The use of real time information to allow mass bespoke manufacturing

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Mass bespoke manufacturing would allow an assembly line to produce customized versions of a product (e.g., sometimes changing the colour of a component). Within an assembly line, products move between stations where at each station the product is progressively assembled. A diverse range of both human and material resources will be engaged (e.g., human operators, components that are part of the product being developed, and tools/resources that keep the assembly line flowing). Some resources will be stored outside the assembly line and distributed by humans, possibly with the use of additional machinery such as forklifts and, increasingly, by autonomous vehicles. Significant strategic planning is required to ensure resources are available when needed and the assembly line is as efficient as possible.

Different optimization solutions are available for assembly lines including active sensing solutions, human-robot collaboration and large-scale automation. However, often these solutions focus on the assembly line itself and not the wider environment (i.e., the factory, warehouse, and wider logistics) that the assembly line is part of [Krueger, Lien & Verl, 2009]. Optimization must include the resource feeding process and wider logistics for two reasons: (1) storage of parts in warehouses is cost-intensive, (2) growing interest in bespoke manufacturing and mass customization requires flexible production and hence adaptive resource solutions [Boysen et.al 2015].

To facilitate mass customization all resources that are involved in the manufacturing the bespoke product must be monitored and analysed, particularly their movements, in real time. The work reported here proposes a combination of IoT technologies and data analytics, to do this and will present a simulation to show how. The simulation shows how such a proposal could work in different environments that include an assembly line with the ability for the user to vary the different factors in the environment. The simulation considers the important role that humans play (e.g., within logistic planning, quality management, maintenance of machines) [Michalos et. Al 2010] and how the integration of fixed and variable sensors could facilitate direct input from the operators ensuring that the importance of humans in the process is recognised and aiding communication and coordination between humans and machines.

The work reported here brings together expertise from Business, Computer Science, Social and Organisational Psychology and Human Geography. This combination of disciplines is crucial to the success of the project as it combines knowledge of integrating sensor data streams with an understanding of important concerns such as privacy and trust in social contexts.

References

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