KATEDRA MECHANIKI I INŻYNIERII OBLICZENIOWEJ

Wydział Mechaniczny Technologiczny

Politechnika Śląska

ROZPRAWA DOKTORSKA

**"Metody inteligencji obliczeniowej
w zagadnieniach projektowania i optymalizacji wybranych
elementów konstrukcyjnych zabudów samochodów ciężarowych."**

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Abstract

The dissertation concerns the use of computational intelligence methods to problems of optimal design of mechanical structures. Within the work, a methodology based on a parametric, modular structure model with variable topology was developed, allowing to build variant models of mechanical structures and their preparation for numerical calculations. Finite element method software was used to solve the boundary problem. To perform the optimization, global optimisation methods in the form of evolutionary algorithm were used. The dissertation focuses mainly on the issues of design and optimisation of selected structural elements of truck bodies.

Author's software implementing the developed methodology was created, which was written on the basis of the object-oriented programming paradigm, using the class hierarchy and polymorphism. The objects created in the software, based on classes, represent particular subassemblies of the structure and they can exchange the necessary information with each other in order to correctly generate the model of mechanical structure.

The dissertation also presents a method of adapting the structure generator to create models of various trucks bodies subframes.

Presented numeric examples proved the effectiveness of the software created on the basis of the developed methodology. The examples concerned both on tasks of optimising trucks body subframes, which were designed individually for a given vehicle, taking into account the installation of dedicated cranes, as well as the issue of optimizing the structure of crane's telescopic arm. Thus, the universality of the developed methodology was demonstrated.

The use of parallel calculations allowed significant shortening of the optimization process in all considered cases.

The optimisation results obtained confirm the correctness and effectiveness of the developed methodology - in each considered case, a structure obtained was better, in terms of the selected criteria, than the structure developed using the existing procedures of the company producing this type of structures.

The dissertation also indicates directions for further development of the developed software, including the use of artificial neural networks to speed up calculations.