

K. Yamanaka, S. Yamamoto, M. Kawakami. *A study on visibility with night driving. Gerontechnology 2008; 7(2):244.* The expansion of motorization in recent years has been accompanied by an explosive increase in the proportion of automobile traffic together with a sharp increase in number of traffic accidents, with a notable increase in the proportion of accidents involving an elderly person as the main party¹. In addition, although nighttime accidents account for only about 30% of total accidents, the number of fatal accidents is similar to daytime rates. This indicates that major accidents are more likely to occur at night². In this study we conducted experiments to assess visibility during nighttime driving. With a clearer understanding of visibility properties during nighttime driving, it may be possible to develop guidelines for designing a safer and more comfortable road environment for all drivers, not only the elderly. **Methods** To assess visibility, we propose a method in which stimulus intensity is defined as size of the visual target to be recognized by the subject, and the psychometric function is a recognition probability curve. According to this method, the probability point is defined by the physical response threshold to sensory stimuli, and this threshold value can then be used for quantitative and normative estimation of visibility with respect to each individual. Furthermore, the proposed visibility assessment method illustrates the effect that the color temperature of automobile headlights and the color difference between the illuminated object and background have on visibility. For the color difference between the illuminated object and background, colors were represented as points in three-dimensional space using the LCH color system, and color difference was quantified with respect to luminance, chroma and hue³. **Results and discussion** A summary of our results is presented below. (i) By setting the visual threshold as the recognition probability point, we developed an assessment method by which visibility could be estimated using a recognition probability scale. The effectiveness of this method was demonstrated. (ii) We showed that as color difference between illuminated object and background increases, visibility increases and variation between individuals decreases (*Figure 1*). In addition, in attempting to ensure visibility, difference between the object and background must include consideration of chroma as well as luminance.

References

1. Nishida Y. Journal of Society of Automotive Engineers of Japan (in Japanese) 2006;60:31-36
2. Dixon WJ, Mood AM, Ameri J. Journal of American Statistical Association 1948;43:109-126
3. Robertson AR. Color Research and Application 1977;2:7-11

Keywords: visibility, headlight, night driving

Address: Tokyo Metropolitan University, Japan; E: kiyamana@cc.tmit.ac.jp

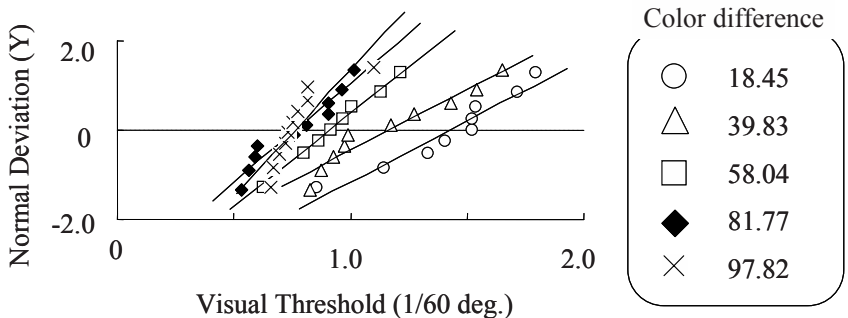


Figure 1 Relation between the color differences and the visibility