

Structure of Model to Quantify Psychological Aspects of Tactile Feedback of Switches (Third Report)

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Switches used in automotive cabins require different tactile feedback characteristics depending on their intended functions. In our previous study, we constructed three-level hierarchical Kansei models that relate psychological measures, such as "comfort" to mechanical characteristics of switches. Furthermore, although the models should be constructed according to individual preferences, factors determining those preferences have not been sufficiently investigated. Accordingly, we investigated whether the perception of switch mechanical characteristics differs according to individual experience. In addition, we investigated whether the perception of mechanical characteristics of switches according to individual experience.

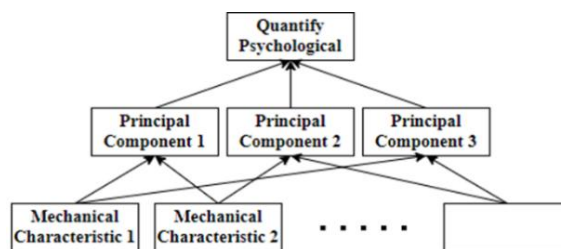


Fig.1 hierarchical Kansei Model

In this study, to quantify operating feeling of switches, we conducted subjective evaluation by SD method. In the experiment, sixty participants operated the switches and then rated their impressions on seven-point scale for perceived smoothness of switch operation. Through cluster analysis using results of the evaluation, hierarchical cluster analysis was performed using the evaluation scores. Participants with experience in the design of standalone switch products were more prevalent in Cluster 1. In contrast, participants with experience in the design of products incorporating switches and those with no switch-related design experience were more prevalent in Cluster 2. To examine whether the distribution of design-experience categories differed between the clusters, a chi-square test was conducted. A significant difference was observed ($p < 0.01$). Therefore, the results suggest that differences in design experience may be one of the factors influencing individual differences in preference.

Furthermore, to examine whether individual experience influences the perception of switch mechanical characteristics, correlation analysis was conducted between the absolute difference in the mean evaluation score of the two clusters and each mechanical characteristic of the switches. The results of the correlation analysis showed a significant correlation between the absolute differences in evaluation scores and stroke of switches ($r = 0.63$, $p < 0.001$). Consequently, differences in design experience may have influenced the perception of switch stroke, leading to different impressions of the switches. One possible explanation is that the stroke characteristics emphasized in standalone switch products differ from those in products incorporating switches because the latter often include additional mechanisms, such as keycaps and hinges. Moreover, participants with no switch-related design experience were grouped in the same cluster as those with experience in designing products incorporating switches, possibly because they frequently interact with such products as end users.

Based on these results, this study demonstrated that evaluation tendencies regarding the perceived smoothness of switch operation differ according to design-experience. These findings indicate that design experience and product knowledge influence Kansei evaluation of switch operating feel and should therefore be considered when constructing personalized Kansei models.

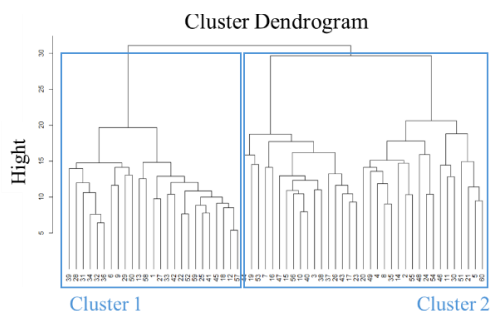


Fig.2 Result of Clustering

Table1 Breakdown of Participants by Clusters

Experience	Number of Participants	
	Cluster1	Cluster2
Switch Product Design	13	7
Switch-Equipped Product Design	7	13
No Experience in Switch-Related Design	5	15
Total	25	35