博 士 論 文 の 内 容 の 要 旨

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（博士論文の内容の要旨）

In this study, an extensive analysis on geometrical and mechanical properties of fabric drape was conducted.

Chapter 1 introduced the background to this research, as well as the purpose and methodology of this study.

Chapter 2 exposed a literature review of previous studies on the general theories regarding drape and its relationship with the mechanical properties of fabric. Related researches on simulation of drape are also presented and summarized in this chapter.

In Chapter 3, the effects of fabric dimension on drape deformation are analyzed using a model of a circular segment cantilever for infinite shear stiffness (upper limit) and the deflection of strip cantilevers in radial directions for zero shear stiffness (lower limit). The drape shapes are determined by nondimensional parameters K and K′ in addition to the parameters m and m′, which are given by the ratio of the fabric radius and segment cantilever length. K and K′ are given by the segment cantilever length for the upper limit and by the differences between the radii of the fabric and support disk for the lower limit, with weights, and bending rigidity. Drape coefficient (DC) limits of fabrics are theoretically obtained using the model in three cases according to the relationship of m and m′. Even for different fabrics, the drape shapes are similar for the same m and K, or m′ and K′ in each case. The effects of dimension on fabric drape are therefore clarified theoretically. Obtained limits are experimentally verified for eight woven fabrics and one sheet. with different combination of fabric radii and disk radii. It is found that the DCs of samples are between the two theoretical limits although there are variations for even the same K or K′. The variations might be due to depressions between adjacent nodes or the presence of double-curvature deformation due to lower shear stiffness. The effects of dimensions in the drape test considering bending rigidity for infinite and zero shear stiffness are　thus clarified theoretically and experimentally.

In Chapter 4, a measuring method of shear deformation in drape using three-dimensional scanning was proposed. Using the proposed method, the local shear angles in FRL drape for various woven fabrics were measured. The effects of the relative positions of the node to the center grainlines that cross at the fabric center, and the bending and shear properties of fabric on the shear angles were investigated. It is found that the FRL drape can be characterized by three areas, except for the flat areas of the support disks: 1) areas along the center grainlines with zero or small shear angles within 3º, which could result from single curvature bending, 2) areas in the bias directions with relatively large shear angles over 3º, which could result from double curvature bending, and 3) polygon edges connected by tangents of the support disk with relatively larger shear angles than their surroundings, which could result from both bending and shear deformation, such as folding and wrinkles. By investigating the relationships between areas with large shear angles and the bending rigidity/shear stiffness, it is also clarified that the bending rigidity indirectly affects the local shear deformation of drape has been clarified.

Finally, the conclusion of this thesis is described in Chapter 5, and the suggestion for future research is also given.

The results of this study will help clarify the mechanism of drape and further investigate drape deformation and verify the simulation of woven fabric behavior considering shear deformation. It is also helpful to improve the simulation accuracy of drape deformation.