Service Science Method to Create Pictograms Referring to Sign Languages

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Abstract. This paper discusses a method to create pictograms referring to several local sign languages with applying the concept of Service Science with Multivariate Analysis (MVA). Since pictograms are universal communication tools, human centred design (HCD) and context analysis by Persona model are applied. The experiments consist of two steps.

Through the proposed method, the relationship between selected words and local sign languages are initially explained by sensory evaluation of the subjects. Under the cycle of HCD, the pictogram designer will perform to summarize the expression of several local sign languages by this method. The acquisition of user experience is to include it as a design guideline for context of emergency and traveling situations.

Considering the results of the second experienced phase to prove the outcome design, the proposed method is one of the guidelines to create pictograms referring to several sign languages.

Keywords: Service Sciences, Human Centred Design, Pictogram, Universal Communication, Sensory Evaluation.

1 Introduction

This paper discusses a method to create pictograms or icons referring to several local sign languages with the concept of service science and Multivariate Analysis (MVA) [1]. Since pictograms or icons are universal communication tools, Human Centred Design (HCD) [2] and context analysis by Persona model by Alan Cooper [3] are applied in this research. This research was started in order to investigate the context of universal communication through local sign languages.

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HCD is based on the context of use which is organized by four factors as user, product, task and environment in use (Figure 1). The research scope covers not only linguistic studies of sign language but also HCD with context of use [4].

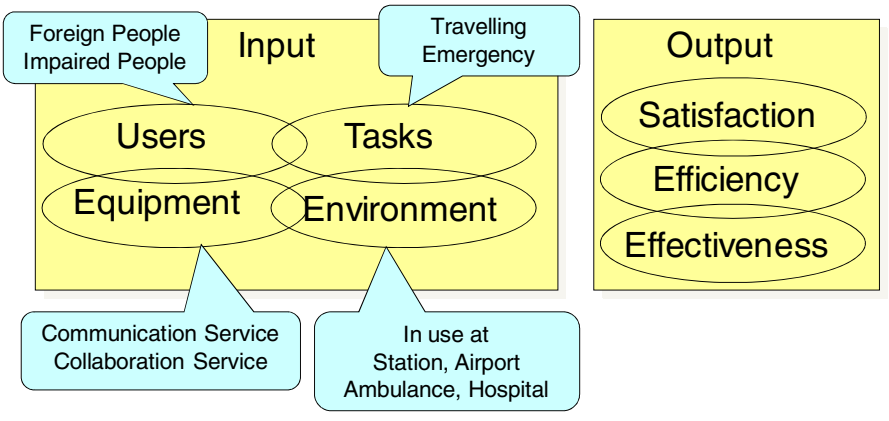

Fig. 1. Context of use of Guidance on usability

2 Research Purpose and Issues

The purpose of this research is to figure out a method to create meaningful pictograms or icons referring to several local sign languages [5]. The sign language (SL) is basically a communication method from one person to the other. The main factors of sign language consist of the hand shape, location and movement. There is a dilemma that SL is a language with motion whereas pictograms or icons are still ones. There was quite a discussion among researchers. Then hand shapes and locations are drawn by an animation and movements are done by arrows referring to a snapshot of the related local sign languages.

3 Research Procedures

Considering such research purpose and issues, the following research procedures are prepared;

- Phase 1: Determine a concept
- Phase 2: Create Persona Model and Scenario
- Phase 3: Extract key words extraction on emergency and travelling situations
- Phase 4: Conduct first Sensory Evaluation with 7 local sign languages
- Phase 5: Design summarized pictograms
- Phase 6: Conduct second Sensory Evaluation with 8 local sign languages
- Phase 7: Conclude a method

3.1 The Context Determination

Based on the concept described above, two context situations have initially been chosen [6]. Alan Cooper proposed the Persona Model related to HCD where several situation representing Personas are imaginably created in order to simulate and find how they will behave under a certain context. This method is highly accepted by the manufacturers in creating new product plans and has been applied to service science as well.

3.2 Persona Model and Scenario Creation

The first step is to create two Personas with applying the Persona Model under HCD [3]. The first Persona is a deaf person in a situation where he suffers a sudden illness while commuting in the morning, and is carried to the hospital by an ambulance. The second one is an office lady who lives in Hong Kong and has to visit Tokyo on business and then pleasure (Figure 2).

Diary like scenarios underlying Personas are described from discussions with three colleagues utilizing the Brain Storming Method. These scenarios mainly pay attention to the dialogues between the Persona and those people surrounding [7]. The first scenario of the deaf person in an emergency consists of about 600 words (equivalent to 3000 Japanese characters) and second with the traveling woman about 1700 words (equivalent to 8500 characters).

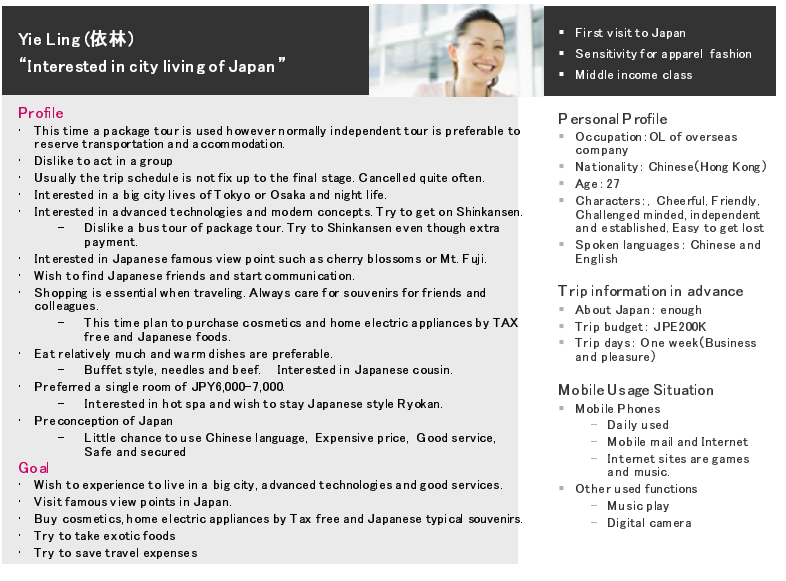

Fig. 2. An example of a Persona model

3.3 Keywords Extraction on Emergency and Traveling Situations

This research is focused upon dialogues with several participants and referring to observations from the view point of the provider and the receiver under service science principle.

The next phase is to extract words that are fundamentally essential to the dialogues of the scenarios. 37 words were selected and categorized by discussions with three colleagues.

Looking at the dialogues in the scenarios under the selected context, the hardest process is initiating the dialogue to a stranger. In modern times, people are worried about security. They are extremely cautious when approached by an unfamiliar person. Several interjections are included to assist the initiation of dialogues.

3.4 First Sensory Evaluation with 7 Local Sign Languages

The research is initially focused upon creating pictograms or icons to make dialogues since the fundamentals of sign language are hand shape, location and movement. This research references to a collection of animation figures consists of seven local sign languages whose author is a deaf architect, gave overwhelming support to the research by supplying and permitting reference to the database. The seven local sign languages are of American, British, Chinese, French, Korean, Japanese, and Spanish [8].

Fig. 3. An example of a voting sheet of "Expensive"

In the experiment, subjects are first shown an expression with the collection of animation figures consists of seven local sign languages. After then subjects are informed of the sign meaning, they are requested to vote with 19 tokens which of the seven different local sign language expressions (samples) best coincides with the informed image. They are asked to put all 19 tokens on the condition that they are permitted eventually zero voting on some samples. This sensory evaluation method can easily make relative comparisons between the seven expressions of local sign languages and is more applicable than the ordering method or pair comparison method. An example of voting sheet of "Expensive" with local sign languages is shown in Figure 3

Then the correspondence analysis of Multivariate Analysis (MVA) by statistic Software, Statistical Package for Social Science (SPSS) [9, 10] is applied. The outcome is plotted as similar local sign languages are to be plotted closely on a plane. In the characteristics of correspondence analysis, the subjects who have general and standard ideas are positioned in the centre, whereas those who have extreme or specialized ideas are positioned away from the centre. The center crossing point of the first and second Eigenvalues is gravity point or average point.

The first experiment subjects are 13 people in their 20's including nine science course students, four humanity course students. Some have experience living overseas and sign language interpreting. After voting by the tokens, all the subjects are asked of their confidence level with Semantic Differential (SD) method.

Figure 4 is an example of outcome chart where "Expensive" is plotted.

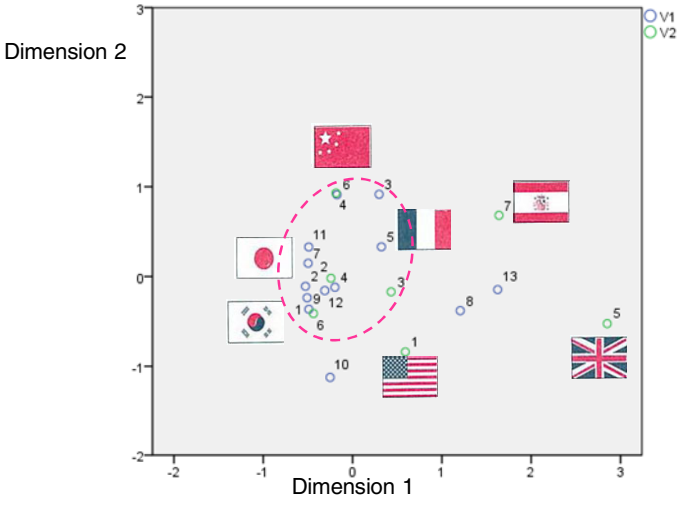

Fig. 4. A plot chart of "Expensive" with seven sign languages

3.5 Summarized Pictograms Design

Through the experience of the first Sensory Evaluation with seven local sign languages of 37 words, many sign language expressions are identified by representing

the meaning. Among them the most converged seven words of “when?”, “good-by”, “painful”, “thank you”, “where?”, “toilet”, and “expensive” among 37 are selected by means of brain storming.

Following to the cycle process of HCD, the original designer is asked to summarize and design an animation like pictogram referring to the outcome of several local sign languages by the sensory evaluation mentioned above. The newly designed pictogram is added to seven local sign languages with American, British, Chinese, French, Korean, Japanese, and Spanish.

3.6 Second Sensory Evaluation with 8 Local Sign Languages

The next procedure is the same manner as the first experiment of Phase 4. After subjects are informed of the sign meaning, this time they are requested to vote with 23 tokens which of the eight different local sign language expressions including newly designed one will be the best coincides with their image. The procedure was the same manner as the first step, and the correspondence analysis of Multivariate Analysis (MVA) by SPSS is once again performed. The outcome including the newly designed pictogram is plotted with other seven local sign languages in order to measure whether the newly created pictogram represents of the cluster.

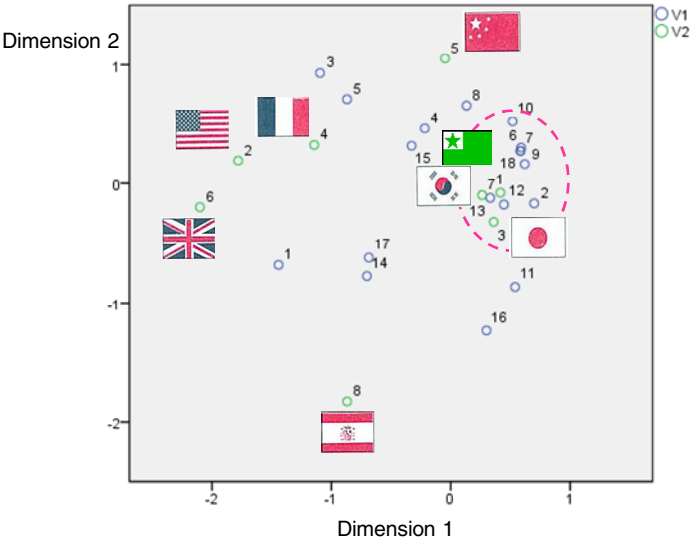

Fig. 5. A plot chart of “Expensive” with eight sign languages

The second experiment subjects are 20 engineering department students in their 20’s including two female students. Almost all except three are different subjects from the first experience. After voting by the tokens, all the subjects are again asked of their confidence level with Semantic Differential (SD) method.

Figure 5 is an example of outcome chart where "Expensive" is plotted. The newly designed one is plotted close to Japanese, Korean, Chinese and French sign languages. Whereas American, British and Spanish plotted further down. These deployments of the plots are simular in seven and eight sign languages experiments.

3.7 Conclude the Method

Comparing two outcomes of Phase 4 with seven local sign languages and 6 with eight local ones, followings are concluded.

- All seven newly designed animation pictograms are positioned in the centre of the related local sign languages cluster.
- Even though almost of the subjects are different at the first and second experiment, the general outcome plot patterns hold similar patterns in space.
- In oriental sign languages of Japanese, Korean and Chinese tend to be plotted closely together.

4 Conclusion and Discussions

This paper discusses a method to extract the summarized expression of several local sign languages in order to draw pictograms by applying the sensory evaluation with MVA. The experiments consist of two steps.

The first step is to find out a pictogram is a majority common expression upon a word among seven local sigh languages. Looking at the first step, this method looks valid in practice since Japanese, Korean and Chinese sign languages are similar by historical background, and in fact and they are plotted close to each other. The second step is to prove the characteristics of the pictogram represent the meaning of the word. Almost all of the newly designed pictograms positioned in the centre of the cluster then it is representative of the clusters.

Through the proposed method, the relationship between selected words and local sign languages are initially explained by sensory evaluation by the subjects. Under the cycle of HCD, the pictogram designer will perform to summarize the expression of several local sign languages by this method. The acquisition of user experience is to include it as a design guideline for instance of the context of emergency and traveling situations.

The issues are that the quality of the newly designed pictogram depends on the designer's ability to summarize several ones. The newly designed pictograms are still biased by sign languages in this research in order to become much easier communication tool, and require further improvement to simplify and easily to understand for everybody.

Considering the results of the second experienced phase to prove the outcome design, the proposed method is one of the guidelines to create pictograms by referring to several sign languages.

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