ABSTRACT

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Elderly people and patients with some kind of disability represent a growing percentage of the world's population that demands autonomy, independency and quality of life. Intelligent wheelchairs (IWs) are meant to fulfil the diverse needs of such a public in a better way than traditional wheelchairs would do. IWs are locomotion devices to which an artificial control system is added in order to assist or replace their users' control.

Techniques derived from Mobile Robotics have already been employed to IWs, such as algorithms for the Simultaneous Localization and Mapping (SLAM) problem. Whereas traditional SLAM uses only one robot, a more recent field of study, called Collaborative SLAM, uses more than one robotic agent and aims for a quicker and more precise mapping. Those are accomplished by exploring the environment in a parallel fashion and decreasing errors through data fusion. To the best of our knowledge, only the traditional SLAM was employed to intelligent wheelchairs until now. In other words, IWs capable of mapping perform it individually, and they do not share the resulting knowledge with other intelligent devices.

This work proposes a system to support the collaborative mapping among intelligent wheelchairs. It should also maintain the produced material up to date and available to any IW or other devices. Such a system needs to store the mapping information, which may be used as prior data on subsequent visits from other IWs and, as a consequence, can be gradually augmented and refined. One of its conceptual bases was IntellWheels, a generic platform for research and development of intelligent wheelchairs. The environment is represented by linear features – a suitable way of dealing with characteristics that can be described in terms of lines and segments, such as walls, doors and furniture.

Keywords: Intelligent Wheelchairs, Linear Features, IntellWheels, SLAM, Collaborative SLAM.