An agent-based approach for dependable planning of production sequences in automated production systems

One approach to achieve flexibility and dependability for the control of automated production systems (aPS) is agent-oriented software engineering (AOSE). In this paper, the modular decoupling of the supervisory control, most significantly the planning of production sequences and transfer routes, from the distributed real-time control of the plant resources is demonstrated by the use of agents. The resulting product management agent (PMA) represents the technical process of the manufactured product and conducts a discrete reasoning algorithm to derive appropriate production plans by the use of graph-search and also by interaction with the underlying resource agents (RA). It is shown, that for a given production system, dependable solutions are automatically generated in regard to a given product recipe. Further it is deduced, that the solutions are calculated and evaluated by the PMA within a deterministic time duration. This is argued on the fact, that the computation complexity does not exceed polynomial time and is mostly predetermined by the design parameters of the plant. Thus, it gives a reasonable approach for the use in a real-time environment. Additionally, through separation of supervisory and field control, a modular software engineering is achieved, offering the advantage that the PMA and the resource agents can be reused, by
solely adapting the knowledge bases and without the need for modifying the planning algorithms after a reconfiguration of the aPS.