

Optimum Button Size and Reading Character Size on Mobile User Interface for Thai Elderly People

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Abstract—As the number of elderly people is increasing in Thailand, but there is only a few studies about graphic user interface (GUI) design on mobile devices. The problem of elderly vision and motor response should be one of design factors in GUI. This paper is about a usability study to design the most suitable GUI for Thai elderly people. This study has been done by using a game designed for testing the elderly vision in two aspects: button size and reading character size.

I. INTRODUCTION

The Internet can alleviate the social isolate problem in the elderly as reported in [1]. As corresponding to Thailand demography, elderly people spend their time on the Internet nearly 31.8 hours per week (4.5 hours per day), and they prefer to use Internet via smart phones more than that of computers [2]. Previous research reported that the aging effect of the elderly [3] is physical ability. This paper addresses the design study on mobile user interface for the elderly ages to overcome their physical impairment. The study focuses on visual test and motor-response test.

II. ELDER-FRIENDLY DESIGN STUDY ON MOBILE DEVICES

Visual test is about how the elderly can see characters and read words on mobile devices. The main variables are font sizes, styles, and colors. For font styles, because this study in Thai elderly, the font styles are fixed with the most popular font style, "Thai sarabun". For color, the black fronts is on bright background.

Motor-response test is about how the elderly can touch button in the correct position and in time. The variable is only button size. This experiment will be on a assumption that users carry device one hand and interact with the other hand.

A. Game design for collecting data

The optimum touch button size is the smallest size that most users can touch correctly. In the same fashion, the optimum reading character size is the smallest font size that most users can read correctly. Following these definition, we designed and developed two games: Touch button size, and Reading character size.

The former one is "How fast you can touch button !" that a player has to touch button as fast as he/she can; however, its button size will be decreasing until the end of the game. And the latter game is "How small you can read !" that a player

has to find the matched Thai word; however, the high score a player dose, the character size will be reduced.

1) *Touch Button Size*: This game is to touch a button (square box) appeared in random position on the screen. A button size will be reduced after the previous was correctly touched. If not, the player has to repeat until success. As shown in Fig. 1, the biggest and smallest button size is shown in Fig. 1(a) and (b), respectively. The game is also designed for recording time spending, touch position, button position, button size throughout the playing.

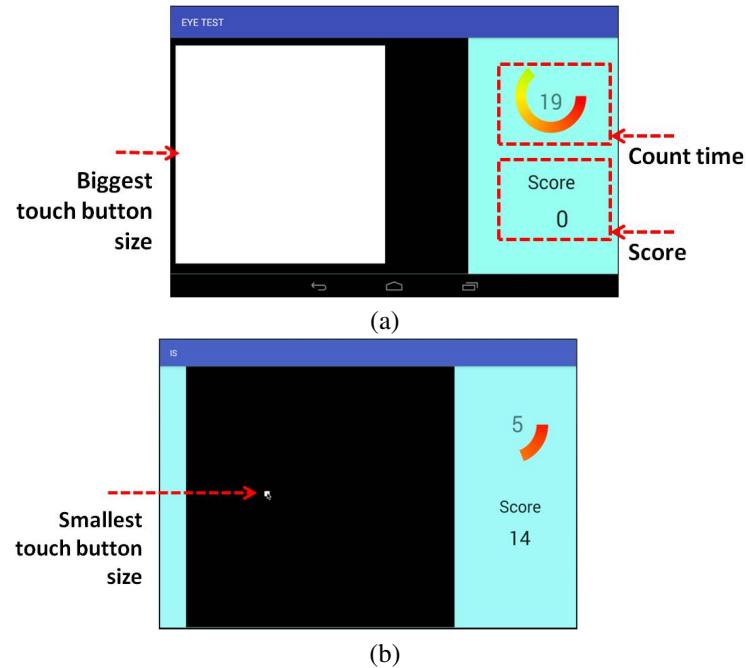


Fig. 1. Game for testing touch button size.

2) *Reading Character Size*: This game is to choose one from choices having the same word as a given big-sized word. The given word is called "question word". Choices will be shown in smaller fronts. The font size of choices is varied but styles. The font style is san serif, and its color is black on the bright background.

On the screen, after a question word is randomly appeared, a player has to find the matched word in choices. The character size will be reduced after the player can read the previous word. If not, a question word will be changed but the front size

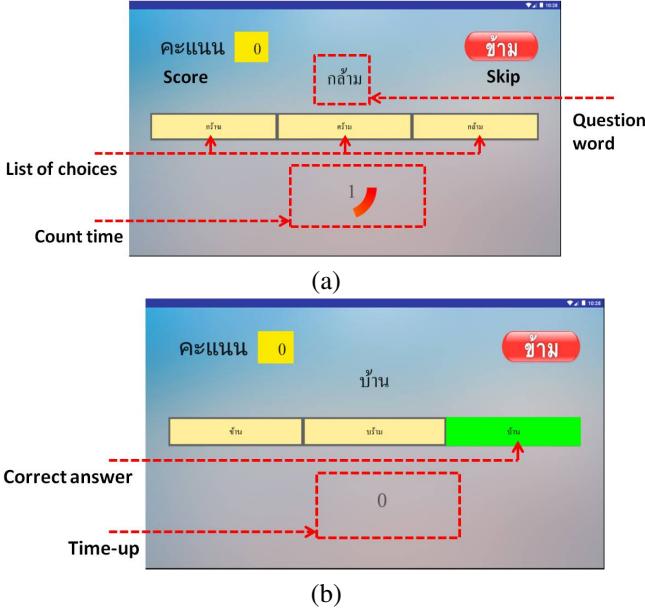


Fig. 2. Game for testing elderly reading THAI words.

of choice words are still the same. Each game has a limited time as shown in Fig. 2. This game has three difficulty levels: easy, medium and hard, each of which is different by word syllable as shown in Fig. 3. Easy level is a set of one Thai syllabus word. Medium and hard levels are a set of two and three syllables, respectively.

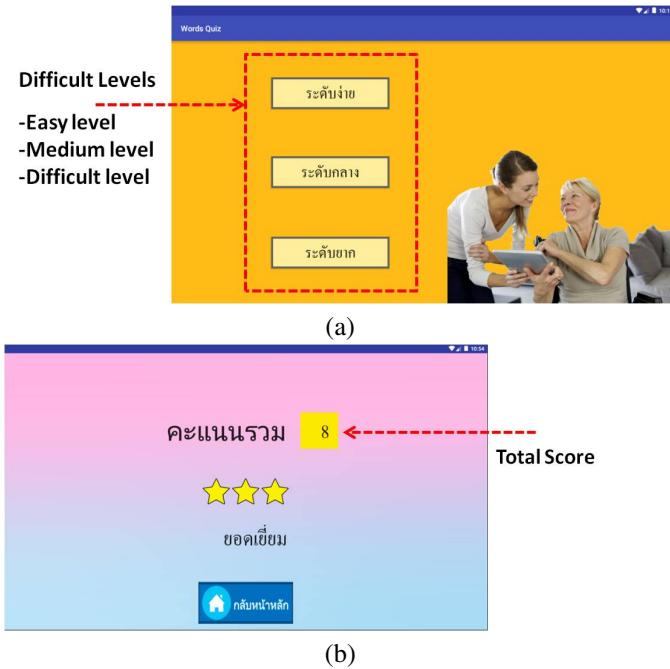


Fig. 3. Starting and ending game: (a) Three difficult levels for reading character size, (b) Total score showing at the game end.

B. Data Collection

1) *Participants:* The participants in our experiments were Thai older adults aged above 55 years old because the retire-

TABLE I
EXPERIMENTAL RESULTS ON TOUCH SPEED AND READING SCORES

Assumptions	Mean	Std	Sig
Touch speed on button size			
Gender-related difference in touch speed			
Male	1.052s	1.022s	
Female	1.172s	1.308s	
Age-related difference in touch speed			
≥ 65	1.288s	1.367s	***
< 65	1.030s	1.072s	
Reading score on character size			
Gender-related difference in character size			
Male	22.75	6.017	
Female	21.69	4.447	
Age-related difference in touch speed			
≥ 65	24.071	3.269	*
< 65	21.000	4.893	

Note: Notation *, **, *** is stand for the significance level at 0.05, 0.01, 0.001, respectively. "s" is stand for second.

ment ages in Thailand started from 55 years old. The total number of participants was 80, which of them played "word matching game" and "button touching game" are 50 and 30, respectively. That means none of them involved both games. There are 58 female and 22 male participants, and all of them were retired government officers.

2) *Procedure:* The procedure to get participants is that we presented our research proposal at retirement reunion club. Volunteers put their name in the list to play a game and win the prize. All participants had one free play before collecting data. Each one must enter his/her name before the game start.

3) *Data Analysis:* We collected the data to investigate the optimum touch button size and the reading character size. In addition, all hypotheses were tested as shown in Table I. The optimum touch button size is 50×50 pixels that is smallest size the users can touch it correctly within a second. The optimum reading characters is 12 pixels that is smallest size the users can read it correctly.

III. RESULTS AND CONCLUSIONS

Our findings showed that both vision and motor response capability in gender of Thai elderly is not significantly difference. Ages below 65 and above 65 has a significant difference in both vision and motor response. As a result, the usability on mobile user interface should carefully care on age more than gender. The optimum button size and reading character size will be used for many mobile applications that user targets are the older adults; especially, training games for memory to prevent people from Alzheimer's disease.

REFERENCES

- [1] S. J. Czaja and S. R. Hiltz, "Digital aids for an aging society," *Communications of the ACM*, vol. 48, no. 10, pp. 43–44, 2005.
- [2] "Value of E-Commerce survey in thailand 2016," <https://www.etda.or.th/publishing-detail/value-of-e-commerce-survey-2016.html>, accessed: 2017-06-07.
- [3] Y. Asano, H. Saito, H. Sato, L. Wang, Q. Gao, and P.-L. P. Rau, "Tips for designing mobile phone web pages for the elderly," in *International Conference on Human-Computer Interaction*. Springer, 2007, pp. 675–680.