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# Improving visual attention : the effect of Warning signs with different formats

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**Abstract**  Designed warning signs were applied in this study to describe the performance of visual attention with different formats of stimulation.  The dependent variables had be obtained from an eye movement experiment. A new proposal about how to sort experimental materials will be proposed.

**Keyword:** color, level of measurement, regression analysis

## 1   Introduction

Luo et. al.[1] has conducted experiment to find the relationship between visual stimulus and human's response time. Besides ANOVA has been used to analyze the data.  In this experiment, all independent variables belong to nominal scale.  Thus correlation analysis cannot be applied.  If we convert independent variables to ratio scale or interval scale[2], changing trend that shows how independent variables affect dependent variables can be predicted. Therefore, in this paper, a method which converts nominal scale to ratio scale has been proposed.

## 2   Previous Research

The purpose of the experiment described in the previous section is to find the relationship between visual stimulus and human's response time.   In this experiment, font types, font color, and font pitch was taken as independent variables, and first fixation duration[3] (FFD for short hereinafter) was taken as dependent variable. In order to show human's response time, FFD is chosen as the indicator.  FFD is duration for a participant moving one's visual fixation onto a target at the first time since the target shows on the screen.  Data obtained from the experiment has been analyzed by using ANOVA. The result shows that colors are the most significant factor on human's visual response time. Here, all independent variables belong to nominal scale. Thus ANOVA can be conducted to analyze the data, but correlation analysis cannot be conducted. Hence changing trend that shows how independent variables affect dependent variables cannot be predicted, and it is necessary to convert independent variables to ratio scale.

## 3   Proposal method for color's quantification

In this study, colors used in the experiment qualified by nominal scale will be converted to ratio scale. The experiment includes three independent variables, font color, font type and font pitch. Because color is the most significant factor on human's visual response time,

| Label | Hue | Luminance |
|-------|-----|-----------|
| Red   | 356 | 55        |
| Blue  | 215 | 33        |
| Green | 165 | 23        |

Table 1: The ratio scale of colors

color has been chosen as the object of conversion for ratio scale. Luminance of color is employed as the quantified indicator of color because luminance of color is affected by saturation and lightness[4].  For example, three colors used in the experiment have been converted by proposed method to ratio scale as shown in Table 1.

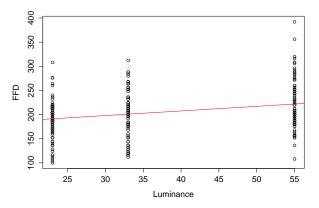## 4   Results and Discussion



Fig. 1: Result of Regression analysis

Fig. 1 shows the relationship between luminance variables and FFD. X-axis represents luminance of color, meanwhile green is 23%, blue is 33% and red is 55%. Y-axis represents FFD obtained form the experiment described in Section 2. FFD has been recorded by the equipment when a participant moves one's visual fixation onto visual stimulus shown on the screen.  The red line in Fig. 1 shows the result of regression analysis[5]. Meanwhile, the gradient of the line indicates correlation coefficient (0.9538).

As we can see from the graph the correlation coefficient is quite close to one.  The reason could be that the number of colors employed in the experiment is insufficient. Data samples are also not enough for observing chang-

ing trend that shows how independent variables affect dependent variables. However, if we could obtain more amount of data, the result wii show the relationship clearly.

## 5　Conclusion

In order to break the limitation of nominal scale used for independent variables in the previous research, a method which converts nominal scale to ratio scale has been proposed.

According to the result of regression analysis, the relationship between independent variables and dependent variables has been investigated.

It is expected that when conducting data analysis concerning colors, Geometric mean, Harmonic Mean and coefficient of variation[6] can be conducted with our method.

## References

1) Luo Zhaofei: Study on warning signs with serif and sans-serif using the visual attention Theory[J], Beijing: Journal of Safety and Environmen, Vol. 11, (2014)

2) Kirch, Wilhelm: " Level of measurement ". Encyclopedia of Public Health 2, Springer. pp. 851/852 (2008. 06)

3) Niu Guoqing, Cui Caicai, Zhang Kun: An eye movement study of auxiliary words effect to safety signs' recognition[J]. Journal of Henan Polytechnic University (Natural Science), pp. 410/415 (2014)

4) Charles Poynton:" What are HSB and HLS?" Color FAQ, (2006. 10)

5) R. Dennis Cook: Sanford Weisberg Criticism and Influence Analysis in Regression, Sociological Methodology, Vol. 13, pp. 313/361 (1982)

6) Stevens, S. S:" On the Theory of Scales of Measurement ", Science pp. 677/680 (1946)