DelocPro Innosuisse project

Real time Machining process control and machine learning in an IoT industrial system

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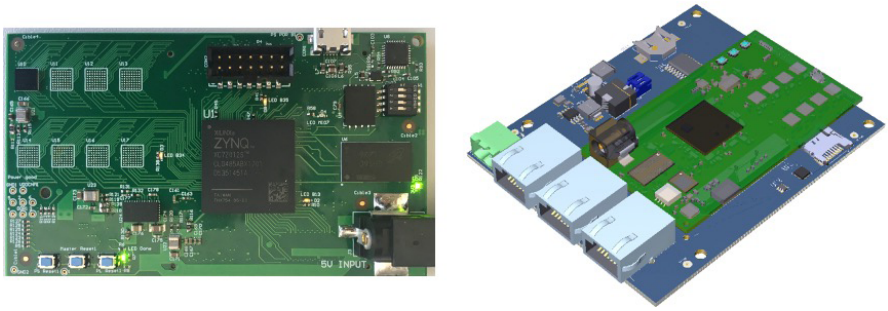
Brief description

New possibilities offered by high-speed connectivity, machine learning and neuronal powerful chips with tremendous processing capability make it possible to consider new industrial control systems to meet specific requirements such as those of the aerospace or medical markets, which have high quality and traceability needs.

Key points

Key challenges in aerospace and medical component manufacturing are: the lead-time for setting up machining strategies and the high costs of quality controls required for delivering parts avoiding failure during operation. Such challenges relate to the fact that extensive manual operations and human expertise are actually required for tuning optimum settings. In addition, the machining park cannot be monitored with static strategies for preventing their drift towards states where anomalies happen.



Design of a neuromorphic board

This project addresses such challenges by setting up a new real time process control system based on fast neuromorphic chipsets at the EDGE, enabling real time recognition of defects with artificial intelligence algorithms and closed-loop to machine controllers.

Contrary to current adaptive ones, such a system allows the automated build-up of knowledge from historical databases and the set-up of optimum control in complex, non-linear operation domains, integrating multiple variables. Moreover, it also provides means for preventing defects in real time and incorporating new information from changing conditions.

The research will focus on two key technologies of GF Machining Solutions: the electro-erosion (EDM) and the high-speed Milling. In this project, we will analyze key process variables and design adapted “machine learning” algorithms for implementation in a neuromorphic chipset, integrated in an EDGE board with a real time link to the machine controllers. For EDM, we will exploit existing high frequency sensors that record discharge features and environment parameters, whereas Milling will use a highly sensitive vibration sensor. The data will be sent wirelessly through a high capacity prototype and a low latency 5G system.