Open Invited Session on "Ability Centred Systems Engineering"
for IFAC MIM 2019

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Large product catalogues, a wide variety of configurations and an almost infinite number of possible combinations make the selection and dimensioning of automation components and their combination into systems and plants a very time-consuming task. Component manufacturers require a high level of consulting by sales engineers. Today, these are supported by individual engineering tools that help with concrete tasks such as the design or configuration of an individual product or product group. Within these tools, however, there is no data continuity; customer and application information often must be queried several times.

During the engineering process, many assumptions are made to present an initial solution with experience and creativity. This can then be accepted or rejected by the customer, but in most cases the first solution results in a change or tightening of the customer requirements. In several loops a possible solution is found with a lot of effort. Normally, however, this is neither efficiently created nor optimal. With this approach, a structured consideration of all solutions is not possible. Much more a solution- and technology-neutral problem analysis is left very quickly and instead a first rough idea is further developed. As a result, many possible, albeit unconventional solutions are lost.

The following problem areas arise from this status quo, which are to be analysed and discussed in the context of this track:

Track topics:

1. application modelling: How can any automation application be described in a structured and standardized way? How can applications be decomposed into a sequence of structured tasks? How can relationships and dependencies between tasks be described? How can components and their skills be modelled? How can a workpiece be modelled? How can the workpiece be modelled? How can the required information be obtained? And what is the required information?
   Therefore, we invite scientists and engineers to contribute their papers in areas including but not limited to the following topics:

   Data modelling, modelling languages, knowledge graphs, rule engines, knowledge-based systems

2. finding possible components: How can e.g. components be found by planning, which are able to carry out a given task together? Special attention should be given to the gripping task in the context of a pick-and-place application: How can possible gripping points on a workpiece be found? How can a gripping plan be created?
   Therefore, we invite scientists and engineers to contribute their papers in areas including but not limited to the following topics:

   Planning, Artificial intelligence, Skill-task-matching, Knowledge Discovery

3. simulation of the proposed plan: How can the physical behaviour be verified and validated?
   Therefore, we invite scientists and engineers to contribute their papers in areas including but not limited to the following topics:

   Optimization, simulation techniques

Proposal 42 submitted to 9th IFAC Conference on Manufacturing Modelling, Management and Control. Received October 25, 2018.

4. derivation of PLC code from the selected plan/application description
   Therefore, we invite scientists and engineers to contribute their papers in areas including but not limited to the following topics:

   Automated code generation, model-based programming

All these problem areas can be viewed on different levels of abstraction: Possible components can be predefined modules in the sense of plug and produce, which can be combined into a production line, or from the level of automation components, which can be combined into machines.

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