

### ΣΤΡΟΓΓΥΛΟΣ ΑΝΤΩΝΙΟΣ

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# <u>ABSTRACT</u>

## PARAMETRIC DESIGN of SHIP HULL USING NURBS IN CATIA ENVIRONMENT

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The design of the hull, which is the main part and structural unit of the ship system, is a research and development project of shipbuilding science. With the advancement of computers, its design process has been more efficient and reliable. The discovery of Bezier parametric curves, B-Splines and NURBS curves gave even greater flexibility to designers to formulate their designs and to be able to give the desired shape to hull points with complex geometries and topologies. In this paper we focused on the parametric hull design at both curves and surfaces level, but also in a dimension oriented level. Using empirical tables, analytical expressions and shape factors as well as making verified assumptions about specific sizes we were able to create a mathematical framework that describes the geometry of the hull. The design was done in the design program Catiav5R20. This program uses the above parametric curves and surfaces enabling us to create complex and demanding surfaces such as that of a ship's hull. We placed the geometric sizes in the software spreadsheet and attached them to their corresponding variables in the design program. This action gave us full control over the design as by simply changing a value in the spreadsheet we have the ability to modify our 3D model. The result of the process is a fully configurable and modifiable model which is a template for the creation of other types of ships. The use of this design package also allows us to further develop the design with all their functional systems as well as their structural and constructional parts, but also the dynamic and static analysis with compatible finite element packages.

Key words: Parametric Design, Hull of Ship, NURBS/Bezier/B-Splines curves, NURBS/Bezier/B-Splines surfaces, Ship dimensions