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A TOOL FOR THE DESIGN AND VERIFICATION OF A SUPERVISORY CONTROLLER FOR DISTRIBUTED MANUFACTURING PROCESS

Allaoua Chaoui[1], Amel Meliouh[2] and Elhillali Kerkouche[3]

[1]MISC Laboratory
Department of Computer Science
Faculty of Engineering
University Mentouri Constantine
Constantine, 25000, Algeria
achaoui@umc.edu.dz

[2]Department of Computer Science
University of Biskra
Biskra, Algeria
a_meliouh@yahoo.fr

[3]Department of Computer Science
University of Oum Elbouaghi
Oum Elbouaghi, Algeria
elhillalik@yahoo.fr

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Abstract. *The present paper proposes a tool for the design and verification of a supervisory controller for distributed manufacturing process using UML and Petri nets. UML use cases and class diagrams are used to model the manufacturing process, to be transformed later into their equivalent Petri net models (in INA specification) automatically using our tool. Then, INA is used for verification purposes. Since UML diagrams and Petri nets models are graphs, the tool is based on the combined use of meta-modelling and graph grammars to translate the UML diagrams to their equivalent Petri nets models. The tool is illustrated by an example of a manufacturing process.*
Keywords: Distributed manufacturing systems, Petri nets, UML, Supervisory controller, Graph transformation

1. **Introduction.** A manufacturing system (MS) aims to produce items. The production processes of MS are composed of production steps. A production step is an activity or set of activities that transform the state of the item undergoing the process. The objective of MS is to execute these production processes [13]. The MS can be classified as Discrete Event Systems (DES), since the dynamical evolution is driven by asynchronous events, i.e., events or actions that occur in a finite time interval; provoke a discrete state transition of the system. This class of systems can present characteristics of parallelism, synchronism, and conflict, because of the lack of a time dependent and predefined sequence of event occurrence [13].

Over the last two decades researchers have addressed the increasing demand of industry for formal control design of discrete-event systems (DES), including manufacturing systems, computer networks, logistic systems and traffic control systems [14]. The supervisory controller of a MS consists, on the basis of a specification of the structure and behaviour of the physical system, of finding a policy of Control. This controller must be able to enable, disable and synchronize the production process operations, according to