Abuse of disabled parking: Reforming public’s attitude through persuasive multimedia strategy

W A J W Yahaya\textsuperscript{1,3} and M Z M Zain\textsuperscript{2}
\textsuperscript{1}Associate Professor, Center for Instructional Technology & Multimedia, Universiti Sains Malaysia
\textsuperscript{2}Town Planner Officer, Federal Department of Town And Country Planning Peninsular Malaysia
E-mail: wajwy@usm.my

Abstract. Attitude is one of the factors that contribute to the abuse of disabled parking. The attitude’s components are affective, cognitive and behavioral and may be formed in various ways including learning and persuasion. Using learning and persuasion approach, this study has produced a persuasive multimedia aiming to form a positive attitude toward disabled persons in order to minimize the rate of disabled parking abuse. The persuasive multimedia was developed using Principle of Social Learning draws from Persuasive Technology as learning strategy at macro persuasion level, and modality and redundancy principles draw from Multimedia Learning Principles as design strategy at micro persuasion level. In order to measure the effectiveness of the persuasive multimedia, 93 respondents were selected in a 2x2 quasi experimental research design for experiment. Attitude components of affective, cognitive and behavioral were measured using adapted instrument from the Multi Dimensional Attitudes Scale toward Persons With Disabilities (MAS). Result of the study shows that the persuasive multimedia which designed based on Social Learning Theory at macro persuasion level is capable of forming positive attitude toward disabled person. The cognitive component of the attitude found to be the most responsive component. In term of design strategy at the micro persuasion level, modality found to be the most significant strategy compare to redundancy. While males are more responsive to the persuasive multimedia compare to females.

1. Introduction
Person with disabilities (PWDs) are often marginalized from the mainstream in many forms including stereotyped attitudes about PWDs, discrimination, being patronized, social ostracization, ignorance, bigotry, accessibility, teasing and bullying (peer abuse), poverty, and unemployment. PWDs refer to a person who has long-term physical, mental, intellectual or sensory impairments which, in interaction with various attitudinal and environmental barriers, hinders their full and effective participation in society on an equal basis with others (WHO, 2007). In 2005, there were 170,455 PWDs registered with the Malaysian Social Welfare Department. Of the number, 56,738 persons or 33 percents were the person with physical disabilities which require wheelchair for mobility. As a wheelchair user, they often face problems related to accessibility which reduce their ability to mobilize and just as important, is the attitude of the public toward the wheelchair users such as the abuse of disable parking lot [1,2]. Although attitudes are often difficult to change, one of the most effective methods for doing so is to provide new information that challenges existing beliefs [3]. Based on the justification, a new medium based on integration of Persuasive Technology and Cognitive Theory of Multimedia Learning has been

\textsuperscript{3} To whom any correspondence should be addressed.
developed in this study which aims to form a positive reforming attitude toward respect of disabled parking facilities among the public.

2. Problem statement
There are several types of abuse of disabled parking spaces. The most well known type is parking without an appropriate permit. A second type is misuse of permit by non disabled person. The third, and most severe type of abuse, is the fraudulent creation of a permit in order to park illegally [4]. A behavior study conducted by [5] and [2] found the benefit of convenience was the most prevalent reason that forms such attitude. [1] has identified several more factors contributing to the abuse including physical design, legal and environmental aspects. Past research shows that inappropriate use of handicapped parking spaces occurs frequently [5]. In term of location, [6] found that rates of violations were high in both urban (76.3%) and town (44%) locations. In a 13 hours observational study by [7], 135 vehicles were observed using the handicapped parking spots. 91 of them (67%) were considered to be abusers. In term of gender, the abuses were committed by equal numbers of males and females (49% and 51% respectively).

In Malaysia, there is no scientific research ever conducted in this area. However, there is an act (Malaysia Person with Disabilities Act, 2008) to protect the right of disabled person but there is no provision for punishing the offenders who abuse the disabled parking is in the act. Base on previous findings, intervention measure to minimize the abuse of disabled parking need to focus on the attitude aspects of the public for more holistic and effective approach. One of the emerging technologies in the attitude formation is Persuasive Technology [8].

3. Theoretical foundation
A tripartite attitude model from [9] was adapted to depict the relationship of attitude and abuse of disabled parking as shown in Figure 1 in which refer the attitude as an individual’s propensity to evaluate a particular entity with some degree of favorability or no favorability. Evaluation can be overt or covert and may encompass aspects of beliefs and thoughts (cognitions), feelings and emotions (affects), and intentions and overt behavior.

By stimulating the degree of favorability of individual’s propensity into a favorable state, a positive attitude toward disabled person can be formed. In order to form the positive attitude, this study will experiment with the use of persuasive multimedia as an attitude formation strategy. The persuasive multimedia was designed and developed based on combination of Persuasive Technology [8] as learning strategy at macro persuasion level and principles of Multimedia Design [10] as design strategy at micro persuasion level which form the Persuasive Multimedia Model as shown in Figure 2.
Captology can be generally understood as a study of computers as persuasive technologies [8]. Captology is expected to be achieved when a persuasive multimedia has significant planned effect toward reduction of problem stated. Therefore, the conceptual framework for this study is adapted from attitude model of disabled parking abuse in Figure 1 and persuasive multimedia model in Figure 2.

4. Hypotheses
The experiment will help researcher to measure if there is a significance difference effect of persuasive multimedia based on persuasive technology principles as learning strategy at macro persuasion level and multimedia learning principles as design strategies at micro persuasion level. It will also measure if there is a significant difference effect of persuasive multimedia between genders. Based on that, the following null hypotheses were proposed:

**Hypothesis #1** - There is no significance difference effect of persuasive multimedia based on persuasive technology principles as learning strategy on the attitude of the public toward disabled person at macro level.

**Hypothesis #2** - There is no significance difference between two different forms of persuasive multimedia based on multimedia learning principles as design strategies on the attitude of the public toward disabled person at micro level.

**Hypothesis #3** - There is no significance difference effect of persuasive multimedia on the attitude of the public toward disabled person between genders.

5. Literature Review
Persuasion is a method of influence using communicated information and argumentation from a given source that begins with changing beliefs and knowledge, the cognitive component of the attitude system. Persuasion is typically defined as “human communication that is designed to influence others by modifying their beliefs, values, or attitudes” [11]. Yale Communication Research Program [12] proposed that opinions tended to persist unless the individual underwent some new learning experience. Persuasive communications that both present a question and suggest an answer serve as learning experiences. Acceptance of the suggested answer is dependent on the opportunity for mental rehearsal or practice of the attitude response, and on the number of incentives included in the communication.

Social Judgment Theory [13,14] suggests that knowing a person’s attitudes on subjects can provide you with clues about how to approach a persuasive effort. Person make evaluations (judgments) about the content of messages based on their anchors, or stance, on a particular topic messages. Another theory on persuasion and attitude change is the Elaboration Likelihood Model (ELM) by Petty and [15] which emphasizes the importance of understanding audience members before creating a persuasive message. The ELM views persuasion primarily as a cognitive event, meaning that the targets of persuasive messages use mental processes of motivation and reasoning (or a lack thereof) to accept or reject persuasive messages.

Persuasive technology is broadly defined as a technology that is designed to change attitudes or behaviours of the users through persuasion and social influence, but not through coercion [8]. It’s mean that the effects of persuasive technology are planned effects not the side impact of the technology. Persuasive technologies can be categorized by their functional roles. [8] proposes the *Functional Triad* as a classification of three "basic ways that people view or respond to computing technologies": computer as tools, computer as medium and computer as social actors. These functions can perform as
single unit or more than one at once. As tools, technologies can increase people's ability to perform target behaviour by making it easier for restructuring it. As media, interactive technologies can use both interactivity and narrative to create persuasive experiences that support rehearsing behaviour, empathizing, or exploring causal relationships [8].

[8] proposed four principles in which persuasive technology can be applied to persuade user toward attitude or behaviour change. *Principle of Virtual rehearsal* offers simulated environment using computer technology to the user to experience new environment that could persuade them via rehearsing new situation that have persuasion element toward behaviour change. Whereas, *Principle of Similarity* suggest that in most situation, people whom we think are similar to us in terms of personality, preferences or in other attributes are able to motivate and persuade us more easily other than people who do not similar to us. *Principle of Praise* makes people feels comfortable and motivated and usually used to appreciate certain efforts or achievement just after a person accomplished certain task which is easily achieved by using computer. Finally, *Principle of Social Learning* views contingent experiences can create expectations. This theory holds that user can learn through observations of others or from vicarious experience through others, and can learn from watching another person’s experience of a situation.

6. Methodology
The research design of the study employed a 2 x 2 quasi-experimental design in which two groups of respondents will be tested twice at the pre test and post test experiments to a particular exposure with two different modes of persuasive multimedia treatments. Therefore, the respondents were run individually or in group according to their type of treatment in lab equipped with multimedia facilities. Experiment consists of three sessions where the respondents are required to answer a pre-test questionnaire, exposed to persuasive multimedia treatment and answer to a post test questionnaire. All questionnaires will be collected at the end of each session. A total of 93 respondents were recruited in this experiment which consists of 41 males and 52 females in two treatment group. Modality group has 46 respondents while the Redundancy has 47 respondents. Respondents were selected conveniently among office workers who have driving experiences. This study employs The Multi-dimensional Attitudes Scale Toward Persons With Disabilities (MAS) by [16]. The questionnaire based on the multi dimensional approach, posits that attitudes are composed of three dimensions: affect, cognition, and behavior. The original instrument consisted of 47 items: 16 affective, 20 cognitive, and 11 behavioral with the Cronbach alpha of reliability coefficient for affective component are .83, cognitive .88 and behavioral .90.

7. Persuasive multimedia treatment
Social learning principle was selected as learning strategy at the macro persuasion level in the development of persuasive multimedia as the theory has been applied extensively to the understanding of aggression and psychological disorders, particularly in the context of behavior modification [17]. Since the target respondents are the public, social learning approach seems to be more general to suit with various levels of society than other persuasive principles. At the micro persuasion level, persuasive multimedia for the modality principle as design strategy has video and voice over narration in the presentation as suggested by [10] that presenting words in the form of narration will reduce extraneous load to working memory thus enhancing learning. While persuasive multimedia that based on redundancy design principle has video, narration and highlighted text in the presentation as suggested by [18] that reverse redundancy principle will not impede learning especially among non English speaking community. The formation of persuasive multimedia treatment is shown in Figure 3.
8. Data analysis and results

8.1 The Feasibility of Persuasive Multimedia in Public’s Attitude Formation (Hypothesis #1)

Analysis of Covariance (ANCOVA) was conducted to see if there is a significant difference effect of persuasive multimedia before and after the persuasive multimedia treatment. The analysis is based on the overall scores as dependent variable. The result shows that the effect of persuasive multimedia is significant at the $F=3.225$, $p=0.044$, level and the effect size is partial eta$^2 = R^2 = 0.066$ meaning that the model explains 6.6% of the variance in the overall scores. Hence the Hypothesis #1 is rejected.

To determine which attitude’s component has the most significant influenced by the treatment, Multivariate Analysis of Covariance (MANCOVA) was employed on each attitude’s component and the result revealed that the cognitive component has the most significant effect at $F =8.096$, $p=0.01$, level compared to the affective component which seem to be not significant at $F=0.824$, $p=0.442$ level.

Table 1. MANCOVA on the effectiveness of persuasive multimedia before and after the treatment.

| Dependent Variables | Type III Sum of Squares | Df | Mean Square | F     | Sig   | Partial Eta Squared |
|---------------------|-------------------------|----|-------------|-------|-------|---------------------|
| Overall             | 2274.394$^a$            | 2  | 1137.197    | 3.225 | 0.044 | 0.066               |
| Affective           | 236.098$^a$             | 2  | 118.049     | 0.824 | 0.442 |                     |
| Cognitive           | 656.205$^b$             | 2  | 328.102     | 8.096 | 0.001 |                     |
| Behavioral          | 424.284$^c$             | 2  | 212.142     | 6.558 | 0.002 |                     |

8.2 The Effect of Persuasive Multimedia Design Strategies (Hypothesis #2)

Univariate Analysis of Variance (ANOVA) was conducted to see if there was a significant difference between two different forms of persuasive multimedia before and after the treatment. The first ("Corrected Model") row shows that the type of persuasive multimedia is significant at the $F=6.360$, $p=0.013$ level and the effect size is partial eta$^2 = R^2 = 0.065$ meaning that the model explains 6.5% of the variance in the overall scores. Hence the Hypothesis #2 is rejected. In order to determine which design strategy has the most significant effect on the attitude formation toward disabled person, a Pairwise Comparison was carried out and the result confirms that the Modality design strategy is significant at 9.723 ($< 3.97$) level compare to the Redundancy design strategy in forming positive attitude of public toward disabled person.

Table 2. ANOVA on the effectiveness of persuasive multimedia according to group type.

| Dependent Variables | Type III Sum of Squares | Df | Mean Square | F     | Sig   | Partial Eta Squared |
|---------------------|-------------------------|----|-------------|-------|-------|---------------------|
| Overall             | 2221.798$^a$            | 1  | 2221.798    | 6.360 | 0.013 | 0.065               |
Table 3. Pairwise comparisons on group type in order to determine the most significant design strategy.

| (I) Group Type | (J) Group Type | Mean Difference (I-J) | Std. Error | Sig. a | 95% Confidence Interval for Difference a |
|----------------|----------------|-----------------------|------------|--------|----------------------------------------|
| Modality       | Redundancy     | 9.723 *               | 3.856      | 0.013  | 2.066 - 17.381                         |
| Redundancy     | Modality       | -9.723 *              | 3.856      | 0.013  | -17.381 - -2.066                       |

8.3 The Influence of Persuasive Multimedia across Genders (Hypothesis #3)

ANOVA was conducted to see if there was a significant difference effect of persuasive multimedia between genders. The first ("Corrected Model") row shows that the effect of persuasive multimedia between genders is significant at the $F=5.054$, $p=0.027$ level and the effect size is partial eta $^2 = R^2 = 0.053$ meaning that the model explains 5.3% of the variance in the overall scores. Hence the Hypothesis #3 is rejected. Pairwise comparisons result shows that male is significant at 8.853 (< 3.97) level compared to female. A cross tabulation of mean scores between genders and group type revealed that males from the modality group have the highest means at 107.32 levels compare to female from the same group. In redundancy group, male also have the significant level of mean compare to females at 90.18 levels.

Table 4. ANOVA on the effect of persuasive multimedia between genders.

| Dependent Variable | Type III Sum of Squares | DF | Mean Square | F  | Sig. | Partial Eta Squared |
|--------------------|-------------------------|----|-------------|----|------|---------------------|
| Overall            | 1796.626 a              | 1  | 1796.626    | 5.054 | 0.027 | 0.053               |

Table 5. Pairwise comparisons on genders in order to determine the most responsive genders towards persuasive multimedia.

| (J) Gender | (I) Gender | Mean Difference (I-J) | Std. Error | Sig. a | 95% Confidence Interval for Difference a |
|------------|------------|-----------------------|------------|--------|----------------------------------------|
| Male       | Female     | 8.853 *               | 3.938      | 0.027  | 1.031 - 16.675                         |
| Female     | Male       | -8.853 *              | 3.938      |        | -16.675 - -1.031                       |

Table 6. Cross tabulation of means between genders and group type

| Gender | Group Mean | Mean | N   | Std. Deviation |
|--------|------------|------|-----|----------------|
| Male   | Modality   | 107.32 | 19  | 25.294         |
|        | Redundancy | 90.18  | 22  | 14.308         |
|        | Total      | 98.12  | 41  | 21.684         |
| Female | Modality   | 91.41  | 27  | 14.666         |
|        | Redundancy | 86.96  | 25  | 17.901         |
|        | Total      | 89.27  | 52  | 16.294         |
| Total  | Modality   | 97.98  | 46  | 21.045         |
|        | Redundancy | 88.47  | 47  | 16.226         |
|        | Total      | 93.17  | 93  | 19.265         |

9. Discussion of findings

The persuasive multimedia has great potential to be used as a public’s reforming attitude formation strategy. The finding from the experiment confirmed that the use of Social Learning Theory as learning strategy in the development of persuasive multimedia in this study has significant effect on the attitude
formation at the macro level. The result is consistent with [19] who proposed that Social Learning Theory which explained the formation and change of attitude through observation in terms of continuous reciprocal interaction between cognitive, behavioral, and environmental influences. [11] stressed that persuasion is a method of influence using communicated information and argumentation from a given source that begins with changing beliefs and knowledge, the cognitive component of the attitude system. The literatures are consistent with the finding why cognitive component has the most significant result compare to other attitude's component in the experiment.

Result of ANOVA on the second hypothesis confirmed that there is a significant difference effect on the attitude formation between Modality and Redundancy principles as design strategy. The finding is consistent with the Cognitive Theory of Multimedia Learning [10] which suggests that combination of pictures or animation along with narration will comprehend viewers better than using combination of three mediums of text, narration and picture or animation in presentation. This could be the reason why the persuasive multimedia with modality design principle has produced a better result than redundancy design principle. The finding is critical for the purpose of this study where the use of persuasive multimedia in reducing the abuse of disabled parking will require mass persuasion strategy in public area. The use of animation and text in an open area may not affected by noise compared to narration. The finding will further strengthened the potential of using persuasive multimedia as a reforming attitude formation strategy for the public towards disabled person in the public area.

[7] found that the abuse of disabled parking were committed by equal numbers of males and females. However, males were significantly influenced by the persuasive multimedia particularly in the modality group has the highest means compare to the females from the same group. In redundancy group, males also have the significant level of mean compare to females. A study by [20] found that males have consistently shown an advantage in visual-spatial abilities, such as aiming at stationary or moving targets, as well as throwing and intercepting projectiles, may justify the findings why males are more responsive to the persuasive multimedia. Behaviorally, females have consistently shown an advantage for verbal abilities, including earlier language acquisition and longer attention spans than males for conversation [21]. The statement is consistent with this study finding which found that females even though less responsive than males, but significantly have higher scores in redundancy group compare to female in the modality group.

10. Conclusion
The findings from the experiment show a significant positive improvement in the reforming attitude component after persuasive multimedia treatment. The experiment confirmed that persuasive multimedia which using Social Learning Principle derived from Persuasive Technology [8]as learning strategy and Modality Principle from Cognitive Theory of Multimedia Learning [10] as design strategy in the development of persuasive multimedia is feasible as a tool for reforming attitude formation strategy especially in disability awareness program like in reducing the abuse of disabled parking facility. The finding also confirmed that the persuasive multimedia has met the theoretical assumptions for this study in term of Captology [8] and reforming attitude formation.

References
[1] Scottish Government Social Research 2007 Tackling the abuse of off-street parking for people with Disabilities in Scotland. Scotland: Department of Scottish Ministers.
[2] Anna T. 2002 A study on why people abuse handicapped parking (Unpublished Master’s Thesis) University of Wisconsin-Stout, Menomonie, USA.
[3] Fishbein, M. & Ajzen, I. 1975 Belief, attitude, intention, and behavior: An introduction to theory and research. Reading, MA: Addison-Wesley.
[4] Edward, J., Dale, S. S. & Hall, J. 2003 Handicap Parking Abuse: Policy Solutions for Kentucky. Kentucky: Kentucky Council on Developmental Disabilities.
[5] Cope, J. G. & Allred, L. J. 1990 Illegal Parking in Handicapped Zones: Demographic Observations and Review of the Literature. Rehabilitation Psychology 35 249-257
[6] Taylor, C. J. 1998 Factors Affecting Behavior toward People with Disabilities. *Journal of Social Psychology* **138** 766-772

[9] Eagly, A. H. & Chaiken, S. 1993 The psychology of attitudes. Orlando: Harcourt Brace Jovanovich College Publishers

[10] Mayer, R. E. & Moreno, R. 1998 A Cognitive Theory of Multimedia Learning: Implications for Design Principles. Retrieved 16 May 2011 from http://www.unm.edu/~moreno/PDFS/chi.pdf. [13] Mayer, R. E. (2001). *Multimedia Learning.* New York: Cambridge University Press. [14] Persons With Disabilities Act 2008, ACT685/2008

[12] Hovland, C., Janis, I. & Kelley, H. 1953 Communication and persuasion. New Haven, CT: Yale University Press.

[17] Bandura, A. 1969 Principles of behavior modification. New York: Holt, Rinehart & Winston.

[18] Toh, S. C., Waddah A. S, M. & Wan Ahmad Jaafar, W. Y. 2010 Redundancy effect in multimedia learning: A Closer Look. In C.H. Steel, M.J. Keppell, P. Gerbic & S. Housego (Eds.), *Curriculum, Technology & Transformation For An Unknown Future.* Proceedings Ascitile Sydney 988-998

[19] Bandura, A. 1977 Social Learning Theory. New York: General Learning Press.

[20] Kimura, D. 1996 Sex, Sexual Orientation And Sex Hormones Influence Human Cognitive Function. *Current Opinion in Neurobiology* **6** 259-263

[21] Kruger, D. J. 2001 An Integration of Proximate and Ultimate Influences for Altruistic Helping Intentions. *Dissertation Abstracts International: Section B: The Sciences & Engineering;* 62 (1-B), 601. (University Microfilms International; 2001, 601).

[22] Eagly, A., Alice, H. & Chaiken, S. 1995 Attitude Strength, Attitude Structure and Resistance to Change, in R. E. Petty & J. A. Krosnick (Eds.), *Attitude Strength: Antecedents and Consequences,* Hillsdale, NJ: Erlbaum.