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On scheduling ship-building lines based on discrete-event system theory

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Summary: The paper presents an unified approach to scheduling problems on ship-building lines based on discrete event-driven system theory. The dynamics of the production lines are mathematically described using linear system representations based on Max-Plus algebra, which makes it possible to solve the problems to strictly keep delivery dates by model-predictive control theory adjusting arriving times of parts or materials. Specifically, for a dock of tandem-type, the dock process consisting of building up blocks, rigging and painting is succesfully modeled by a Max-Plus-algebra-based linear system representation which determines the cyclic delivery dates for the block-assembling process. The process is consisting of making-up blocks ('Oo-gumi'), stocking them and gathering several bolocks ('Sou-gumi') is also modeled by another Max-Plus-algebra-based linear system representation.Simulation results show that arriving times of parts to the block-assembling process can be determinded by 1-step-ahead or 2-step-ahead model-predictive control methods. Futhermore, it is shown that the problem reducing stock periods can be formulated into linear programing problem.

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