AUTONOMOUS VEHICLE NAVIGATION: MOVING TO URBAN AREAS

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ABSTRACT:

The two Grand Challenges and the Urban Challenge, organized by the US Defense Advanced Research Projects Agency (DARPA), created not only a lot of interest in robotics, but resulted in major developments in the past few years, including the capability for effective real-time mapping of the vicinity of the robots. In addition, there have been many new sensors developed specifically to support these races, and these powerful sensing systems significantly broadened the suit of mobile mapping systems. Autonomous vehicle navigation is primarily based on waypoint navigation, but to stay on track and to avoid obstacles the vehicles must have sophisticated sensor systems. In particular, this is the case in urban environments, where the robots deal with a number of moving vehicles and must follow the traffic rules. From a conceptual perspective, the required sensing capability of an autonomous vehicle is comparable to that of a mobile mapping system, and the major difference is the real-time processing of the raw sensory data into high-level object space information. This paper will review the recent developments in real-time mobile mapping, and will provide an analysis of the real-time mapping effort through the experiences of the OSU DARPA Ground Challenge group that raced as the TerraMax team in 2004, Buckeye Deserts in 2005, and OSU ACT in 2007.