Keynote Lecture

Pedestrian Path Prediction and Action Classification using Computer Vision and Body Language Traits

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Professional outline

Miguel Ángel Sotelo received the degree in Electrical Engineering in 1996 from the Technical University of Madrid, the Ph.D. degree in Electrical Engineering in 2001 from the University of Alcalá (Alcalá de Henares, Madrid), Spain, and the Master in Business Administration (MBA) from the European Business School in 2008. From 1993 to 1994, he held an Excellence Research Grant at the University of Alcalá, where he is currently a Full Professor at the Department of Computer Engineering and Vice-president for International Relations. In 1997, he was a Research Visitor at the RSISE of the Australian National University in Canberra. His research interests include Real-time Computer Vision and Control Systems for Autonomous and Assisted Intelligent Road Vehicles, as well as Vehicle-Infrastructure cooperation. He is author of more than 200 publications in journals, conferences, and book chapters. He has been recipient of the Best Research Award in the domain of Automotive and Vehicle Applications in Spain in 2002 and 2009, and the 3M Foundation Awards in the category of eSafety in 2004 and 2009. He served as Auditor and Expert at FITSA Foundation for RTD Projects in the domain of automotive applications in 2004-2010. Miguel Ángel Sotelo has served as Project Evaluator, Rapporteur, and Reviewer for the European Commission in the field of ICT for Intelligent Vehicles and Cooperative Systems in FP6 and FP7. He was Director General of Guadalab Science & Technology Park (2011-2012) and co-founder and CEO of Vision Safety Technologies, a spin-off company established in 2009 to commercialize computer vision systems for road infrastructure inspection. He is member of the IEEE ITSS Board of Governors (2012-2014) and Executive Committee. Miguel Ángel Sotelo served as Editor-in-Chief of the Intelligent Transportation Systems Society Newsletter in the period Jan 2013 to Jan 2014. At present, he is Editor-in-Chief of the IEEE Intelligent Transportation Systems Magazine, Associate Editor of IEEE Transactions on Intelligent Transportation Systems, and a member of the Editorial Board of The Open Transportation Journal. He was recipient of the 2010 Outstanding Editorial Service Award for the IEEE Transactions on Intelligent Transportation Systems. He has served as General Chair of the 2012 IEEE Intelligent Vehicles Symposium (IV'2012) that was held in Alcalá de Henares (Spain) in June 2012, Program Chair of the 2013 IEEE Intelligent Vehicles Symposium (IV'2013) in Gold Coast, Australia, and Regional Program Chair for Europe at the 2013 IEEE Intelligent Transportation Systems Conference in the Netherlands. In 2013, he got the IEEE ITSS Outstanding Application Award.

Abstract

Driver Assistance Systems have achieved a high level of maturity in the latest years. As an example of that, sophisticated pedestrian protection systems are already available in a number of commercial vehicles from several OEMs. However, accurate pedestrian path prediction is needed in order to go a step further in terms of safety and reliability, since it can make the difference between effective and non-effective intervention. Getting to understand the underlying intent of an observed pedestrian is of paramount interest in a large variety of domains that involve some sort of collaborative and competitive scenarios, such as robotics, surveillance, human-machine interaction, and intelligent vehicles. In contrast to trajectory-based approaches, the consideration of the whole pedestrian body language has the potential to provide early indicators of the pedestrian intentions, much more powerful than those provided by the physical parameters of a trajectory. In this talk, we consider the three-dimensional pedestrian body language in order to perform path prediction in a probabilistic framework. For this purpose, the different body parts and joints are detected using stereo vision. The use of GPDM (Gaussian Process Dynamical Models) is proposed for reducing the high dimensionality of the input feature vector in the 3D pose space and for learning the pedestrian dynamics in a latent space. Experimental results show that accurate path prediction can be achieved at a time horizon of up to 1.0 s.