Robots in Human Environments. The Intelligent Vehicle Context

Invited talk, Conference on Autonomous Mobile Systems 2009 (AMS09)

One of the dreams of researchers in robotics is to develop robots having the capability to "share" the human living space. Thanks to the recent technological progress in sensor technologies, robotics technologies, miniaturized mechatronic systems, embedded systems, and more generally ICT technologies, this dream is gradually becoming a reality. For instance, several autonomous mobile robots have already been successfully immersed in some human environments such as museums (mobile robots for guiding visitors) or experimental urban road environments involving both autonomous vehicles and regular cars (the 2007 DARPA Urban challenge).

However, the real deployment of autonomous robots among human beings is still a real challenge, since some major issues such as "Robustness to uncertainty", "Safety", or "Human – Robot interaction" still have to be more deeply addressed. Existing approaches have to be revisited under these additional constraints, and new models have to be designed for dealing with the required perception, navigation, and decision functions which have to exhibit a sufficient level of safety. On one hand, involved environments are highly dynamic, open, and partially known (e.g. some moving obstacles having unknown behaviours might suddenly show up); on the other hand, a special emphasis has to be put on the safety issue, since such environments are populated by human beings (i.e. how to guarantee a given level of safety when taking navigation decisions in presence of the real world uncertainty?).

This talk will address these two major issues located on the cutting edge of the state of the art. Both open research issues and recent results obtained in the scope of some European and International industrial projects will be presented. Particular attention will be put on the following key issues: Robust detection and tracking in complex dynamic environments, Prediction of the future world changes, Risk assessment, Safe goal-oriented navigation in dynamic and uncertain environments.