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Building General Perception for Blind People as Orientation System in the Bandung City Train Station Through the Pictogram Design

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Abstract. Blindness is not a reason for blind people not to undergo daily activities. The human aspect as one of the centrists in the 4.0 industry era demands that the blind can be productive by channeling their interests and talents outside their homes. The challenge is how to design a communicative media as an orientation system to support the mobility of the blind in the middle of an era that is now fast and instant.

Braille is currently used as a reading medium for blind people. Its function can be developed into a message in the form of communicative tactile with pictogram role function approach if it is analyzed from various research results about the use of Environmental Graphic Design (EGD) as an orientation system. The general perception that is built when interacting with the tactile pictogram is directed to answer the needs of the visually impaired in understanding the motion instructions that are adjusted to the context of space navigation.

The output of this research can be an input for PT. Kereta Api Indonesia in facilitating the limited space for the blind at the train station in the city of Bandung.

Keywords: *general perception, blind people, orientation system, train station, pictogram.*

1 Introduction

Some train users in the city of Bandung are visually impaired. Independence of blind mobility is a positive phenomenon that needs to be supported by the surrounding environment. Referring to this phenomenon the train of Bandung should be improved in terms the quality of its orientation system. This is because based on Law 8 of 2016, disability is a concept of processes related to the environment and limitations that do not arise because of not seeing, and the inability of the environment to provide information actively. This needs to be

done so that it does not hamper the daily activities of the blind in the industrial era 4.0.

One of the media that is often found in public spaces is a pictogram, which is a series of information represented on symbolic forms and communicative graphics. As one of the themes of Environmental Graphic Design (EGD), pictograms become elements that play a role in conveying information. One of the functions of the pictogram in transportation facilities is to be a pointer to the destination quickly outside the context of the vocabulary understood by the user. The motion of the pictogram is a two-dimensional visual form that is translated by the eye awake through the process of the symbols contained in it.

This study aims to find out how to build perceptions through images presented as tactile images as orientation systems. In general, the research is expected to carry out recommendations for visual communication designers in designing the communication complex for the visually impaired. In particular, this research is a material for PT. Kereta Api Indonesia for the improvement of facilities and infrastructure to accelerate the mobility of service users who are blind. This improvement has an added value because the use of pictograms in ways that can be done by ordinary-eyed humans is considered to be seen.

2 Methodology

The method used in this study is the desk research with descriptive analysis method. Descriptive analysis is divided into two steps, namely: qualitative and quantitative. Qualitative descriptive analysis serves to produce primary data in the form of problem solving regarding conceptual perceptions of blind people who are awakened when the senses other than vision interact with media orientation in public space. Quantitative descriptive analysis serves to obtain the right criteria and conditions in designing pictograms for the blind.

3 Theory and Concept

3.1 Orientation and Mobility of Blind People Concept

One of the effects of visual impairment is the limited mobility experienced by the blind. For the visually impaired, orientation is a process of using their remaining senses to identify the environment by positioning themselves and recognizing the surrounding objects. When blind people perform mobility there are three principles of orientation that are simplified into three questions, namely: Where am I? Where should I go? And how can I achieve that goal?

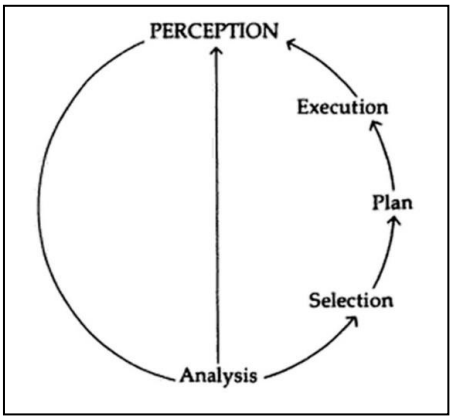

Figure 1 Cognitive process

To answer these questions there is a cognitive process in the blind that always needs be trained in daily activities. Everett Hill and Purvis Ponder in their book entitled Orientation and Mobility Technique: A Guide for Practitioner (1976) revealed that there are five steps in the process, namely:

1. Perception: The process of assimilating data from environment through the remaining senses, odors, sounds, tactual, kinesthetic perceptions, or change in brightness level.
2. Analysis: The process of organizing perceived data into categories according to consistency, dependability, familiarity, source, sensory type and intensity.

3. Selection: The process of choosing the analyzed data that best fulfills the orientation needs of the present environmental situation.
4. Plan: The process of designing a course of action based on the sensory data selected as most relevant to the present environmental situation.
5. Execution: The process of performing the planned course of action.

The concept and experience gained when blind people do their mobility give influences to the development of cognitive processes. Mobility for the visually impaired is an important process involving their ability, readiness and ease in order to describe the motion in their body. Learning about a description of a gesture will give them the concept and experience in building perceptions. Blind people learn through a process of fingering instruction. Therefore, there are three basic aspects in blind learning instruction, namely: Concrete (having a form, can be seen and touched), Doing (interacting involves all the senses), Comprehensive (observe in detail from the largest to the smallest component).

3.2 Visual Language for Pictogram Design Concept

Visual language is a drawing system invented by Primadi Tabrani (2012). Visual language is an image system that has proximity to Albert Einstein's theory of relativity which reveals that space cannot be separated from time. This image system is called Space-Time-Plane (STP). Because of the similarities, images with STP systems are found in prehistoric, primitive, traditional and children's images. This group of images is called "Predecessor Image". One example is an imagery below of Wayang Beber Jaka Kembang Kuning.

Figure 2 Wayang Beber Jaka Kembang Kuning

The characteristics of the STP system are described in various directions, distances and times. The object is drawn in its entirety instead of close up, there is no sequence of standard reading directions, the story is told with gestures, and the characters are depicted by the attributes used. Some important aspects of STP systems including stories, messages and communications that are not aesthetic or symbolic. It was stated by Primadi that the function of visual language was used as a medium of communication or applied arts instead of pure arts. The creation of visual languages involves interactions throughout all the senses (touch, feeling, movement, hearing, appearance, etc.) so that humans are able to think abstractly with images in their mind. This visual language context is limited to only descriptive images instead of abstract images, motifs, geometries and the like.

There are three components in learning how to draw with an STP system. These components are image way, inner grammar, and outer grammar. Image way is the way in which objects are drawn. How to arrange various image way in a scene so that you can tell a story is called the inner grammar. Whereas the method of distinguishing image way and the arrangement of expressions between panel and one another until the sequence of the panel are able to tell a story is called outer grammar.

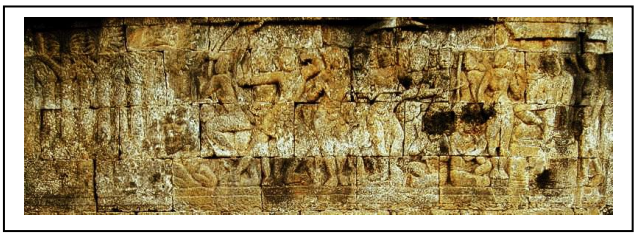

Figure 3 Lalitavistara: Story of archery contest

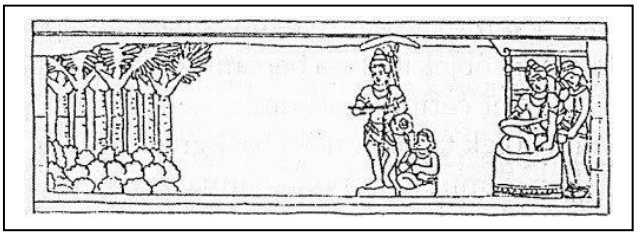

Figure 4 Story of archery contest I

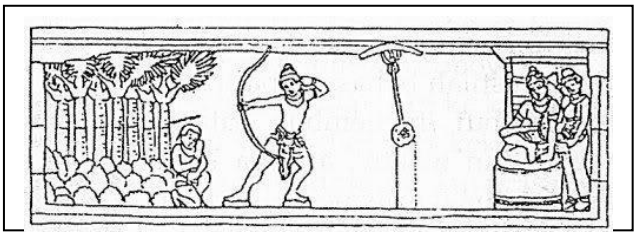

Figure 5 Story of archery contest II

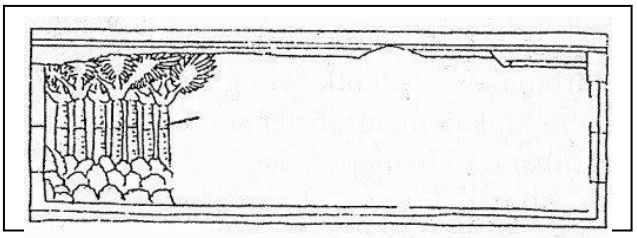

Figure 6 Story of archery contest III

The pictures above are an example of a reading scheme and the application of three components to draw on STP system. Those pictures are taken from one of the reliefs from the Borobudur temple which tells the story of an archery contest.

The system used in visual languages is different from the image system known by the majority of people in the world. Many people are more familiar with the system of drawing Naturalistic-Perspective-moment opname (NPM), including the pictogram design. The NPM system has proximity to Newton's physics theory which reveals that two dimensions only include length and width, while the three dimensions are length, width and height. Some examples that use the NPM system are photos, videos, still life paintings, television and so on.

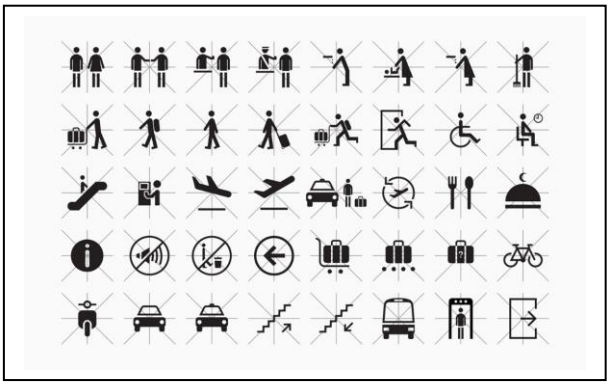

Figure 7 Pictogram in Husein Sastranegara Airport

NPM system draws objects from one direction, one distance and one time so that the image is 'frozen' or as we could refer to as a still picture. This system only describes what is being held so that in order to be able to tell the story this system requires time dimensions such as music, literature, dance, drama and so on. The NPM system is on STP systems. However, the STP systems are not found on the NPM system. Based on the delivery of messages, the way to communicate, and the length of the story telling, STP systems are superior to the NPM system.

4 Result and Discussion

The three basic aspects of visual language have similarities with the ones of learning methods for the visually impaired. These basic aspects are:

1. The shape not drawn close up matches the comprehensive aspect.
2. Storytelling with gestures and attributes match the concrete aspects.
3. The use involving all the user's senses matches the aspect of doing.

The equation of those aspects will eventually generate a concept to design a pictogram for the blind. To find the answers to what extent the concept effectively builds perceptions as a visually impaired orientation system, an experiment needs to be conducted. The case given in this experiment is to perceive of how "a person walking". This case was chosen seeing that walking is one of the main activities performed at the station. The experiments are divided into two processes and three schemes, namely: identifying forms (image way), describing motion (inner grammar) and understanding stories (outer grammar).

4.1 Process I: Identifying Form

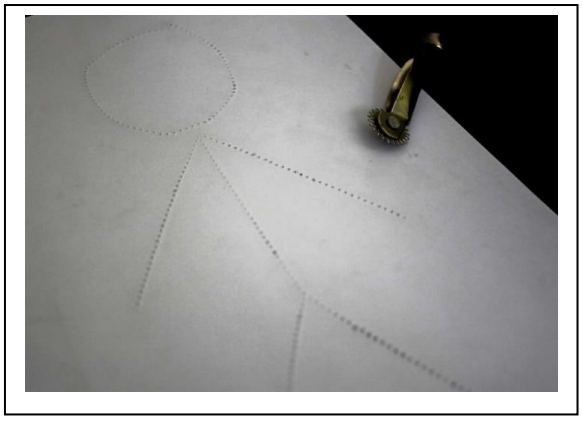

Figure 8 Form for experiment I

Referring to the components of drawing in image way, the concept is to draw a human body in its entirety but without the details and the close ups. The human

body anatomy is described by using the approach of two-dimensional figures and line elements. This method was chosen based on the observation results that showed that two-dimensional figures have high readability for the blind and blind people have the tendency to associate a shape with a two-dimensional figure (round shape). The image was then applied to a 200gr paper by using tracing wheel in freehand with hard foam as a pad.

The main requirements of respondents in this experiment are people who have received special orientation and mobility programs. The requirements are made considering the blind people who have not received this program will not have a good understanding in perceiving something according to the structure of cognitive process. The experiment was conducted by gathering the respondents in one room and then to have them touch the image without being given any description and then later they were interviewed about the experience. This experiment was conducted on January 10, 2018, to 20 respondents at SLBN A Bandung.

Figure 9 Documentation of experiment I

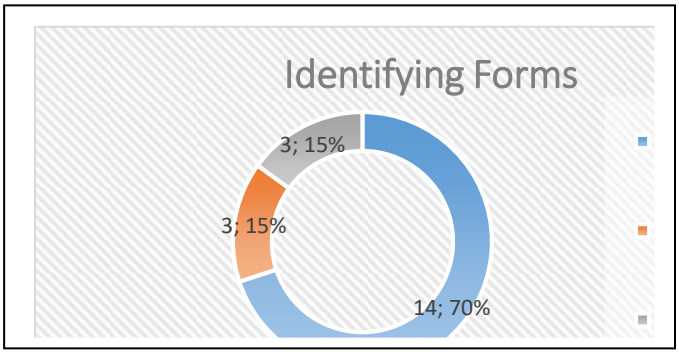

Figure 10 Result of experiment I

The experiment result revealed that most of the respondents managed to successfully identify the image. Respondents were able to imitate the gesture from the image. Most of the respondents who didn't get the right answer identified the image as a buttons, a tree and a piece of clothing.

4.2 Process II: Describing Motion & Understanding Stories

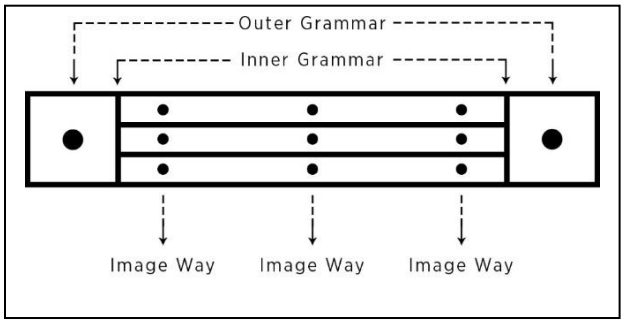

Figure 11 Visual system of pictogram

The first step of this process is to carry out a study that simplifies the three components of visual language into a visual system of pictograms. Further studies conducted through the first experiment resulted in a concept of anatomical depiction divided into three parts with the aim of making the way of reading easier, namely: head, body and legs. This experiment performed by

having people alternately touch the three objects horizontally from the first object to finding the position of the last object. Perception is built when a user interacts with an image that coincides with a sign of motion.

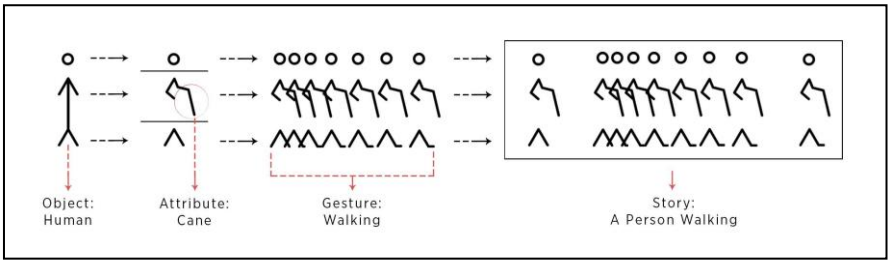

Figure 12 Forms for experiment II

A stick attribute is given to one of the hands in the drawing. These attributes are drawn based on the observations which showed that blind people always carry a stick as a mobility aid at the station. Meanwhile, a horizontal line is added to the foot of the "walking" motion drawing to create the perception of "moving legs".

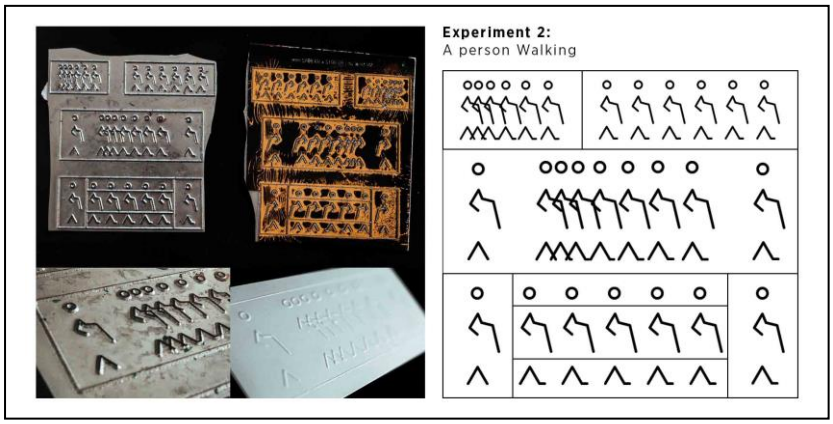

Figure 13 Production process

The next process is to produce pictogram designs into tactile media. Emboss technique is used in the production process while embossed plates and paper are the required tools in this experiment.

The experiment was conducted on January 31, 2018, to the respondents at the same location. However, at this stage the technical method of the experiment

was divided into two, namely: without instruction (as the first experiment) and with verbal instructions on how to read the pictogram system.

Figure 14 Documentation of Experiment II

The result of this experiment showed that all respondents were not able to read the pictogram and the story on both the embossed plates and the paper. All the respondents agreed that the picture was too tricky. Especially on a thin paper, the respondents had a hard time to feel what it was. Attributes and gestures failed to be described. Even though at the end of the test the respondents were given the correct answer that it was a picture of a person walking, they were still unable to feel it.

4.3 Analysis of Process

From the aspect of drawing objects with STP system, blind people are able to identify forms well. However, when the inner and outer grammar components are applied to an object, the object could not be read by the blind, whether it is in form, motion or story. Respondents perceive the pictogram form in this experiment as an alphabetical form and as a two-dimensional figure, not as "a person walking". The use of pictograms as a symbolic language requires a specific learning process about similarities in perceptions of the forms they identify.

4.4 The Principles of Pictogram Design

Based on the analysis results, there are five basic aspects found of using pictograms for the blind. They are:

1. Legibility: Clarity of form or image as a symbol.
2. Clarity: Clarity of the form of the pictogram compared to one with another.
3. Tangibility: The thickness of the media that have the pictogram.
4. Proximity: Placement of the pictogram in media.
5. Ergonomics: Adjusting the size of the pictogram within the area of sensory touch.

In addition to the basic principles of use, the results of the analysis also find three basic elements in designing a pictogram, namely:

1. Verbal: Equipped with a written or audible message.
2. Shape: Image style, size, layout and the thickness of the media.
3. Color: Can be clearly seen by the eyes as additional value.

5 Conclusion

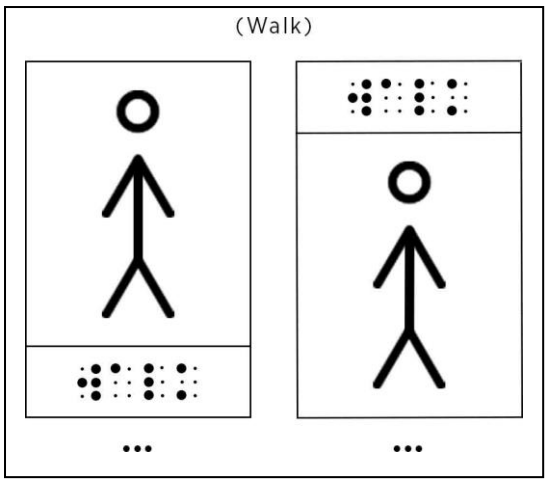

Figure 15 Recommendation system for pictogram design

Blind people cannot build perceptions through pictograms without the attachment of the context. This is evidenced from the results of the experiments showing that pictograms designed with the concept of visual language are not effective in building the perception of the blind. The component of motion which is translated by crushing the image without the text cannot be read clearly by the blind. This makes verbal role in optimizing the function of the pictogram as an orientation system is important to be the main criteria in its process.

There are two main requirements to make a pictogram become one of the basic elements in visually impaired orientation system. The two conditions are:

1. A mutual agreement is needed regarding the perceptions of blind people to symbols.
2. A more segmented group of blind people who are able to read pictograms are those who have taken orientation and mobility programs.

In addition to the agreement of the Braille system, to this day there has been no other international agreement, especially regarding the tactile image system. Referring to this phenomenon, any research on this study about pictograms for blind people has a great opportunity to update the symbol language for the blind. The benefit and the purpose are to make it easier for blind people to understand contextual motion that supports mobility in public spaces such as at the Bandung City train station. Therefore, further research needs to be continued.

References

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[2] Tabrani, Primadi., *Bahasa Rupa*, ed. 3, Kelir, 2012.