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Distributed cloud-based manufacturing integration through intelligent information sharing

Recent developments in information technologies and internet have enabled shortening of product delivery cycles and on-line ordering of products with high level of customization with direct access of catalogues and product databases by end customers using web based interfaces. On the other side, manufacturing in most of industries has shifted focus from mass production, through just-in-time manufacturing, and cellular manufacturing into rapid response manufacturing with the goal of shortening product manufacturing cycles. Those two approaches can be combined to develop distributed manufacturing integration based on cloud computing which enables custom product design and manufacturing in very short cycles in order to meet the customer requirements. In such approach each individual customer selects the product options at an entry point into design and manufacturing. Therefore, product shape and its manufacturing are in fact seen as information content holder. Storing design and information data on a cloud-based platform enables the manufacturers to reduce all components of the order lead time: product design, process design, product manufacturing, and delivery time, but require that both design and manufacturing planning are supported by knowledge, information, and data models using modern technologies as well as underlying infrastructure for cloud based data and application storage. This paper addresses the technologies necessary to achieve distributed integrative product and process model for product configuration and mass customization. The following technologies are identified as enablers for integrative model of design and manufacturing: a) knowledge management and knowledge based reasoning, b) generation of design options and manufacturing alternatives, c) visualization of the decision space for product configuration, d) product and process visualization, e) neutral XML based data communication and exchange, and f) distributed agent-based data processing and module development. The application of these technologies in integrative product modeling and manufacturing planning and their implementation in IMPlanner prototype are described. Several agent-based applications are illustrated on industrial examples.

Biography

Dusan N Sormaz is an Associate Professor of Industrial and Systems Engineering at Ohio University, Athens, USA. His principal research interests are in process planning, Computer Integrated Manufacturing (CIM), simulation and lean manufacturing, and application of knowledge based systems in manufacturing. He developed the prototype of intelligent process planning system 3IPP. He has worked in a technology transfer project with Adizes Southeast Europe in Novi Sad. He also worked on FIPER project funded by NIST (ATP) in developing cost modeling tool. He has developed the distributed process plan modeling system IMPlanner and applied its algorithms in projects for Delphi automotive. Recently, he has worked on developing cost models for jet engines and turbines, and on development of corrosion modeling software. He has published his research (over 80 refereed papers) in refereed journals, the two book chapters and at international conferences. He serves as a Reviewer for several international journals (IJPR, CAD, and others), and he co-edited proceedings of Group Technology/Cellular Manufacturing World Symposium 2003. He received his PhD degree in industrial and systems engineering and MSc in computer science from University of Southern California, Los Angeles, CA, and MSc in industrial engineering and BS in mechanical engineering from University of Novi Sad, Yugoslavia. He is Member of IIE, Senior Member of SME, and Member of IEEE.

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