# DEVELOPMENT OF APPLICATION SOFTWARE FOR AUTOMATIC MANUFACTURING TECHOLOGY DESIGN OF FREE FORM SURFACES

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## Abstract

*Development and usage of a software application representing a CAD/CAM system for automatic manufacturing technology design for parts with free form surfaces is presented. The system provides tool path generation for manufacturing input CAD models of a workpiece and a part, which will represent optimal tool path for multi criteria optimization methods. Based on already developed and implemented procedures for tool path generation and optimization, it allows usage without any user's expertise in the field of CAD/CAM systems. Obtained tool path is generated based on the loaded part and workpiece CAD models according to multi criteria optimization method which is implemented in system. The optimal tool path for manufacturing will be generated, which will be performed in the shortest time possible, having appropriate surface precision and quality. Developed procedures which are implemented in this system are the result of years of research in this field at the Department of Production Engineering, Faculty of Mechanical Engineering, University of Belgrade, Serbia. For the purpose of developed cutting force model, cutting coefficients were experimentally determined for tool/workpiece geometry and material blend. Research was conducted for combination of aluminium workpiece and ball end mill of HSSE steel. The application software is developed in MATLAB as a GUI interface and it allows generation of control (G) codes for rough and finish machining for the tool stored in the application database. According to the generated control codes by this developed software, several parts were manufactured using the ILR HMC 500/40 machine tool in order to verify developed procedures for tool path generation and optimization. Based on the conducted experiment, it was concluded that the machining was performed in allowed tolerances and cutting conditions which confirm the usability of the developed software application.*

## Keywords

CAD/CAM systems, Free form surfaces, Tool path optimization

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