AN ANALYSIS OF SMART WHEELCHAIR CONTROL SYSTEMS

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Abstract

In this paper we realize an analysis of smart wheelchair control systems which interact with their environment. The main focus of this analysis, is the detection of the most important characteristics that those systems present for applying them in the development of a new control architecture for smart wheelchairs. This new architecture is the first step in a research project which pretends to improve the quality of life of handicapped persons, not only in their mobility but also in their interaction with external devices. First of all, we have study the Controller Area Network (CAN) which is the base technology used by most of the systems. Due to its characteristics for developing real time distributed architectures, it is used in commercial wheelchairs and research prototypes. Some CAN protocol properties are: i) prioritization of messages with deterministic access to medium, which facilitates the construction of real time systems; ii) multimaster, which facilitates the design of distributed systems; and iii) automatic error detection and error signaling, which make the communication system robust. Although some of the smart wheelchair control systems are modular and extensible, they are limited by the control architecture used. Furthermore, they are oriented only to satisfy a set of basic needs such as the mobility of the wheelchair, or the control of some electrical appliances. Our goal is to design a new control architecture which apart of providing the functionalities offered by actual systems, also offers the possibility of improving them, for example by adding sensors to the wheelchair in order to help the navigation in small or difficult places, or by allowing the interaction with the new domotic systems. In this paper we present the analysis of the existing systems and the first approach to the new architecture that we want to design.