

Max-Plus Algebra in Modeling of Access to Common Resources

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Abstract. This paper presents the use of Max-Plus algebra in modeling dynamic behavior of a system with discrete cyclic processes. The job-shop system is considered, where scheduling is one of the most basic problems to be solved within the manufacturing industry. The research is focused on a design and control at the lowest level of the system. Modeling and control on operational level are developed. The processes considered are sequential and cyclic. Access to each common resource is coordinated by a mutual exclusion protocol. Unfortunately, scheduling problems generally considered within large scale systems are difficult to solve in most practical situations. Timed Petri nets are used for the specification of system considered. The tools of the Petri nets are well suited to the modeling of flexible manufacturing systems. Max-Plus algebraic techniques to handle the systems considered are proposed. A numerical solution which allows evaluation of the performance of the job-shop system is provided. As a performance evaluation measure the cycle time of the system is chosen. The Max-Plus algebra which represents a linear algebraic form of discrete systems supplies new tools to its modeling.

Key words: Max-Plus algebra, Petri nets, discrete processes