Automated Inspection And Product Control: Proceedings Of The 8th International Conference 23-25 June

Available online at www.sciencedirect.com
ScienceDirect
Procedia CIRP 52 (2016) 112 – 117
www.elsevier.com/locate/procedia
Changeable, Agile, Reconfigurable & Virtual Production

Adaptation of Reconfigurable Manufacturing Systems for Industrial Assembly – Review of Flexibility Paradigms, Concepts, and Outlook

Guido Huettemann[a]*, Christian Gaffry[b], Robert H. Schmitt[a]
[a]Chair for Metrology and Quality Management, Laboratory for Machine Tools and Production Engineering (WZL) of RWTH Aachen University, Steinbachstr. 19 D-52066 Aachen, Germany
[b]Student of RWTH Aachen University, Aachen, Germany
* Corresponding author. Tel.: +49-241-80-20570. E-mail address: g.huettemann@wzl.rwth-aachen.de

Abstract

The introduction of new variants and continuously decreasing lot sizes following the paradigm of individualized production require the frequent reconfiguration of assembly systems. Albeit advances in 'plug and produce', current assembly systems remain limited when additional processes, changes in process sequence or processing time are required. This limitation is caused by physical constraints related to the typically employed fixed transfer systems (e.g. roll conveyors) and temporal constraints resulting from line balancing. Based on a review of the state of the art a framework is proposed to assess the adaptability of different flexibilisation approaches to industrial assembly. The matrix-shaped framework covers different levels of production systems from work stations to production networks on one axis and considers three different objects, i.e. technical resources, organization, and control and traceability on the second axis. Different criteria for assessment are assigned to each field of the matrix. Based on requirements derived from literature and discussions with experts from different industries it is concluded that the paradigm of Reconfigurable Manufacturing Systems (RMS) is suitable for adaption to small-lot and small to medium series assembly. Key boundary conditions for the application are outlined and further research topics to enable the application in industrial assembly are identified.

Peer-review under responsibility of the scientific committee of the Changeable, Agile, Reconfigurable & Virtual Production Conference 2016
Keywords: Reconfigurable Assembly Systems;Flexibility Paradigm; Changeability; Assembly System Design; Reconfigurable Manufacturing System

1. Introduction

Assembly is the final step in the manufacturing of complex products, using up to 50% of production time and accounting for up to 20% of overall cost and 20-70% of labor cost associated with production [1–3]. Assembly and assembly system design for typical manufactured goods (e.g. consumer goods, electronics, automotive industry), in this context referred to as industrial assembly, are driven by an increased number of product varieties resulting in increased complexity of both product and assembly processes while competition in global production networks increases simultaneously [4,5]. This leads to an increase in the rate of reconfigurations.

Currently deployed manufacturing systems are largely designed for stable market environments with less frequent changes in design and demand. Assembly lines are particularly sensitive to changes in process time, process sequence, or to the addition of new or changed processes. They are limited by physical constraints related to the typically used fixed transfer systems (e.g. roll conveyors) and temporal constraints resulting from line balancing and the elimination of buffers. This prompts the need for new approaches in assembly system design to allow manufacturing system changes [6,7].

The term changeability comprises means such as adaptability, modifiability, scalability, flexibility, and reconfigurability that are considered enablers for product variety management [5,8,9]. Flexible and reconfigurable manufacturing paradigms have been a subject of research for some time. Newer paradigms address scalability [10–14] with a focus on machining systems. Several approaches for assembly system design based on modularization emerged in

Peer-review under responsibility of the scientific committee of the Changeable, Agile, Reconfigurable & Virtual Production Conference 2016
doi:10.1016/j.procir.2016.07.021

Automated Inspection and Product Control: Proceedings of the 8th International Conference, June , Chicago, USA [K.E. McKee] on tuforoparawebmasters.comFind Advanced Search Automated inspection and product control: AIPC 8: proceedings of the 8th international conference, June , Chicago, USA .tuforoparawebmasters.com: Automated inspection and product control: AIPC 8: proceedings of the 8th international conference, June , Chicago, USA: Great.Automated inspection and product control: AIPC 8: proceedings of the 8th international conference, June , Chicago, USA: Books.Automated Inspection and Product Control: AIPC 8: proceedings of the 8th International Conference, June , Chicago, USA by International.Proceedings of the 6th International Conference on Ship and Marine Research . Rome dimensional control based on optical co-ordinate measurement in shipyard .. with product design, and an on-line inspection step. .. devices and CAD/CAM systems (Aubin) and an automated Chicago, 23 - 25 June 8th Int. Conf. Automated Inspection and Product Control, Chicago, June (Kempston: Baker L R c Optical sensors for automated surface metrology Automatic . C. Y. Chan et al The International Journal of Advanced Manufacturing Technology C. Butler et al IFAC Proceedings Volumes 21 The experimental automatic measurement systems were based on optical co-ordinate Keywords geometric control, measurement, planning, three dim ensional systems, . International Conference on Ship and Marine Research. .. with product design, and an on-line inspection step. Chicago, 23 - 25 June Amazon kindle ebook Automated Inspection and Product Control: Proceedings of the 8th International Conference, June , Chicago, USA PDF.Computer Vision and Pattern Recognition and International Conferences on Pattern 6th Int. Conf Automated Inspection and Product Control, Birmingham, Control Eng., Barrington, IL. . Industrial Robots, Chicago, Illinois, April , Sot. experimental system for disk head inspection, in Proceedings, 8th Int. Conf.He received the Silver Medal from the International Geneva Conventions in .. Mayez Al-Mouhamed, Identification of object faces by tactile sensor, The 8th Inter. Conference on Automated Inspection and Product Control, Sponsored by the of America (MPCA), and IFS, June , , Chicago, USA, pp 7.and Mayez Al-Mouhamed, Identification of object faces by tactile sensor, The 8th Inter. Conference on Automated Inspection and Product Control, Sponsored by the of America (MPCA), and IFS, June , , Chicago, USA, pp Number of Iterative Tasks, Proceedings of the 4th International Symposium on.Reddit Books online: Automated Inspection and Product Control: Proceedings of the 8th International Conference, June , Chicago, USA X.[3] Kalpakjian & Mickee, K E; 'Automated Inspection and Production. Control', Proceeding of 8th International Conference, June,. , Chicago, USA.Seznam sborniku PROCEEDINGS v knihovni SPIE/CS Olomouc. Optical (March , Baz Point, Florida). Vol . Thermal Infrared Sensing for Diagnostics and Control International Conference on Education Optics . Automated Inspection and High Speed Vision Architectures.IEEE Computer Society Press Los Alamitos, CA, USA David Gries, The Science of Programming, Springer-Verlag New York, Inc., Secaucus, NJ, . programming,

Proceedings of the 8th international conference on Functional and .. Software Engineering, June , , Prague, Czech Republic.