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Surface Flattening Assisted with 3D Mannequin Based on Minimum Energy

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Abstract : The topic of surface flattening plays a vital role in the field of computer aided design and manufacture. Surface flattening enables the production of 2D patterns and it can be used in design and manufacturing for developing a 3D surface to a 2D platform, especially in fashion design. This study describes surface flattening based on minimum energy methods according to the property of different fabrics. Firstly, through the geometric feature of a 3D surface, the less transformed area can be flattened on a 2D platform by geodesic. Then, strain energy that has accumulated in mesh can be stably released by an approximate implicit method and revised error function. In some cases, cutting mesh to further release the energy is a common way to fix the situation and enhance the accuracy of the surface flattening, and this makes the obtained 2D pattern naturally generate significant cracks. When this methodology is applied to a 3D mannequin constructed with feature lines, it enhances the level of computer-aided fashion design. Besides, when different fabrics are applied to fashion design, it is necessary to revise the shape of a 2D pattern according to the properties of the fabric. With this model, the outline of 2D patterns can be revised by distributing the strain energy with different results according to different fabric properties. Finally, this research uses some common design cases to illustrate and verify the feasibility of this methodology.

Keywords : surface flattening, strain energy, minimum energy, approximate implicit method, fashion design
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