

THE BRIEF

Pulse Systems designs, develops, and deploys cloud-connected smart sensors & controls for commercial buildings and provide building management solutions. In addition, the company has an R&D and production facility allowing them to develop rapid prototypes of any sensor technology to take to market.

They challenge the existing unwieldy solutions by enabling property owners and managers the ability to see everything, all their building's data, in one place. Making smart buildings a reality. Future-proofed by its open nature. It enables substantial savings through energy, operational, capital, and carbon costs.

Pulse Systems required CW4.0 to support their research into the growth and direction of the PCB assembly line. Assembling printed circuit boards (PCBs) can be a complicated process, involving repeatedly placing hundreds of tiny electrical components with precision and accuracy onto a small surface area, often with a specific orientation. Even when taking advantage of pick and place (PnP) machines to automate the process, the complexity and quantity of components means that errors often occur.

Manual QA for this process is taxing, time-consuming, and requires a great deal of attention to detail.

Pulse Systems were also keen for the CW4.0 team to support their research into identifying more efficient storage of data leading to better skills and knowledge of big data analytics, opening doors to larger collaborators & end-users. Gathering regular telemetry from many sources for a variety of customers quickly leads to a very large database. This has knock-on effects on the front-end, with dashboards and data visuals that query and display data over large time periods becoming at risk of being less responsive.

Unfortunately, deleting old data is simply not an option, as companies may require it for compliance and reporting years later (particularly if it is related to a safety concern, such as fire systems). However, some data such as temperature readings, HVAC system nodes and air quality, could be aggregated into coarser intervals based on age.

THE APPROACH

Pulse Systems required support with the development and implementation of a computer vision-based solution that could examine PCBs as they exit the PnP and identify if any components are missing or misplaced. The system needed to use the OAK-1 and/or OAK-D from OpenCV which was supplied by Pulse. The system needed to have a form of user feedback such as a web-based user interface to inform when an issue arises, as well as to identify and highlight the problem.

The support provided by the CW 4.0 team at Liverpool John Moores University (LJMU) involved the engagement of an undergraduate final year student and academic expertise in Computer Science and Mathematics. The project explored the use of a Convolutional Neural Network to automatically detect PCB defects using images supplied by Pulse Systems Ltd.

The CW4.0 team from Liverpool John Moores University (LJMU) also comprised a detailed report that involved the investigation, development, and implementation of efficient ways to effectively aggregate and archive data in a manner that provided a good compromise between space and accessibility. The data was accessible via the newly developed system and via Pulse's existing API.

THE BENEFITS

Pulse Systems identified they are now aware of the nuances between different neural networks and can make more informed decisions to ensure the most appropriate algorithms are used for their projects. This will enable them to benefit from a higher accuracy rate that will be used for quality assurance purposes.

The project provided a framework that the business can use to adapt and improve the accuracy of its manufacturing process in the future. Therefore, no human intervention will be required for quality assurance in their PCB assembly line. This results in highly skilled staff, increased productivity, and time to be used in other areas of the business.

The detailed report gave Pulse Systems insight into how their customers want their data to be visualised. This is crucial for Pulse Systems to achieve because ultimately, their platform aims to be driven and designed with the user experience in mind to streamline building operations and workflow.

The Pulse Systems team stated the in-depth knowledge provided by LJMU's academic experts and graduates on how to handle big data and evaluation of the different ways to proceed has provided the company with unique insight and guidance to adapt and improve their data storage, ultimately resulting in savings on data hosting costs.

The detailed report analysed and evaluated all aspects of the data, ensuring that everything was considered including how robust the data is, its operability, and how the data should be perceived, whilst making data storage accessible, simple, and easy to navigate to every person which is essential to their business beliefs.