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CAD Tool for Parametric Design modification of Yacht Hull Surface Models

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Abstract : Recently parametric design techniques became a vital concept in the field of Computer Aided Design (CAD), which helps to provide sophisticated platform to the designer in order to automate the design process in efficient time. In these techniques, design process starts by parameterizing the important features of design models (typically the key dimensions), with the implementation of design constraints. The design constraints help to retain the overall shape of the model while modifying its parameters. However, the process of initializing an appropriate number of design parameters and constraints is the crucial part of parametric design techniques, especially for complex surface models such as yacht hull. This paper introduces a method to create complex surface models in favor of parametric design techniques, a method to define the right number of parameters and respective design constraints, and a system to implement design parameters in contract to design constraints schema. For this, in our proposed approach the design process starts by dividing the yacht hull into three sections. Each section consists of different shape lines, which form the overall shape of yacht hull. The shape lines are created using Cubic Bezier Curves, which allow larger design flexibility. Design parameters and constraints are defined on the shape lines in 3D design space to facilitate the designers for better and individual handling of parameters. Afterwards, shape modifiers are developed, which allow the modification of each parameter while satisfying the respective set of criteria and design constraints. Such as, geometric continuities should be maintained between the shape lines of the three sections, fairness of the hull surfaces should be preserved after modification and while design modification, effect of a single parameter should be negligible on other parameters. The constraints are defined individually on shape lines of each section and mutually between the shape lines of two connecting sections. In order to validate and visualize design results of our shape modifiers, a real time graphic interface is created.

Keywords : design parameter, design constraints, shape modifies, yacht hull
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