

Observation threshold of product represented angles and its related factors

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Abstract

This research attempts to find the observation threshold of product representation angles recognized by the general public. It also approaches the possible factors affecting the observation threshold of product representation angles – “familiarity” and “product component” to study the related factors. This research uses NOKIA 8250 as the objective cellular phone, and the contrasting cellular phone of component difference found in the previous test. It uses questionnaires to divide subjects, according to familiarity, into groups for experiments, and then calculate the representation angle observation threshold of subjects. The conclusions of this research are: (1) The observation thresholds of product representation angles are found as an X shape on the distribution maps, and the two sides of the distribution maps show the difficult recognition areas. (2) Familiarity affects the observation threshold of cellular phone representation angles, while product component difference show little effect. (3) Most subjects favor a clockwise or up turned presentation angle of cellular phone. (4) Products with sufficient components show a larger range of representation angle observation threshold.

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1. Introduction

Kansei Engineering is a method that can “measure” the feelings and shows the relationship to certain product properties [7,10]. For example, Semantic Differential (SD) method is the measurement instrument most commonly used by “words” to obtain the emotional value of products [2]. The same product can have different image-words due to people’s different explanation of words [3]. Experience will influence the shape identification [6]. When consumers look at image pictures and the substantial products in an experiment, through spatial recognition thought process, imagery recognition differences are formed naturally. Lee et al. [5]

prove by experiments that subjects show no obvious imagery recognition differences between image pictures and the substantial products. But this is only true under the condition that the image pictures used honestly reflect the product figure specialties and the product features. Ke [4] studies show that both 3D images (perspective) and 2D images (3-view) are affected by the level of spatial recognition ability and different ways of representation, causing difference in product figure image recognition. The above research shows that no matter 3D shapes or 2D images, on top of personal recognition differences, image representation of the different observation points will also cause product recognition differences on consumers. The quick growth of the internet overloads consumers with excess product information. This also lowers the security and reliability level. The fact that internet shopping is unable to provide substantial product contacts also increases the recognition risk [1,8,9].

Facing the “information-rich, time-poor” internet age, no matter product representation or 2D image representation,

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the importance of object observation angle cannot be overlooked. According to different product qualities, product representation is built to match public recognition, also hoping to provide a complete reference sample for the future multimedia database building and application.

2. Methods

2.1. Variables

Many psychological researches show that “familiarity” and “product component” could be the main factors affecting product recognition. Therefore in this study, we use “familiarity” and “product component” as the control of variables. The familiarity experiment uses “people” as the control factor, using questionnaires to divide target cellular phone users into groups of familiar and unfamiliar. The component experiment uses “cellular phone” as the control factor, one being “objective cellular phone” – NOKIA 8250; the other being the “contrasting cellular phone” using the difference in components found previously and redesign.

2.2. Subjects

The research subjects have been defined as internet users. A total of 22 subjects (Female: 12, Male: 10) took part in the observation threshold of product representation angle test. Subjects filled in a familiarity questionnaire prior of the test, with a total of 5 questions. If a subject correctly answers more than 3 questions, he or she is defined as “familiar with the objective cellular phone – NOKIA 8250”. The result produced 11 subjects familiar with the

NOKIA 8250 cellular phone and 11 subjects unfamiliar with it.

2.3. Prior experiment

After setting the objective cellular phone as the NOKIA 8250, using the previous two tests to find the contrasting cellular phone with component difference.

2.3.1. Prior experiment 1 – finding cellular phone components of the consumer impression

In order to find out what consumers know about cellular phone component structures, a cellular phone component questionnaire was given. This experiment targets the general cellular phone users, attempts to find out what impressions consumers have on cellular phone components. Through 65 questionnaire result statistics, we found that keypad, monitor, antenna, shape, cap and brand label, the above six cellular phone components, made a deeper impression with consumers.

2.3.2. Prior experiment 2 – finding factors that affect cellular phone recognition

Knowing the main cellular phone components on consumers’ minds, recognition tests are found according to each component difference, finding the components that affect cellular phone recognition and then using these components to design the contrasting cellular phone. This experiment shows flash cards to find the main components that affect cellular phone recognition.

The experiment consists of testing the subjects on the recognition of “same – not the same” during a short time (see Fig. 1). Within the ten questions, six of them have

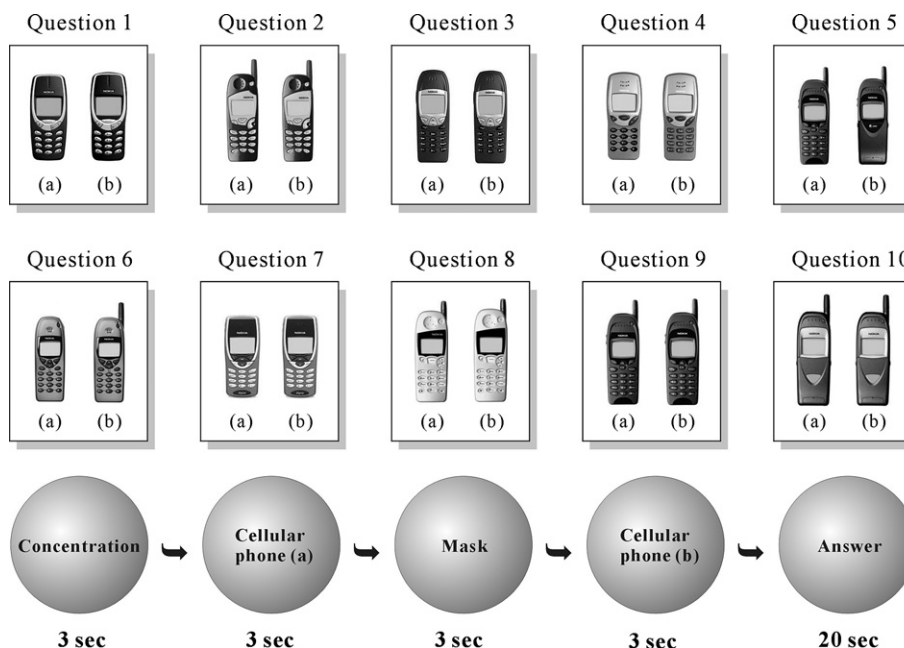


Fig. 1. Task process of affect cellular phone recognition.

component differences, they are “keypad difference”, “monitor difference”, “existence of antenna”, “shape difference”, “existence of the cap” and “existence of brand label”, the other four questions uses the same cellular phone to test the credibility of the subject answers.

There were 66 subjects, 32 male and 34 female with an average age of 23. Result shows that, within the cellular phone components, “cap” and “antenna” are the easiest component differences to spot. After finding the component difference factors, we design the contrasting cellular phone, continue using the Solid Work software to draw the objective cellular phone and the contrasting cellular phone (Fig. 2).

2.4. Task

After building 3D product models using Solid Work, we proceed with product rotation programming. Product representation angles with a basic gap of 15 degrees. Horizontal (*x* axis) turning of 15 degrees angularly shows 24 different product representation angle pictures in one turn. Vertical (*y* axis) turning of 15 degrees angularly shows 24 different product representation angle pictures. Each product has $24 \times 24 = 576$ different product representation angle images, also controlling each angle representation images so that they have the same light source and size (Fig. 3).

Other than the control on the computer-aided drawing models, in the hardware part of the image representation, we used the View Sonic VP150M LCD, avoiding causing eye fatigue on the subjects due to long time experiments, we were showing the best product representation results by using the high quality resolution of 1280×960 pixels.

In the experiment of product representation angle observation threshold, to avoid the error caused by “learning”, questions are set to occur randomly. Some subjects will proceed with the “objective cellular phone” representation angle observation threshold experiment, while some

subjects proceed with the “contrasting cellular phone” representation angle observation threshold experiment.

After the subjects have found the recognizable observation range of products, we then proceed with the study of the effects “familiarity” and “product component” have on the threshold.

3. Results

3.1. Product representation angle observation threshold

We have statistically calculated the cellular phone representation angle recognizable to the subjects, then represented the resulting data in different shades of gray, black representing the angles recognizable to all subjects while white representing the angles unable to be recognized by any subjects, results are shown in Fig. 4.

According to the representation angle observation threshold distribution map, we obtain the following results:

- (1) The subjects’ observation thresholds of representation angles are showing as an X shape on the distribution maps.
- (2) The subjects’ observation threshold of representation angles distribution shows that the two sides of the distribution maps are the difficult recognition areas.

3.2. The range of representation angle observation threshold

Concluding the product representation angles recognizable to 22 subjects, the product representation angles recognizable to over 50% of the subjects can be concluded into two ranges:

- (1) Range 1: This range sets the front view of cellular phone ($X = 0^\circ, Y = 0^\circ$) as the original point, do left, right, up, and down directions turning. When cellular phone turns side ways, the representation

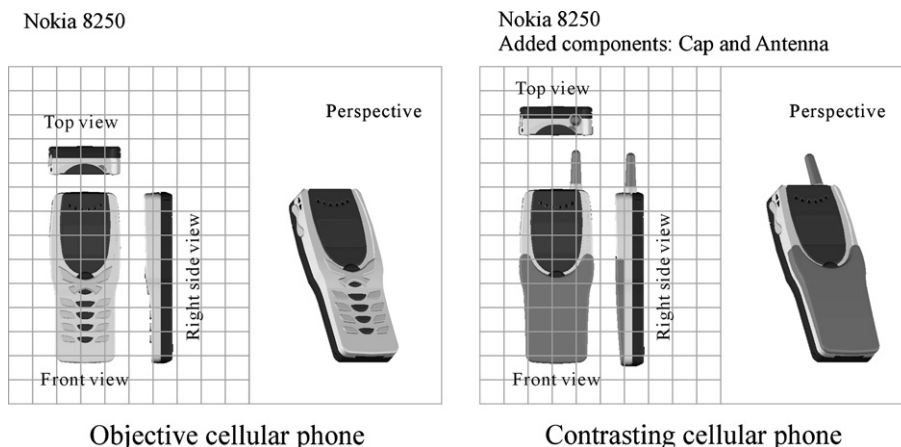


Fig. 2. The objective and the contrasting cellular phones.

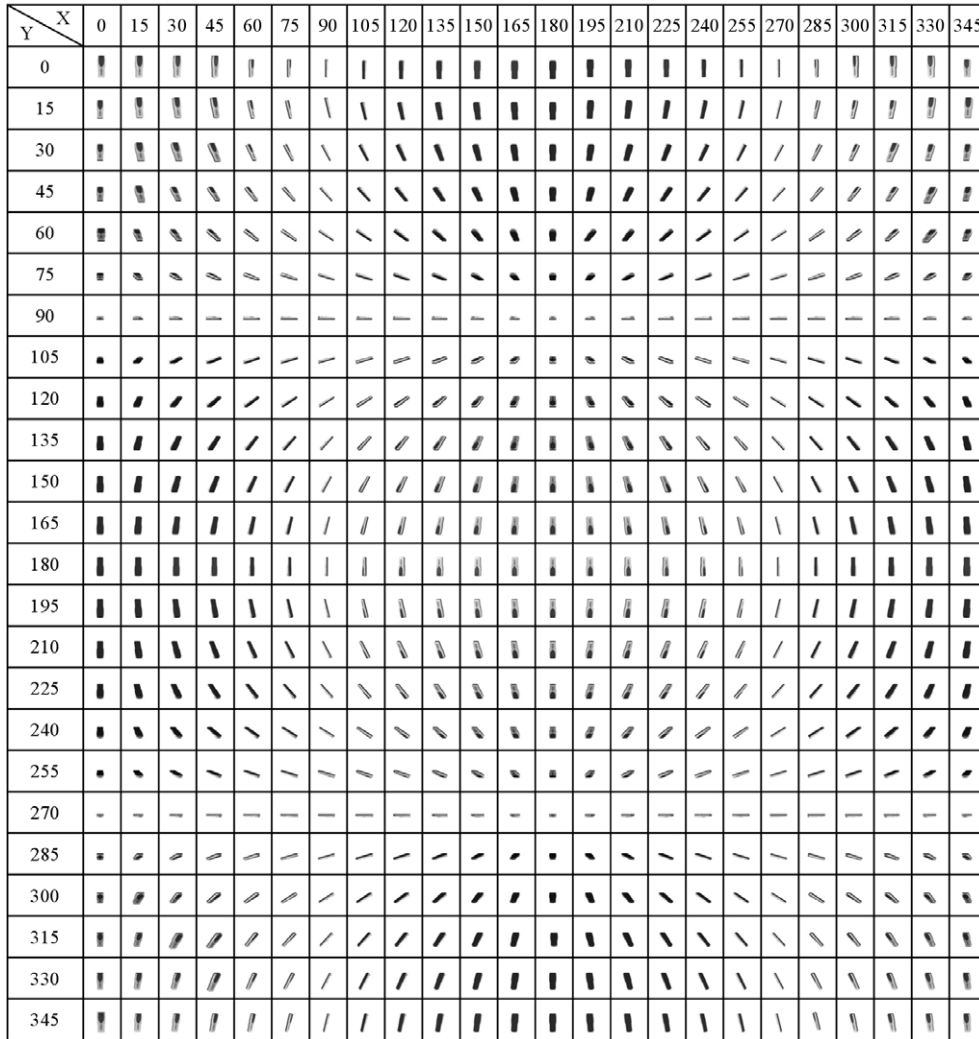


Fig. 3. Product representation angles with a basic gap of 15 degrees.

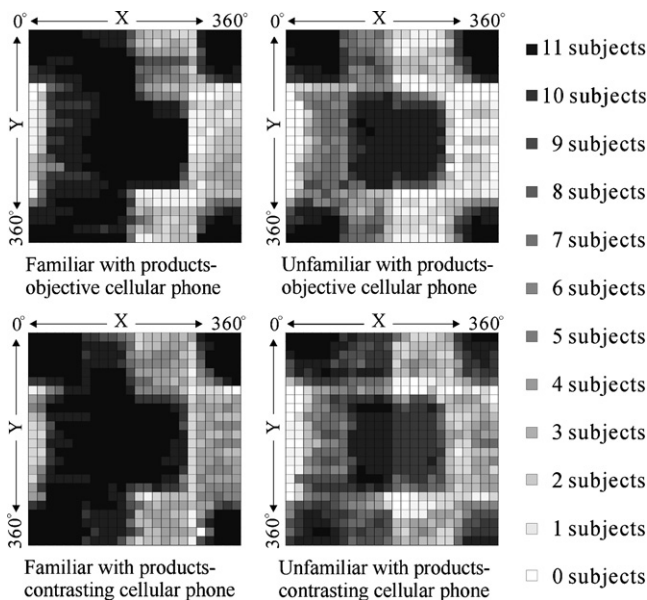


Fig. 4. Representation angle observation threshold distribution map.

angle observation threshold is unsymmetrical. This could be due to the presence of the volume adjusting button on the left side of the cellular phone, so when cellular phone turns to the right it provides the subjects with a recognition mark, therefore the representation angle when turning right reaches an angle of 165°, while being 60° when turning left, up and down flipping has a range of 75°. Range 1 is the union area of when X is between -60° and 165° and when Y is between -75° and 75° . Range 1 is shown in Fig. 5(a).

(2) Range 2: The cellular phone angle represented in this area are mostly inverse, taking $X = 180^\circ$, $Y = 180^\circ$ as the origin, the left and the right turning are unbalanced; the one with the volume control button has a broader representation angle observation threshold of product view angles. Range two is the union area of when X is between 45° and 255° and when Y is between 105° and 255° . Range 2 is showing in Fig. 5(b).

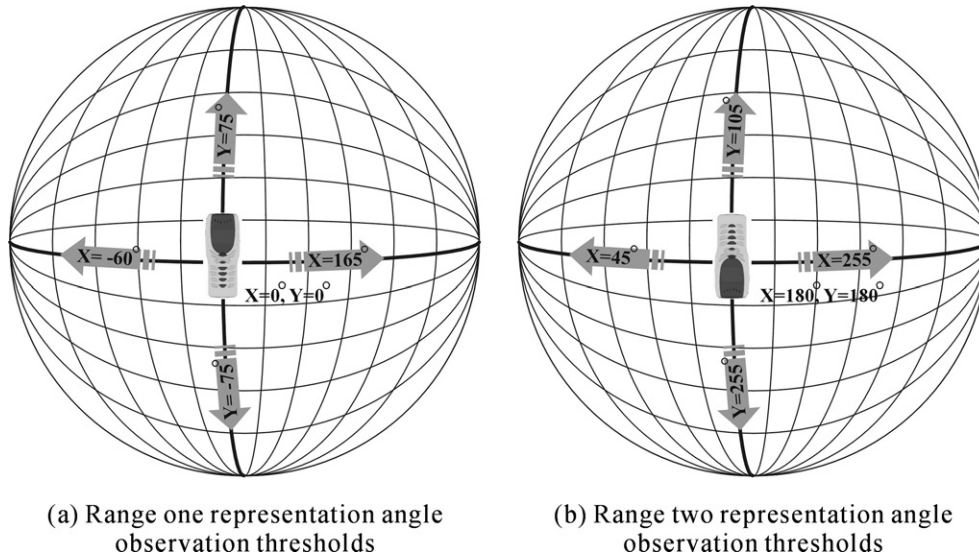
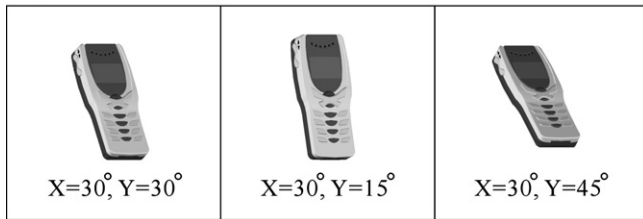


Fig. 5. Range one and two representation angle observation thresholds.

Objective cellular phone



Contrasting cellular phone

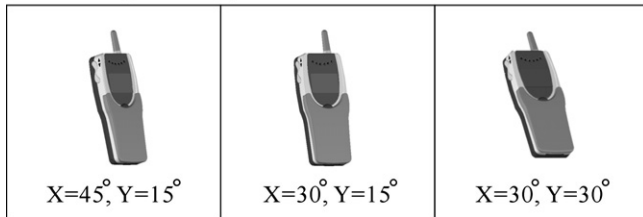


Fig. 6. The most favorite represented angles.

3.3. The most favorite represented angles for cellular phone

Among the most favorite objective cellular phone represented angles, more than half of the subjects like the pictures represented by the angles of $X=30^\circ$, $Y=30^\circ$; $X=30^\circ$, $Y=15^\circ$ and $X=30^\circ$, $Y=45^\circ$. About that of the contrasting cellular phone, more than half of the subjects like the pictures represented by the angles of $X=45^\circ$, $Y=15^\circ$; $X=30^\circ$, $Y=15^\circ$ and $X=30^\circ$, $Y=30^\circ$, refer to Fig. 6.

4. Discussion

This research studies the observation threshold of product representation angles and the related factors affecting it. Using cellular phones for experiments, in order to find

out the relationship between the representation angle observation threshold and the factors of familiarity and product components. The following are the conclusions:

- (1) There is an obvious priority in the representation angle observation threshold of the familiar users when compared to the unfamiliar ones. Familiar users grip the small details easily, therefore has a broader product representation angle recognizable range.
- (2) There is no obvious reflection of the product component difference on the product representation angle observation threshold. This could be due to that subjects judge the cellular phone representation angle observation threshold by the recognition of the cellular phone.
- (3) Whether familiar or unfamiliar subjects, objective cellular phone (NOKIA 8250) or the contrasting cellular phone, the representation angle observation threshold of subjects shows an X shape on the distribution maps, and the two sides of the maps are being the difficult recognition areas.
- (4) Most subjects favor a clockwise or up turned presentation angle of cellular phone.
- (5) Products with sufficient components show a larger range of representation angle observation threshold.

The product representation angle observation threshold and its related factors research can be seen as a foundation research, it has a broad range of applications. For example, when the shape recognition threshold data is built, the future computer data search can then proceed with search on shapes; in the e-commerce era when products using electronic 2D media as a medium will be popular, the product representation angle observation threshold research may provide better observation angles. The conclusion obtained

in this research is hopefully a reference to provide researchers the same direction with a basis of future research.

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