A SEMIOTIC INVESTIGATIONS ON TRAFFIC SIGNS AND ITS IMPACT ON DRIVERS IN MALAYSIA: WARNING DANGER SIGNS (MEX EXPRESSWAY)

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ABSTRACT

Accident statistics increases annually and much has been done by the government to overcome this problem. There are many factors that contribute to this problem amongst which encompasses the driver, traffic and road conditions which is why drivers need to be informed repeatedly so that they are alert with their surroundings while driving. This research is about a study on drivers’ behaviour towards road signs, how they react and actions taken once they see warning given. Thanks to the latest technology, drivers now can get the latest and updated traffic info with Variable Message Signs (VMS). Compared to static and printed signs, VMS is more compatible as it is not only display signs but it also can capture drivers’ attention with bright lights (LED or wig wag lamps) which can deliver more visual impact and alert drivers.

Instead of using long text which takes four to six seconds for drivers to read, this study attempts to discover a new method to deliver messages by using animated signs. A qualitative approach is adopted in trying to improve the Malaysian VMS display by using an experimental methodology in developing a recommended prototype (animated signs). The purpose of this study is to simplify all long text and static signs into animated versions to make it simple, faster and easier to understand. As signs are one of the important medium to convey any message to drivers, it is important to ensure that drivers are able to understand and capture the messages display fast so that they can act accordingly in order to avoid accidents.

Keywords: Traffic signs, warning danger signs, semiotics theory, variable message signs (VMS).
1. Introduction

The idea of this research comes from The Sun Daily news article; “Miros Statistics Say Human Error Causes 80% of Traffic Accidents” by Lee Choon Fai with the number of death is 65,850 people in road accidents between 2004 and 2013 had resulted in as much as RM78 billion being lost in economic contributions with an average of RM1.2 million each.

Black spot location is an areas identified as accident-prone or place where accidents keeps on happened, Lembaga Lebuhraya Malaysia (LLM). Most black spots area have been installed with bunch of Warning Danger Signs but accident cases still happen at the same place or area. As for LLM, improvement made every year to overcome this problem is by installing more and more Warning Danger Signs (major improvement made and almost all black spots area are install with new road signs) and others actions taken depends on the road conditions but it seems like still didn’t solve the problems.

Traffic signs are a way to convey a message to drivers. Each symbol printed on signboard gives a different message or meaning for the driver’s safety. A symbol is an image printed on a signboard (Arahan Teknik (Jalan) 2A/85 - Manual on Traffic Control Devices (Standard Traffic Signs)).

If reading and processing a message on a VMS imposes attention demands which exceed the available amount of attention capacity, mental workload increases. As a consequence, the message will not be adequately processed, or driving will be impaired and accident risk may increase. (Sagberg, 2003; Krammes & Glascock, 1992)

Traffic signs or signage is one of the sources which cause occurrence of accident. Therefore, the existence and understanding of signage meaning is very important to give awareness and alertness to users especially drivers. In line with recent technological developments, there are several types of signage such as printed signs (implement by JKR for all federal road and highway used) and electronic signage (also called electronic signs or electronic display). Since this study discuss on signage for highway used, it is suggested to use Variable Message Sign (VMS) to display warning danger signs as a dynamic display to attract road users’ attention which is supervised and monitored by Lembaga Lebuhraya Malaysia or LLM. It is proven that by using VMS can help to reduce injury accidents by 13% (MIDAS system research, England HA).

In this paper, we intend to identify a new type of signage display in order to help drivers regain their awareness of the surroundings and the existing traffic signs for their benefit, and the benefit of other drivers, some jurisdictions have come up with several ways to get the attention of drivers. By identify existing signs problems, researcher will get practical solutions to overcome this problems.

At the end of this study, hopefully we will get practical solutions to create new medium and guidelines as well as traffic signage for easy and better understanding. Finally, the achievements of this study will be helpful to the distribution of information of road sign to road users especially drivers.

2. Problem Statement

Existing signage give less impact to drivers as some of it are not been recognize by most of the drivers which will lead to confusion, misinterpretation of signs meaning and caused road accidents.
Road traffic accidents can be attributed to three most common causation factors. These are human behavior, vehicle and road environment. Road environment consists of road conditions, road surface, water ponding, signage, road side trees branching, etc (Road Safety Forensic Unit (RFSU), JKR).

3. Literature Review

3.1 The Application of Semiotics Theory to Signs (Pictogram)

Semiotics is the general study of symbolic systems, including language. The subject is traditionally divided into three areas: syntax (syntactics), or the abstract study of the signs and their interrelations; semantics, or the study of the relation between the signs and those objects to which they apply; and pragmatics, or the relationship between users and the system (C. W. Morris, 1938).

When the road users see sign what are they supposed to do or react? For visual signs and representations, semioticians analyze pictograms as modes of representation (or signs) having structure (syntax), meaning (semantics) and usage (pragmatics). These are where visual semantics can be applied. Once they saw the signs, their brain will start to analysis what are the symbol, and what are the symbol used for, where they start to identify the meaning (semantics) and finally how should they react or the actions taken, drive slowly while passing the road or area (pragmatics) (Tijus, C., (2001)). Therefore, emphasis should be given to visual semantics in order to create a good pictogram and the meaning itself so that it will understand universally by the road users.

Semiotics theory concerned with the study of systems of ‘signs’ in language, literature, and the material world, in terms of design (Barthes, Roland. ([1957] 1987). This study basically explain on the pictogram effect, which can be summed up as follows: a pictogram is better than a label, and recognizing an image is easier than reading text (Norman, 1990).

3.2 Pierce’s Theory of Sign

“I define a sign as anything which is so determined by something else, called its Object, and so determines an effect upon a person, which effect I call its interpretant, that the later is thereby mediately determined by the former.”(Charles Sanders Pierce)

Peirce thought that “representations” generate further interpretants in one of three possible ways. First, via “a mere community in some quality” (Goudge, T., 1965). These he calls likenesses, but they are more familiarly known as icons. Second, those “whose relation to their objects consists in a correspondence in fact” (Goudge, T., 1965) are termed indices. And finally, those “whose relation to their objects is an imputed character” (Goudge, T., 1965) are called symbols.

3.3 Saussure’s Theory of Signs

Sign is something that stands for something else in a system of signification (language, images, etc (Martin Irvine (1998 – 2010)) while code is the relational system that allows a sign to have meaning, the social organization of meanings into binary oppositions, hierarchies, and differential systems (Martin Irvine (1998 – 2010)).

Saussure chooses the term "sign" over "symbol" because the latter implies motivation. For Saussure, the sign is arbitrary. Virtually all signs, Saussure maintains, have only arbitrarily ascribed meanings. Since Saussure, this notion has been taken as axiomatic in Western linguistics and philosophy (Roland Barthes, 1999).
3.4 VMS and Driver Attention

According to Arash, Othman and Majid (2009) by using VMS it is concluded that an effective variable message sign may draw attention from other, fixed signs.

If reading and processing a message on a VMS imposes attention demands which exceed the available amount of attention capacity, mental workload increases. As a consequence, the message will not be adequately processed, or driving will be impaired and accident risk may increase (Sagberg, 2003; Krammes & Glascock, 1992).

4. Testing and Evaluation of Impact of Using VMS

The respondents for this study comprised drivers at MEX Expressway. The data used in this study is obtained from testing evaluation. The testing evaluation is more on justification towards animated signs prototype to figure out whether drivers look to message display on VMS board or just ignore it and to see whether they give respond to those sign or not. The rationale is to see whether drivers understand the signs meaning (semantics) and do they give responds (pragmatics) towards the message display. However, due to limitation on VMS technology specification used by MEX Expressway, only speed limit sign, queue sign and incident sign can be tested.

Software used to upload messages (pictograms and text) for VMS system called ITAC (Intelligent Traffic Automation Centre). To display message using this system, first register the pictogram. This research approaching animated signs. But, as it only can run bitmap (.bmp) file, all the animated movement need to be transfer into still picture and upload those picture so that it can be form into animated movement. Only five messages (pictogram and text) can be uploading for display at one time.

The animated element used for incident sign is flashing. Same goes to speed limit sign. While queue sign are using movement element to show the cars moving. Once done, send those messages to open network and display it at selected VMS board.

Figure 1: Animated Signs (actual messages display on VMS board)

1) Incident Sign

![Incident Sign]

2) Speed Limit Sign

![Speed Limit Sign]
A camera used to record all vehicles pass by the VMS from 6.00 pm to 7.00 pm. Once completed, researcher will start to count how many drivers comply with the message displayed by counting the number of braking light were lit on the vehicle that was approaching VMS. The respondents for this study comprised drivers at MEX Expressway.

Figure 2: Research Map (drivers comply with message display)
5. Results and Analysis

Identified animated signs will be test out using actual VMS board at KM 15.5 (southbound) at MEX Expressway. The data was gathered by manual counting using tally counter and binocular; observe on drivers look to message display at VMS and video recording; observing on how many drivers give responds towards message by counting on drivers braking lit.

![Figure 3: Result Analysis Table]

By using this new approach researcher manage to get 47.34% of drivers (refer to Figure 3: Result Analysis Table) look to VMS board with 44.86% drivers respond to message given by pressing car brake’s when they saw the message display on VMS board.

6. Semiotic Implication of Animated Signs

They are several animation technique applied in creating this prototype to give impact to signs meaning; how movement can help drivers understand the signs used as well as impact to drivers’ behaviour. First technique used is flashing. This technique was applied to give interpretation of fast movement. From observation of human behaviour, we know that speed of movement initiation and execution can be influenced by motivational factors, for example we move faster when in a hurry (sense of urgency impact) or write faster during an exam (potential reward of good results) (Mir P, Trender-Gerhard I, Edwards MJ, Schneider SA, Bhatia KP, Jahanshahi M, 2011).

The second technique used is movement. This technique was used to give meaning to signs by form a movement from pictogram. The purpose of using this technique is to reinforce pictogram meaning through animated sequence (movement).

Animating things (creatures or objects) in a communicative or realistic manner can be challenging, but there are a number of tricks that can be useful. The first theory apply is attraction tricks; used for flashing effect. The purpose on applying this trick is to attract the viewers’ attention so that they do not miss the message. This trick is about giving drivers a hint about certain event by speed up and down the effect used so that they are aware of traffic condition and can manage to act accordingly and necessarily depends on situation (Michael Louka, 2001).

Next theory used is timing tricks. Sometimes it can be appropriate to use non-realistic timings in order to achieve the desired communicative effect. The viewer should anticipate actions, see them, and react to them, but this should not happen to quickly (or you'll lose the viewer) or too slowly (or the viewer will get bored) (Michael Louka, 2001). This theory was applied on flashing and movement.
technique. Basic VMS message display is four second per message. Therefore, researcher tries to play with frame rate and key frames used to achieve the desired communicative effect within the time used.

The third theory applied is motion enhancement tricks on movement technique. Sometimes, it is necessary to make it more obvious that a motion is taking place (Michael Louka, 2001). This theory was used so that drivers can see the symbols move like real moving objects. This trick can help to give a good impression of motion for drivers’ better understanding on signage meaning.

7. Conclusion

From this study, researcher found that drivers do give respond to animated signs and alert with the message display on VMS board. This shows that animated signs do give impact to drivers and help them act accordingly. Referring to the prototypes created, most prototypes chosen applied both animation technique (flashing and movement) and animation theory (attraction tricks, motion tricks and timing tricks). The important key function of animated signs is to make users especially drivers do understand with animated sequence presented so that they can act accordingly due to events and warning message display. From the test conducted, drivers do respond to the message given by pressing car brake’s when they saw the message display on VMS board. Therefore, it is proven that animated signs do help drivers to understand the traffic signs easier and faster as well as give them more impact and alertness in order to reduce accidents compared to existing printed signs (warning danger signs).

8. Recommendation

8.1 Animation Technique and Theory

There are several animation techniques that can be applied to animated signs. As for this research prototype, researcher decided to choose flashing, movement, fading effect and zooming technique. Based on result, flashing and movement technique was preferably chosen by drivers. As for animation technique, researcher used timing tricks, motion enhancement tricks and attraction tricks. According to pre – result, drivers prefer to choose timing tricks. However, there is a lot of animation technique and theory that yet have to be proven. This will require further research and testing. This would open another opportunity for other researcher to continue research on this field.

8.2 Transform Existing Signs to Animated Signs

As drivers do give positive respond to animated signs display, it is recommended to transform the existing signs to animated form. However, it is suggested that the transformation process is done in stages so that drivers can adapt and make used of the new animated signs environment approach.

8.3 Semiotics Study on Animated Signs

Other than that, various study on animated signs meaning especially applying semiotics study on animated signs are needed to make sure that the signs meaning can be clearly understood to avoid confusion that may endanger users especially drivers.
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