

A Method to Define Quasi-Developable Surfaces Based on Physical Properties

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Abstract

This paper presents a methodology for the definition of a quasi-developable surface that interpolates two 3D B-spline curves. Working with boundary curves is a frequently used technique in engineering design applications, when some curves describe the aimed shape and properties of the object and quasi-developable strips that contain the curves can define the object surface. This surface can be later constructed with sheet materials such as steel, aluminum, or plywood.

Due to the complexity of exact developability conditions, some procedures found in the scientific literature are hard to use in engineering applications which demand practical methodologies that could work in standard CAD software products. In practical construction, exact developable surfaces are usually difficult to obtain and a certain degree of developability error is used because of material plasticity. This is the reason why quasi-developable surfaces are attracting more and more attention in published works.

The physical material used for manufacturing was included into the methodology and the mentioned developability error was quantified as a limit warp angle dependent upon the sheet material and plate thickness and dimensions.

Index Terms

B-Splines, Quasi-Developable Surfaces, Particle Swarm Optimization