

Design of Autonomous Driving Platform for an Electric Wheelchair*

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Abstract— The electric wheelchair is a system developed to assist the elderly or disabled with difficulty in moving by their own power. They are widely used by people with severe handicaps that are difficult to operate with manual wheelchairs. In this paper, we propose the design and test of an electric wheelchair platform with autonomous navigation using QR Code and magnetic band.

I. INTRODUCTION

The improvement of social environment and the rapid development of medicine are making possible the age of 100, and a great number of countries are quickly becoming an aged society and a super aged society. The elderly are soon accompanied by discomfort and disability. In turn various assistant systems have to be developed for their good life.

An electric wheelchair is a system developed to assist the elderly or disabled with difficulty in moving by their own power. Electric wheelchairs are widely used by people with severe handicaps that are difficult to operate with manual wheelchairs. They are equipped with various convenient functions such as steering and speed control system. It is also difficult to use the electric wheelchair comfortably for those who have suffered impaired sensory or manipulation ability. It is because it constantly requires the user's precise and accurate level control. To improve this, an advanced intelligent electric wheelchair with various useful functions is being developed.

An electric wheelchair with advanced functions is implemented by a controller that implements an intelligent algorithm such as learning and judgment instead of a simple feedback control using a conventional joystick. Nowadays, the algorithm based on image processing can be easily implemented because the performance of the processor is greatly improved.

In [1], a robotic wheelchair that provides mobility and autonomy for people with limited mobility was introduced. It has a wide area navigation (WAN) control structure to support autonomous driving in wide and congested areas. It also has a hierarchical driving structure composed of basic control level, tactical level, and strategic level. The Bremen autonomous wheelchair was introduced in [2]. Authors implemented obstacle avoidance, driving and path planning with shared

control system. In [3], a design scheme of an efficient real-time control software structure for autonomous driving of intelligent wheelchair system for the elderly and the disabled is presented. Here, real time schemes for motor control, position estimation, and obstacle recognition were proposed.

Autonomous navigation technologies used in robots or industrial fields such as Internet of Things (IoT), machine vision, and AGV (Automated Guide Vehicle) have been studied. Studies on wheelchair and related technologies such as outdoor autonomous navigation using GPS, indoor map building using 3D camera, obstacle recognition, optimal path setting, etc. are widely progressed. However, electric wheelchairs using these high-performance technologies are very good in terms of technical level, perfection, and functionality, but are expensive and difficult to maintain them.

In this paper, we propose the design of an electric wheelchair platform with autonomous navigation using QR Code and magnetic band. It is much more useful in terms of market creation.

II. CONCLUDING REMARKS

We proposed an autonomous driving electric wheelchair based on QR Code and magnetic band. The proposed system was tested in a laboratory environment and its results were good. It results in reducing the price of the product compared to the function and convenience. With this in mind, it will be widely used in small and medium sized industries that require AGV as well as people with handicapped disabilities.

In order to improve the quality of life of people with disabilities, it is also important to develop a system that satisfies both the purpose of convenience and the improvement of market share through the development of practical products.

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