A STUDY ON A SUBLIMINAL ALARM FOR CAREFUL DRIVING

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ABSTRACT

This paper provides a new warning method for increasing drivers' sensitivity for recognizing hazardous factors in the driving environment. The method is based on a subliminal effect. The results of many experiments performed with six subjects show that the response time for detecting a flashing mark tended to decrease when a subliminal mark was shown in advance. This paper also proposes a scenario for implementing this method in real vehicles.

1. INTRODUCTION

It is necessary to construct cognitive support systems that tolerate uncertain information within given limits. For example, consider a situation where many vehicles are stopped due to congestion in the oncoming traffic lane of a two-lane road with two-way traffic. For the drivers of vehicles traveling in the opposite lane that is not congested, there is the uncertain possibility that someone might suddenly dash out from behind one of the stopped vehicles in the congested oncoming traffic lane. There are people who exercise vigilance against such a possibility and drive very cautiously[1].

This study focused on a method of improving drivers' risk sensitivity and prediction in relation to unsafe factors of an uncertain nature that might occur at anytime, which are referred to here as hazardous factors. Focusing on the subliminal consciousness that acts on human latent consciousness, a study was made of the possibility of using subliminal warnings to increase drivers' awareness of and attention to their surrounding circumstances.

2. WARNINGS ACTION

The term subliminal combines the prefix "sub", meaning below, and the Latin word "limen", meaning threshold or boundary. A threshold is a value that marks the dividing line between whether a presented stimulus can be consciously perceived or not. A stimulus which does not reach that level is subliminal. The quantity of visual information humans can perceive is reported to be 10 Mbit/s[2], which is equivalent to the number of characters on approximately 53 newspaper pages. Of that amount, it is said that humans can consciously perceive an information flow of 40 bit/s, which means cognition of 2.5 characters per second. Subtracting 40 bit/s from 10 Mbit/s gives the quantity of information that is not consciously perceived and is processed as subliminal information.

3. BASIC EXPERIMENTS

The experiments examined how long attention was improved by the presentation of information at the subliminal consciousness level. The experiments also examined the relationship between the timing for presenting subliminal information and the effect on improving attention. A concrete explanation of the experimental procedure is given below.

A time chart for the presentation of the images is shown in Fig. 1. The subjects were not told about the presence of...
the predictor and only knew that their task was to press the button as soon as they recognized a change in the image in. The subjects are 6 people.

4. RESULTS AND DISCUSSION

The mean and standard deviation of the response time data obtained from all of the subjects are shown in Fig. 2. The vertical axis indicates the measured response time, and the horizontal axis shows the interval between the presentation of the predictor (exclamation mark) and the presentation of the final mark (star). The results in the graph indicate that the response time tended to be shorter when the predictor mark, which presumably acted on the subliminal consciousness, was presented compared with the condition when it was not shown. In addition, the mean response time became faster as the interval between the presentation of the predictor mark and the presentation of the final mark was gradually lengthened from 1 s to 3 s to 5 s. Among all the intervals, the greatest effect on improving the response time was seen for an interval of 5 s, after which the response time became slower again. The results of a test for a statistically significant difference indicated that there was a significant difference, with a 95% confidence interval, for the patterns where the images were changed after intervals of 7, 9 and 10 s, compared with the condition without the predictor mark.

The following experiment was conducted to verify the reliability of the measured data. The continuity of the measured data was examined to see if there was any difference ascribable to the ease of perceiving the predictor mark. The response time was investigated for the pattern where the presented images were changed after 5 s, which was the interval that showed the fastest response time overall. Three types of images were used in this experiment: one without a predictor mark, one with a difficult-to-perceive predictor mark and one with an easy-to-perceive predictor mark. The results clearly indicate that the response time was faster for the images with the predictor mark compared with the response time without it. The response time continuously became faster in the order of no predictor mark, difficult-to-perceive predictor mark and easy-to-perceive predictor mark. The continuity of the effect on the response time attributable to the difficulty in perceiving the presented information can be seen from the results.

5. CONCLUSION

This paper has proposed the use of subliminal warnings as a new way of presenting warning information to drivers and described the results of a preliminary study of its effectiveness. It was found that the presentation of subliminal warnings to six subjects significantly increased their awareness of a change in the images of the driving scenes presented.

REFERENCES


Fig. 2 Relationship between presentation of predictor mark and response time