Digitization of Structured Composite Plates with Regard to Their Numerical Simulations

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A method of 3D scanning and a subsequent data reconstruction presented in this paper are focused on digitization of highly structured composite parts with regard to creation of a fully functional CAD and FEM model. The digitized parts are structured carbon composites made replication of steel templates. Production of steel templates is a technological procedure mostly based on pressing or rolling. However, the data obtained from 3D scanner are not in appropriate format, there are a cloud of points interleaved by a sufrace and it is necessary to use some aditional methods to solidify the resulting geometry. Most often with using commercial software as for example: Creo, Catia, Inventor, Rhino or Geomagic studio is the cloud of points parameterized in a continuous surface. Now, based on some next operations (intersections, blends) the desired solidified model in CAD format could be achieved. Despite the relatively rapid creation of the main shape the minor inaccuracies that occur during non-contact measurement results either in local areas or individual points with a large deflection. The aim of this thesis was to assess the appropriate method for creating geometry and compensation the inaccuracies with regards to numerical simulations, especially the meshing and convergency of a solved model. As has been quite surprisingly found, some local small step changes in the geometry could be for the calculation easier to solve than a complicated and highly approximated area. An influence to a solution does not seem important.

Keywords: Composite plates, 3D scan, Reverse engineering, Free surfaces, Mesh

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