subsequent AI applications.

Keywords : human machine interface, industrial internet of things, internet of things, optical character recognition, video analytics