

Determining and Strengthening the Visual Cues for Predicting Cyclist Intent in Traffic

P.E. Hemeren, M. Johannesson, M. Lebram, F. Eriksson, K. Ekman & P. Veto

School of Informatics
University of Skövde
Box 408, 528 42 Skövde, Sweden
e-mail corresponding author: paul.hemeren@his.se

ABSTRACT

With the increasing occurrence of cyclists in traffic, there is a greater need for operators of motor vehicles to predict cyclist behaviour. This two-year project has addressed the issues of determining the visual cues that drivers might use to assess the intent of cyclists approaching a crossing [1, 2] and the extent to which those cues can be made more salient by placing reflecting material in a pattern that emphasizes the cyclist's biological motion and head turning behaviour [3]. How accurate are human observers at predicting the behaviour of cyclists as the cyclists approached a crossing, and what cues might be used to make the predictions? Four experiments were carried out to answer these questions and to assess the effect of different patterns of reflecting material to strengthen access to the cues. Our results showed that at 3.5 meters from the crossing, observers achieved an accuracy rate of over 80%. The critical cues were head movement, speed, pedal movement, the leaning position of the cyclist and the position of the cyclist on the bike path. Observers demonstrated accuracies of 75% at 6 meters from the crossing and 60% at 9 meters from the crossing. A logistic regression model based on the 5 cues listed by the observers could reliably predict the behaviour of the cyclists at an accuracy level of just over 90%, which confirms the critical relevance of the cues. Our results also showed that placement of reflecting material consistent with the biological motion patterns of the cyclists lead to significantly better intention prediction accuracy than control conditions lacking the biological motion patterns, which is consistent with previous results from Wood et al.[4]. The results from this project can also be used to develop active safety systems in vehicles. These systems would have advantages over systems that merely detect cyclists since there would be an inherent flexibility in such systems to adapt to what the cyclist will likely do in the near future.

Keywords: guidelines for authors, template, final symposium paper, formatting instructions.

REFERENCES

- [1] L. Satori, C. Becchio and U. Castiello, "Cues to intention: The role of movement information", *Cognition* 119 (2011), pp. 242-252.
- [2] A. Vinciarelli, M. Pantic and H. Bourlard, (2009). "Social Signal Processing: Survey of an Emerging Domain", *Image and Vision Computing Journal* 27(12), (2009), pp. 1743-1759.
- [3] M. J. Johnson, "Biological motion: A perceptual life detector?", *Current Biology*, 16(10), (2006), pp. 376-377.
- [4] J. M. Wood, R. A. Tyrrell, R. P. Marszalek, P. F. Lacherez, T. P. Carberry and B. S. Chu, "Using reflective clothing to enhance the conspicuity of bicyclists at night", *Accident Analysis and Prevention*, 45, (2012), pp. 726-730.