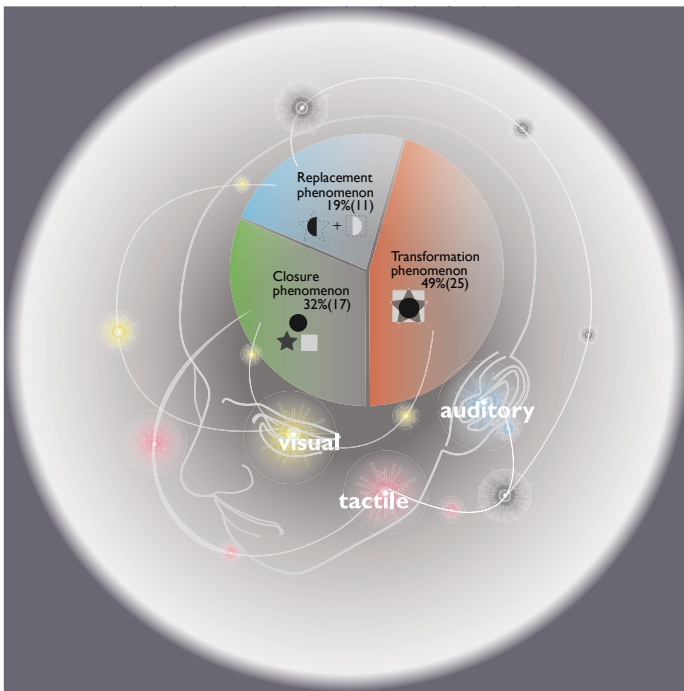
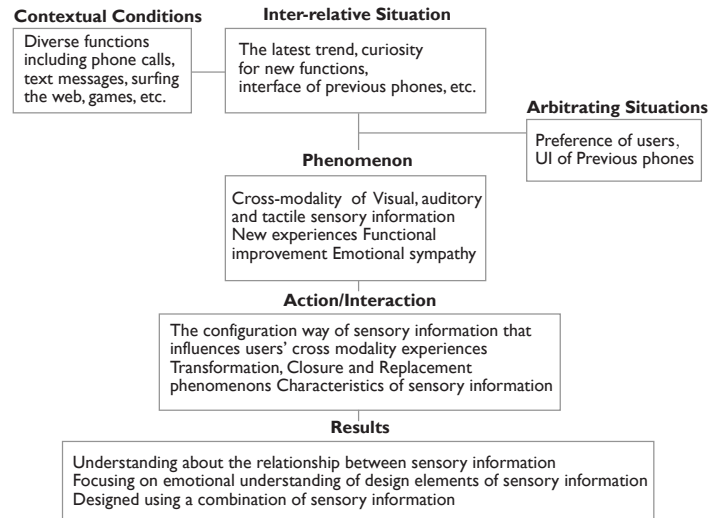


How People Tend to Organize Sensory Information into Unified Wholes in Haptic Phone? - Focusing on Cross Modality Interaction

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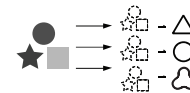


[Figure 1. The interaction between Cross-modality and Sensory informations]

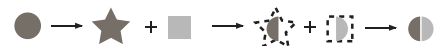


[Figure 2. Procedure of analysis for In-depth interviews]

2. Closure phenomenon also refers to the one of the cross modality experiences that makes users remember past experience through sensory information of sight, hearing, and touch. At this moment, the impact of past experience is stronger, as the suggested sensory information is more specific and vivid. Moreover, changes of sensory information should be occurred within the expectable level of users.



3. Replacement phenomenon means one of the cross modality experiences that provides information on more than two senses. When certain sensory information is shielded, the other sensory information replaced the shield information and was recognized by a user. This occurs more easily when the level of similarity between shielded sensory information and replacement sensory information is high and when the kinds of replacement sensory information are diverse.



4. Conclusion

Since people embrace information easily without extra cognitive process, users might consider cross modality as a simple phenomenon, but actually cross modality is not simple and does not occur in the same way. From the study, it was determined that cross modality phenomenon strongly influences the emotional level of users, due to the significant increase of a cross modality phenomenon of information devices providing the tactile sense and the active interaction between private devices and users. This is because tactile information is actively introduced as the touch function of recent information devices strengthens. In particular, in mobile phones, the characteristics that users carry all the time in private fit well with the characteristics of tactile sense, which is sensitive and privatized sensory information. In transformation phenomenon, audio and visual senses intervene as main stimuli while the tactile sense intervenes as sub-stimuli amplifying the main stimuli. In case of replacement phenomenon, we can know that tactile sense is utilized as a substitution of audio and visual senses. For closure phenomenon also, it is tactile phenomenon that most directly and vividly recalls past experience.

References

Goldstein, E.B. 2007. *Sensation & Perception*, 7th edition. Belmont, CA: Wadsworth.
 Strauss, A. & Corbin, J. 1990. *Basics of Qualitative Research: Grounded Theory, Procedures, and Techniques*. Sage Publications, Newbury Park, CA.

Acknowledgements

Immersion Corporation and 9FruitsMedia generously supported this research. We would like to appreciate Seungji Yoo and Kahyun Huh for their supports.

1. Introduction

Considerations of interface design have been limited to the senses of sight and hearing. However, as the sense of touch, such as haptics, began to be applied to equipment, new interaction has emerged. Due to the integrated nature of people (Goldstein, 2002), it is important for a new system that added tactile stimuli to correctly analyze and understand users' experiences. This study analyzes integrated cross modality user experiences from devices providing information on the senses of sight, hearing, and touch.

2. Methodology

The research procedure is based on a grounded theory (Strauss & A. Corbin, 1990). The grounded theory is a process of inductive research and study that establishes a theory through collection of related data and analysis. To recruit participants fitting for the objective of the study, the research was conducted by selecting those who have used devices for over six months. The average age of participants was 28.2, while 39% of them were females and 41% were males. The interview time was from 1.5 hour to 2 hours, including a break time.

3. Analysis

At Open coding stage, users' experiences were classified by purchase chances or interactions with devices at usual times with situational elements and sensory information before being conceptualized. The second stage is the axial coding and categories could be drawn by stages of interaction as seen from <Figure 2>. Classes of derived phenomenon from the axial coding stage were categorized based on configuration ways between sensory information. Cross modality can be classified into transformation phenomenon, replacement phenomenon, and closure phenomenon. It arranges users' experiences in the order of inter-relative situations, contextual conditions, arbitrating situations, phenomenon, action/interaction, and results.

1. Transformation phenomenon is one of the cross modality experiences that provides information on more than two senses, and users divide sensory information into main and sub senses, so that they recognize main sensory information strengthened by sub-sensory information. At this time, in order to strengthen specific sensory information, ambiguous information is transformed to main information while unrelated information is excluded or reduced in the process of integration.

