Streszczenie rozprawy doktorskiej

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Decomposition of concurrent control systems specified by Petri Nets

The doctoral dissertation deals with issues related to the decomposition of concurrent control systems described by Petri nets. An integral part of the decomposition process is the selection of state machine subnets, which allows to choose only the necessary set of sequential automata that can be implemented concurrently. Two new decomposition algorithms have been developed, based on the algorithm for determining p-invariants (commonly referred to as the Martinez-Silva method). The method has also been improved to consider a reduced subset of state machine components. The main purpose of such a technique is to reduce the number of operations required to obtain the coverage of a Petri net. Furthermore, two novel selection algorithms based on the exact transversal hypergraph (called xt-hypergraph) have been developed. In particular, a specific property of such a hypergraph is applied. Therefore, it is possible to solve the selection problem in a polynomial time and return a result that corresponds to the minimum coverage. The performed experiments have shown that 93% of the tested benchmarks fulfill the required conditions to apply such a technique. Thus, the decomposition process is faster compared to the classical methods. The correctness of the presented author's algorithms has been verified analytically and experimentally with the use of Hippo system. Hippo was created and it is being developed at the University of Zielona Góra.