GA BASED FEATURE RECOGNITION OF STEP FILE FOR CAD/CAM INTEGRATION

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ABSTRACT

Feature-based method has been successfully applied in several fields of manufacturing. However, most of the applications use the solid modeling method that cannot meet the requirements of a product design that needs a free-form surface or a complicated surface. This research utilizes the Genetic Algorithm (GA) technique for feature recognition of STEP file. A GA model is proposed for optimizing the coordinates which is used for feature recognition. It is proposed as an input for automatic feature recognition in Computer Aided Design and Manufacturing (CAD/CAM) application. These methods accomplish their task based on recognition of features as GA made up. This technique used standard for exchange of product information (STEP) formats for geometrical data extraction representation to matching the coordinate from STEP file to decide the correct or optimize solution. Genetic operator such as selection, crossover and mutation are performed repeatedly to acquire the optimal sequences of coordinates. Even though the result of this processes are optimal, some coordinates are not placed in the correct position.

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LIST OF ABBREVATIONS

3D	Three Dimensional
CAD	Computer Aided Design
CAM	Computer Aided Manufacturing
CAPP	Computer Aided Process Planning
CAS	College of Arts and Sciences
CPU	Central Processing Unit
DFX	Data Exchange Format
FEM	Finite Element Method
GA	Genetic Algorithm
GT	Group Technology
IFRM	Intelligent Feature Recognition Methodology
IGES	Initial Graphics Exchange Specification
ISO	International Standards Organization
NC	Numerical Control
NBS	National Bureau of Standards
NCGA	National Computer Graphics Association
NIUG	National IGES User Group
SC4	Sub Committee 4
SET	Standard d'Echange et de Transfert
STEP	Standard for the Exchange of Product Model Data
USPRO	U.S. Product Data Association
UUM	University Utara Malaysia

CHAPTER 1
INTRODUCTION

Integration of different Computer Aided Systems such as CAD, CAM and CAPP has been put into serious consideration for the agile manufacturing environment. Thus, various methods have been proposed and investigated for this purpose and this includes implementation of feature recognition techniques, data exchange or neutral format and many others. In the feature recognition approach, for instance, it searches the data structure of a 3D model corresponding to particular design and manufacturing functionality (Meeran and Zulkifli, 2002). The feature recognition and extraction techniques have been extensively developed since the works of Kyprianou (1980) and Henderson (1984). The technique is intended to represent the low level geometric information of CAD model into high level design and manufacturing information and thus directly support the main objective of Computer Aided Systems integration. CAD systems support engineering functions such as mass properties calculations, interference checking and geometry definitions for finite elements, drafting, and numerical control, but considerable human interaction is still needed for successful design (Shah and Rogers 1988).

However, recently with the complexity of design and manufacturing feature recognition, the previous works done by researchers seem to have limitations. For example, The GA gave robust matching result for the test shape, providing rotation and size independence (Tsai and Yu, 1985). Di Ianni (1996) has also applied GA for

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