

Optimizing Cycle Times in Robot Based Manufacturing Lines

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The use of industrial robots in the automotive industry noticeably changed the view of production plants and led to a tremendous increase in productivity. Nonetheless, rising technological complexity, the parallelization of production processes, as well as the crucial need for respecting safety issues pose new challenges for man and machine. Furthermore, the progress shall proceed – production cannot be too fast, too safe or too cheap.

This is the topic that me and my colleagues from TU Chemnitz tackle within the ERDF research project viRAL (Validierte Inbetriebnahme von Roboteranlagen mit automatischer Logik- und Lageprüfung) joint with Voith Engineering Services GmbH and Fraunhofer IWU in Chemnitz. Our goal is to create tools that make the commissioning process more reliable by verifying the programs of robots and logical controllers. This in particular includes optimizing the schedule of robots in order to ensure desired cycle times already in the planning phase.

The talk will be about a periodic scheduling problem as it typically appears in the context of generating train timetables as well as why and how the mathematical models used in this field are well applicable to our scheduling problem. We adapt a max-plus algebra approach to the industrial environment, yielding a max-plus eigenvalue problem.