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ЗБІРНИК ТЕЗ ДОПОВІДЕЙ

XX МІЖНАРОДНОЇ КОНФЕРЕНЦІЇ НАУКОВО-ПЕДАГОГІЧНИХ ПРАЦІВНИКІВ, НАУКОВИХ СПІВРОБІТНИКІВ ТА АСПІРАНТІВ «ПРОБЛЕМИ ТА ПЕРСПЕКТИВИ РОЗВИТКУ ТЕХНІЧНИХ ТА БІОЕНЕРГЕТИЧНИХ СИСТЕМ ПРИРОДОКОРИСТУВАННЯ: КОНСТРУЮВАННЯ ТА ДИЗАЙН»

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THE CREATION WORKFLOW OF TRIANGULAR MESH FOR CAD

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Computational methods and tools are becoming important part of scientific research and development about mechanical engineering products [1]. These

methods can provide designers and researchers information that helps to understand complex phenomena and thus further creation of new and better products. It is known that almost all modern computer-aided design systems use triangular meshes to improve workflow for object modelling [2, 3]. Triangular meshes and as many other types of meshes are suitable for visualization and simulation (fig. 1).

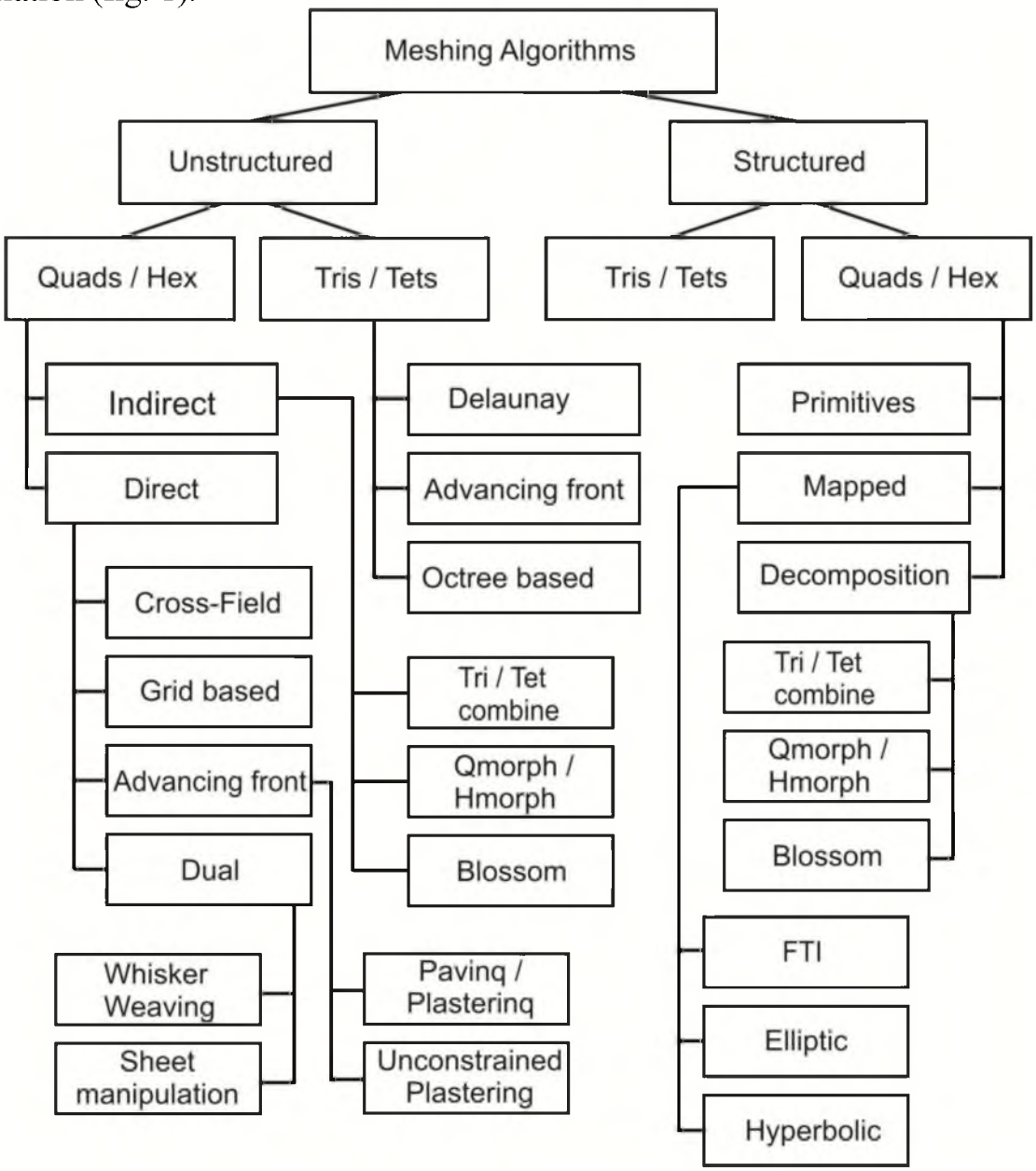

Fig. 1. Classification of the meshing algorithms

A triangle mesh is a type of polygon mesh in computer graphics. It comprises a set of triangles (typically in 3D) that are connected by their common edges or corners. Mesh generation is an essential part for the solution of tasks which often consumes most of the computational time and human resources [1-3]. The data from these systems is usually form of a boundary representation made up of hierarchical connectivity and associated geometric entities. Care must be taken about providing accurate representations of these inherently piecewise-smooth

solids, while robustly preserving the curved features defined by the input topological description.

During processing of 3D model, there is need to reduce its geometric complexity and to create geometry with the same shape but with less triangles. Modern software offers different ways to simplify or decimate triangulated surfaces. Also, it`s able to preserve geometrical detail and texture mapping. In other cases, user may want to increase the number of triangles.

Our work focuses on to improve the state-of-the-art for algorithms for building triangular meshes of the boundary surface of the interior solid (fig. 2).

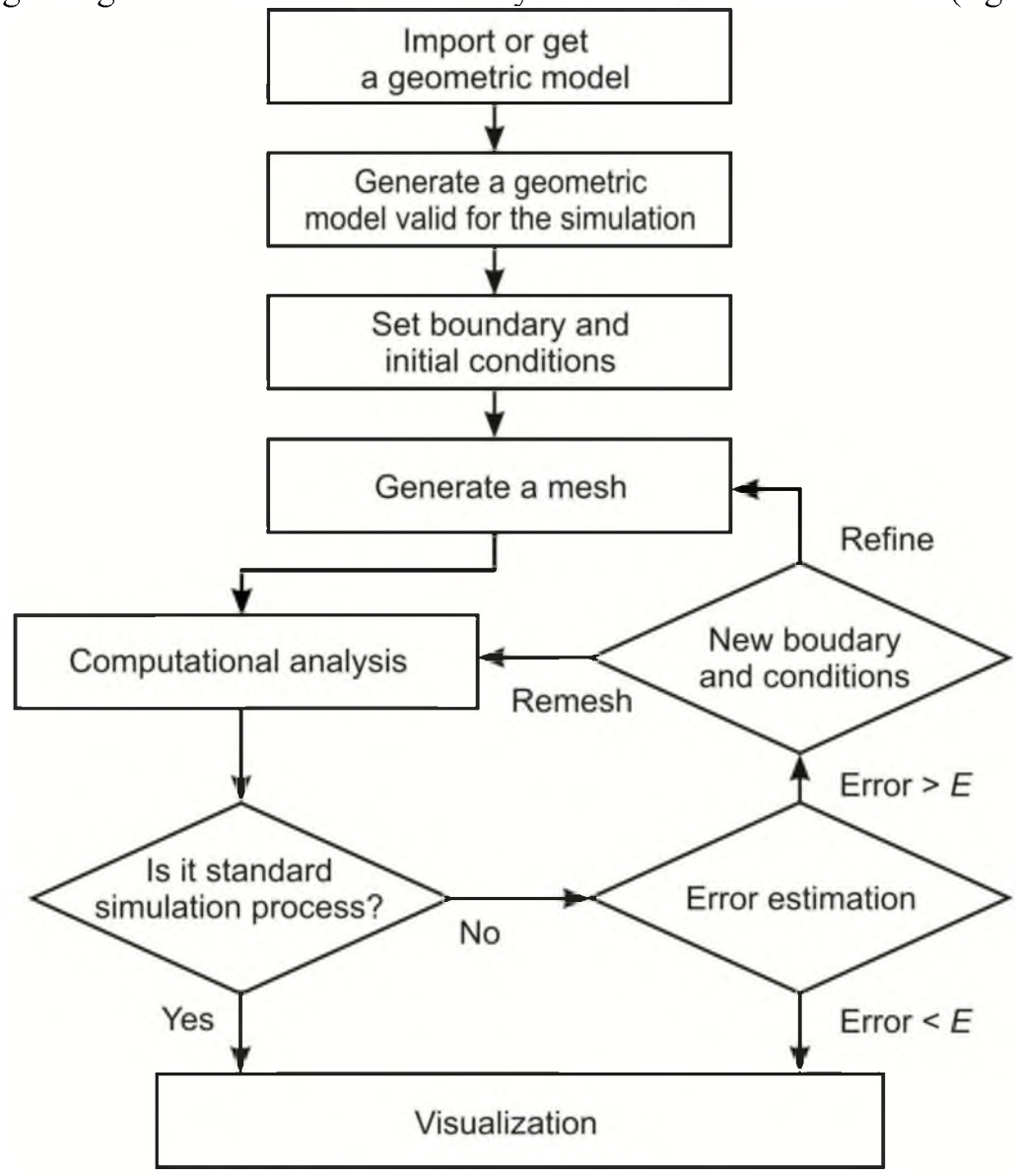

Fig. 2. Algorithms workflow of triangular mesh for CAD

Then our contributions can be summarized as the following:

1) Fast mesh generation of these samples through the use of the Delaunay triangulation (fig. 3).

2) A hierarchical sampling of features in increasing dimension, inspired by weighted approaches.

3) An automatic technique for constructing isotropic surface meshes by minimizing works.

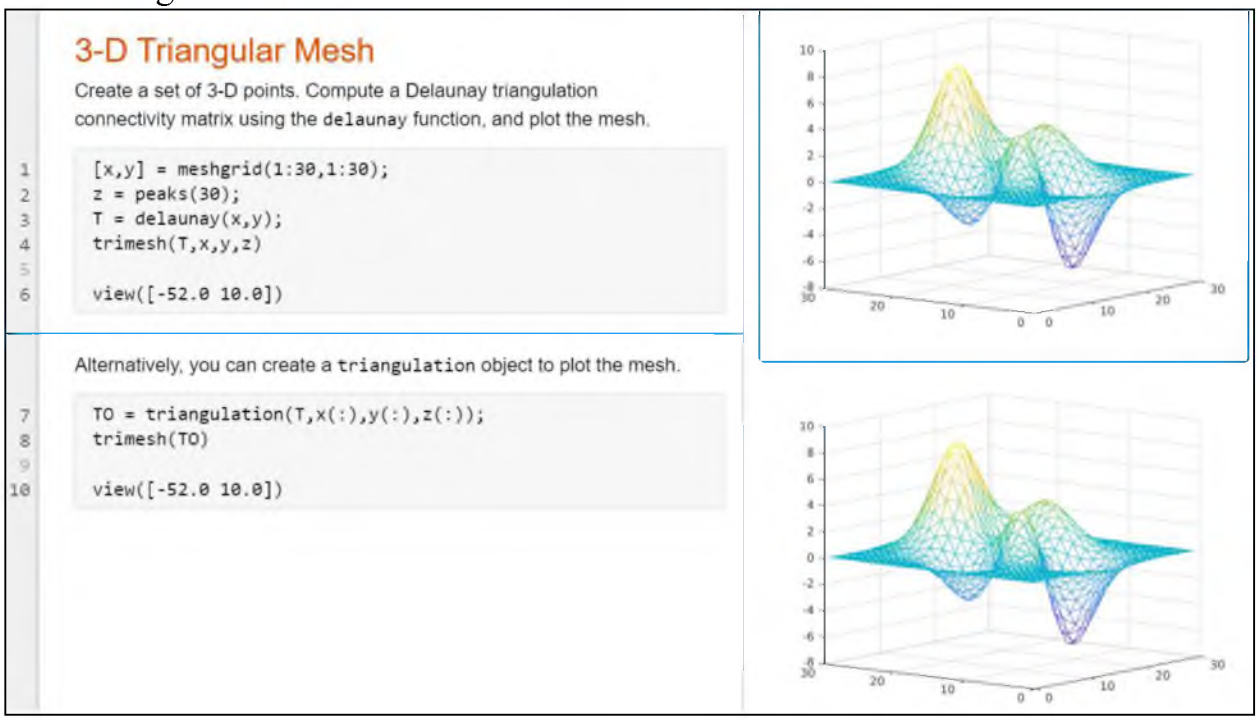

Fig. 3. The workflow of creating and analysis of triangular mesh for CAD object with MathWorks

Conclusion. We have described the most important features of a general triangular mesh generation and adaptation computational methodology, and we also presented some examples to illustrate its flexibility and the good quality of the meshes. The main goals during the development stages of the methodology were to keep the strategies simple and easy to implement and to make possible to convert any available surface of objects into a triangular mesh. Some examples have been tackled with our methodology and were also briefly presented showing that the obtained meshes are valid for numerical simulation.

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