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Robotic Navigational System

Guillermo Del Castillo
The Foundation for Research on Information Technologies in Society

ABSTRACT OF THE TALK

An advanced prototype Robotic Navigational System has been developed at University of Notre Dame to provide autonomy for highly disabled users, whose mix of disabilities makes it difficult or impossible to control their own power chairs in their homes. The working paradigm is “teach and repeat” a mode of control for typical industrial holonomic robots. Ultrasound sensors, which during subsequent autonomous tracking will be used to detect obstacles, also are active during teaching. Based upon post-processed data collected during this teaching event, elaborate trajectories – which may involve multiple direction changes, pivoting and so on, depending upon the requirements of the typically restricted spaces within which the chair must operate – will later be called upon by the disabled rider.

An off-line postprocessor assigns an ultrasound profile to the sequence of poses of any taught trajectory. Use of this profile during tracking obviates most of the inherent problems of using ultrasound to avoid obstacles while retaining the ability to near solid objects, such as when passing through a narrow doorway, where required by the environment and trajectory objectives.

Recent advances in GPU (Graphical Processing Unit) technology and its possible impact in obtaining more robust visual information will be discussed also. This research has been possible thanks to US Department of Veterans Affairs, the Rehabilitation Research & Development and Spinal Cord Injury, Hines VA Hospital, the AME Department at U. of Notre Dame and IT'IS- IIS ETH Zürich.