

Full Length Research Paper

A rule-based system for fixture design

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Modern market imposes stringent demands regarding the product quality/price ratio, with an ever decreasing time-to-market. Furthermore, products are increasingly manufactured in small batches and high varieties, which requires flexibility not only from manufacturing system but the entire manufacturing process. Such demands require manufacturing systems which are highly automated in the domain of preparation and realization of manufacturing activities, which include fixture design. Owing to present trends towards reduction of lead time and human effort devoted to fixture design, computer aided fixture design has gained a prominent role in computer aided environment. In this paper, a system for computer-aided fixture design is presented and verified. This system comprises methods and techniques for fixture design. The structure of this system is based on modular principle, and uses data base and knowledge base. The system allows fixtures to be designed based on geometric features of workpiece, process planning and machining information. A segment of output results is also shown. Finally, conclusions are presented with directions for future investigation.

Key words: Machining fixture, rule-based systems, data base, knowledge base.

INTRODUCTION

During the last couple of decades, the computers have been increasingly used to assist design activities. The beginnings of their application date back to the sixties of the last century, when they were first successfully used to control machine tools. This was followed by an expansion of their application in various domains of manufacturing engineering. During the seventies of the twentieth century, the concept of Flexible Manufacturing System (FMS) was first introduced. Such systems have been capable of functioning within a fully automated environment with a very flexible manufacturing program. During the last thirty years, Advanced Production Technologies (APT) have gained special importance. APTs include a number of technologies that are used through all steps from computer designing level, up to computerized integration of machine and equipment

during manufacturing process (Semiz, 2010). The APTs that are most used nowadays include: Computer Aided Design (CAD), Computer Aided Manufacturing (CAM), Computer Aided Engineering (CAE), Computer Aided Planning (CAP), Computer Aided Process Planning (CAPP), Computer Aided Quality (CAQ), Computer Aided Inspection (CAI), Computer Numerically Controlled (CNC) machines, and robotics (Ostojic et al., 2010; Semiz, 2010; Tadic et al., 2011). Today, the emphasis is placed on the Intelligent Manufacturing Systems (IMS) which are able to solve problems without the use of an explicit and detailed algorithm or a mathematical interpretation of the problem. Various computer aided systems are used to assist product design and manufacture in order to shorten the time and related costs. Numerous systems have been developed which allow automation at particular stages of design and manufacture. Computer technologies have revolutionized modern manufacturing. From the standalone CAD/CAM applications, to Product Data Management/Enterprise

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