OPINION

by Assoc. Prof. Stamen Iliev Antonov, PhD
on the dissertation work
of Eng. Ali Abdulkarim Gitan
on the topic:
„Optimizing the establishment of workpieces during mechanical processing in the conditions of a CAD environment“
for awarding the educational and scientific degree "PhD"
in the field of higher education: 5. "Technical Sciences"
Professional field: 5.1. "Mechanical Engineering"
PhD program: "Technology of Mechanical Engineering"

1. General description of the dissertation work

The dissertation is structured in an introduction, four chapters, conclusions, conclusion, contributions and references. The total volume of the dissertation is 114 pages, including 40 figures and 17 tables. A review of 103 titles in Bulgarian and foreign languages has been made. Each chapter ends with conclusions, and in the final part the general benefits realized from the study are presented.

2. Actuality of the problem

In the scientific research, the problem identifies its relevance through the study of the development of systems, CAD/CAE systems, for automated design in the field of technological preparation of production and in particular of fixtures, which should include increasingly new tools, libraries, functional applications and levels of integration.

As noted in the study, one of the most complex and responsible tasks in the automated design of fixtures is the selection of an optimal scheme for setting up the blanks. Therefore, it is necessary to supplement the CAD modules with specialized blocks for selecting optimal schemes for setting up the blanks, the development of which is of particular relevance when using integrated CAD systems that fit well with the CAM modules of technological production.

Knowing the status of the problem

Chapter one presents methods for automated design of fixtures for locating workpieces in mechanical processing.

To implement the tasks related to the design of fixtures, including automated design, the phases and stages in the design of fixtures for locating workpieces, methods for designing fixtures and locating workpieces are presented. The goals and objectives of the dissertation can be derived from the content of the first chapter.

Approach and solution to the problem

The **second chapter** presents the methodology for selecting an optimal scheme for locating the workpieces in the fixtures and its constructive implementation. An analysis of the possible schemes for locating the workpieces in the fixtures for mechanical processing with a view to their use in automated design

has been made. An analysis has been carried out, with the help of which the criteria for geometric compatibility have been defined, allowing the selection of locating schemes that satisfy the geometric shape of the workpiece.

In the **third chapter**, a general model of an automated system for selecting an optimal fixture scheme in fixtures for fixture fixing using CAD systems based on three-dimensional solid modeling is presented. Models and algorithms have been developed for automating individual local tasks for optimizing fixture schemes related to ensuring accuracy, reliability at minimal costs for manufacturing the fixture, and the database necessary for implementing the developed models and algorithms has been specified.

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In the **fourth chapter**, a structural diagram of the software product for selecting an optimal fixture scheme is presented. For the automated selection of an optimal fixture scheme, a database with reference information containing data of different content and structure has been developed: tolerance fields; economic accuracy of processing methods; surface quality parameters after various processing methods; inaccuracies from fastening, etc. A system has been developed for selecting the optimal scheme for setting up workpieces during mechanical processing in CAD conditions - an environment that ensures the improvement of technological preparation of production by reducing the cost of time and money when designing fixtures.

The dissertation contains conclusions, conclusions, contributions, scientific and applied contributions, as well as literature., a structural diagram of the software product for selecting an optimal fixture scheme is presented. For the automated selection of an optimal fixture scheme, a database with reference information containing data of different content and structure has been developed: tolerance fields; economic accuracy of processing methods; surface quality parameters after various processing methods; inaccuracies from fastening, etc. A system has been developed for selecting the optimal scheme for setting up workpieces during mechanical processing in CAD conditions - an environment that ensures the improvement of technological preparation of production by reducing the cost of time and money when designing fixtures.

The dissertation contains conclusions, conclusions, contributions, scientific and applied contributions, as well as literature.

3. Assessment of the degree of personal participation of the doctoral student in obtaining contributions

The declared authorship of the doctoral student for the research carried out in the dissertation, the specific author's style and the results obtained are grounds for concluding that they are his personal work.

The materials developed in the doctoral studies were presented and discussed at Scientific Forums in 20219-2024, dedicated to the current problems of choosing an optimal scheme for establishing blanks in mechanical processing. Part of the results of the theoretical research conducted in the dissertation have been published in scientific journals.

The five publications on the topic provided allow for public information about the dissertation among specialists in this field. The results obtained in the dissertation are important, useful and may be of interest to managers of enterprises and companies.

The above proves that the doctoral student's research on the topic has been approved before scientific forums in a national and foreign format, where the academic community has become familiar with the content of the scientific research and the results achieved by Eng. Ali Gitan.

4. Abstract

The abstract reflects the content of the dissertation work and the main results and contributions of the doctoral student. It is presented according to the requirements of the Technical University-Gabrovo.

5. Main contributions

Main contributions Based on the analysis and research carried out, the author claims the following **scientific** and **applied contributions**:

- systematization of possible schemes of basing of blanks in fixtures for setting with a view to their use in automated design;
- defined criteria for: geometric compatibility, allowing selection of a basing scheme satisfying the geometric shape of the blank; selection of BE structures, when using different technological bases;
- developed methodology, models, algorithms and diagrams of classes and states that can be used to develop a software product for selecting an optimal scheme of setting;
- developed structural diagram of the program package for selecting an optimal scheme of setting;
- developed database with solid models of basing elements.
- automated tables for: selection of models of basing elements; preliminary assessment of the economic efficiency of the designed fixtures.

Based on the results of the theoretical research conducted in accordance with the goal and objectives of the dissertation, the author claims that the dissertation research can serve to develop a software product that allows for the automation of routine activities related to the selection of an optimal scheme for setting up workpieces during mechanical processing.

6. Critical notes and recommendations on the dissertation

Some recommendations and critical remarks may be made to the dissertation, abstract and publications presented by the doctoral student regarding the formulation of some problems, the completeness of some of the analyses, the precision in the vocabulary when formulating individual results. These recommendations and remarks do not affect the essence, significance, relevance and importance of the contributions received by the doctoral student, and do not in any way hinder their applicability in practice. Therefore, I do not discuss them in this review.

7. Conclusion

I believe that the dissertation submitted to me for review meets the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria and the Regulations for its implementation, I vote positively and propose that the esteemed members of the Scientific Jury vote positively for the award of the educational and scientific degree "PhD" in the field of higher education: 5. "Technical Sciences", Professional field: 5.1. "Mechanical Engineering", PhD program: "Technology of Mechanical Engineering" to Ali Abdulkarim Gitan.

Member of the Scientific Jury:.....

14.07.2025 Assoc. Prof. Stamen Iliev Antonov, PhD