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Evaluation of Resource Flexibility in Digital Factory Planning in Small and Medium sized Enterprises

Kiril Aleksandrov[1], Hendro Wicaksono[1], Sven Rogalski [1*]

[1]ISPE/PDE
FZI Research Center for Information Technology
Karlsruhe, 76131, Germany

ABSTRACT

For years, production companies have faced an increasingly complex and rapidly changing market, which also results in higher client customization. Their competitiveness is increasingly dependent on the identification of new customer and market demands and the ability to dynamically respond to these in a timely and adequate fashion. To ensure the long-term success of a business, the production especially must take an active role, which demands a constant adaptation or modification of existing plant structures, production resources and processes, in order to continue to meet the performance objectives of time, quality, costs and innovative competence. Manufacturing SMEs in particular have to react very flexibly to the ever-changing needs of their customers. For this reason, they must plan their factories from the start in such a way that uncertain, but significantly influential, factors can be buffered by the production structure. This calls for information technology tools, aligned with the SME's needs, that both virtually verify the layout of production stations, as well as analyse the existing flexibility and resource efficiency of systems which are to be planned, while taking into account product life-cycle-related aspects. The proposed paper deals with a software tool called FLEX-Plan, developed at the FZI Research Center for Information Technology in Karlsruhe, Germany. As opposed to the complex digital factory planning tools often used in industry, this allows SMEs to plan their factory structures, production resources and -processes in a much simpler way. Using their existing IT and CAD systems, SMEs can simulate their often two-dimensional plant factory layouts (e.g. machines and their configurations, material flows, storage and work areas etc.) within the geometric constraints of the building. Based on this, the resource information contained in the 2D CAD factory models can be evaluated with regards to the existing manufacturing flexibility for different design alternatives. This is done to evaluate the existing potential for optimization and to determine the optimal configuration of resources.

* Dr. Sven Rogalski: Tel.: (+49) 721-96 54 522; Fax: (+49) 721-9654 523; E-mail: rogalski@fzi.de

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Manufacturing Education and Training resorting to a new mobile robot competition

J. Gonçalves[13*], J. Lima[13], P. Costa[23], and A. Moreira[23]

[1]Polytechnic Institute of Bragança, Department of Electrical Engineering, Bragança, Portugal

[2]Faculty of Engineering of University of Porto, Department of Electrical Engineering and Computers Porto, Portugal

[3]Robotics and Intelligent Systems Research Group INESC-TEC Porto, Portugal

ABSTRACT

In this paper it is discussed the educational, research and development outcomes that are expected to achieve from a new robot competition, proposed and conceived by the authors, that was recently included in Robotica (the main Robotics Portuguese Competition). The robot competition takes place in an emulated factory plant, where Automatic Guided Vehicles (AGVs) must cooperate to perform tasks. To accomplish their goals the AGVs must deal with localization, navigation, scheduling and cooperation problems, that must be solved autonomously. The presented robot competition can play an important role in education due to the inherent multi-disciplinary concepts that are involved, motivating students to technological areas. It also plays an important role in research and development, because it is expected that the outcomes that will emerge here, will later be transfered to other application areas, such as service robots and manufacturing.

* Corresponding author : Tel. : (+351) 273-3068 ; Fax : (+351) 313-051 ; E-mail : goncalves@ipb.pt