C-09

A Study on a Structured Method for Developing Auditory User Interface Design Tool

With an Emphasis on a Hierarchical User Interface Design

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Abstract

As hardware features of computer-related products have expanded in recent years, means of their interface design are changing significantly. The growing technology can implement a new idea of using sounds to human computer interfaces. Nonetheless Interface designers do not have expertise in music. Creating earcons is not easy for them. This study aimed to establish basic rules for creating sound design tool, and introduce some specific guidelines.

At first, this study examined the theoretical approaches based on the acoustics and psychoacoustics. The perception of the sound is crucial for the area of auditorial user interface. The variations of the auditory user interface were reviewed such as data auralisation, musical messages, earcon, auditory icon.

Then the ways of using "earcons" in the information hierarchy were investigated. The information hierarchy is the information structure mainly used in current interface design. Earcons, which are basically musical messages, have hirearchical structure, so that they can enhance the usability in using the interface. The structure of the earcons was investigated based on the principles of navigational interface.

Earcons can be defined as "non-verbal musical messages that are used in the user interface to provide information to the user". The existing design guidelines for earcons are too broad to be applied to current interface systems. This study took an experiment for establishing specific design guidelines for the concept of human perception. The experiment was conducted to identify how the users recognize each timbre. Timbre is the key element for user to distinguish one node from another. Timbre can be separated by its own character: envelope, register, material.

A prototype of earcon design tool was developed with Visual Basic 6.0. The prototype consists of 7 modules: a module for creating auditory map, a module for setting the principle of navigation, a module for arranging the distribution of timbre, a module for setting the rhythm, a module for setting the harmony,
a module for setting the pitch and dynamics, and a test module.

With this prototype, the study developed an auditory map for a cellular phone interface, and conducted a usability test with a computer simulation. The previous guidelines had some problems, and revised based on the findings of the test. This revised guideline may be a part of the auditorial user interface design.

Keywords

auditory user interface, earcon, hierarchical UI Design

D-06

Curvature Entropy as A Shape-Generation Index

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Abstract

In curve design, it is important to grasp and control the characteristics of the whole shape that emerges from the combinations of shape elements. However, the conventional shape-information is difficult to represent the characteristics of the whole shape. Therefore, a new shape-information that represents the characteristics of the whole shape is desired.

In the past study, curvature entropy was defined as a new shape-information that represents the characteristics of the whole shape, and it was found curvature entropy represents the complexity that is one of the characteristics of the whole shape in the basic curve profile. In this study, the shape-generation method using curvature entropy was described, and this method was applied to the design of an automobile side view. As a result, it was confirmed curvature entropy represents the complexity of a shape in the curve profile of products such as an automobile. Moreover, quadratic curvature entropy based on Markov processes considering the continuity of a curve was defined, and it was found quadratic curvature entropy is a useful shape-generation index in the higher freedom of the shape-generation.

As is mentioned above, the effectiveness of curvature entropy as a shape-generation index was showed.

Keywords

Shape-Generation, Information Theory, Entropy, Genetic Algorithm, Markov Processes