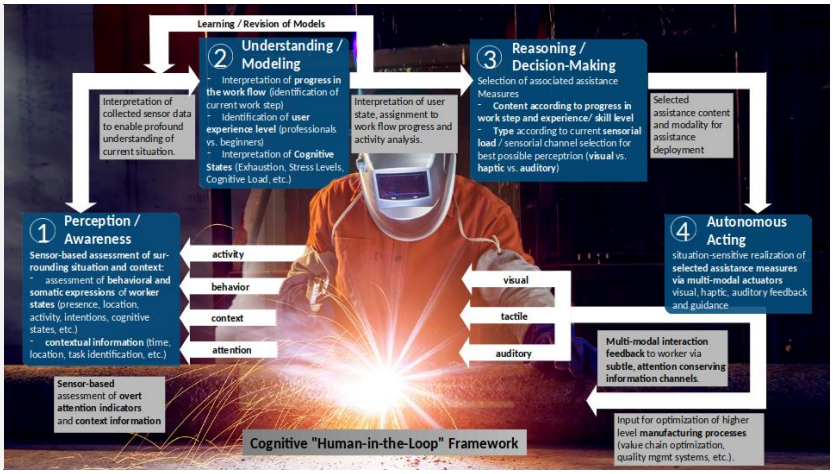
SUCCESS STORY

Pro²Future
Products and Production Systems of the Future

Programme: COMET – Competence Centers for Excellent Technologies

Programme line: COMET-Centre K1

Type of project: DP1, 4 Y, multi-firm



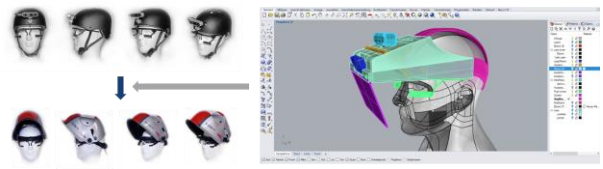
DEVELOPMENT OF COGNITIVE PRODUCTS

COGNITIVE PRODUCTS ENABLE THEIR USER TO BE WELL SUPPORTED IN EVER-CHANGING DIGITALIZED PRODUCTION ENVIRONMENTS

While digitalization enables production systems to be more flexible, the added complexity may be stressful to workers. With the establishment of assisting artificial intelligence-powered cognitive products, help is on its way. They can perceive the real world through sensors (perception and awareness), reason about what they have seen so far and what is seen now (reasoning, learning) and decide on their own according to pre-trained models if they need to act (prediction, decision making) through means of actuators (autonomous acting).

Built upon features we already see in today's products, such as online, real-time, self-* capabilities, cognitive products facilitate true collaboration between the analogous and digital domain.

Scientific and industrial partners established this vision, in welding through means of communication between welding torch, unit and shield. In this case different functionality is embedded in these devices and the head gear functions as a conductor and integrates the cognitive abilities of this cognitive product. In a first step, cognitive product design is essential for distributing and embedding sensors and actuators in respective industrial product. It provides the ability to quickly develop different generations of prototypes and analyse those for their applicability in the field with actual workers.



Computer aided cognitive product design enables fast progression through multiple prototype generations.

After the design process, the embedding of sensors, computing platform, actuators into an actual physical

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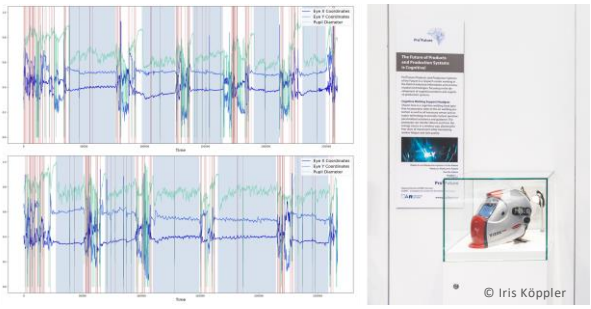
product, and deployment not in the laboratory but in the field, a rigours analysis of sensor data is required.

Features of sensors are investigated and analysed for solving a particular problem addressed by a cognitive product.

Afterwards, but based on the analysis, machine learning and artificial intelligence mechanism can be set up to solve various specific industrial problems, in this case we realised the following: (i) Online digitalization of industrial environments based on body-worn off-the-shelf RGB and RGB-D cameras, which can be then be used to support navigation in complex shop floors; (ii) Through gaze-based skill level detection, using eye tracking cameras, the proper amount of feedback can be given to a user. This helps novices to immediately be productive without excessive learning processes and avoids that experts are annoyed by overhelpful technology; With (iii) workflow recognition algorithms users do not get confused with lot-size-1 production. If mistakes occur, workers are able to correct it immediately with the help of the cognitive product on their own.

Impact and effects

Based on principles developed in this project, company partners, addressed not only welding support but also other areas of work affected by future problems of digitalization, such as: (i) assembly assistance, (ii) expertise transfer between workers, (iii) complexity management, (iv) early detection and avoidance of fatigue, (v) in-process quality control, (vi) detection and avoidance of safety and ergonomic hazards (vii) stress reduction through production changes or (viii) production optimization through identification of bottlenecks.



With the prototype developed (right) a company partner was able to analyse (left) how humans behave during welding tasks (blue phases) and establish a cognitive product in the form of a head gear to better support workers in this high voltage task.

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- TRUMPF Maschinen Austria GmbH + Co. KG, Austria
- KEBA AG, Austria
- Wacker Neuson Linz GmbH, Austria

This success story was provided by the consortium leader/centre management and by the mentioned project partners for the purpose of being published on the FFG website. Further information on COMET: www.ffg.at/comet

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