University of Essex

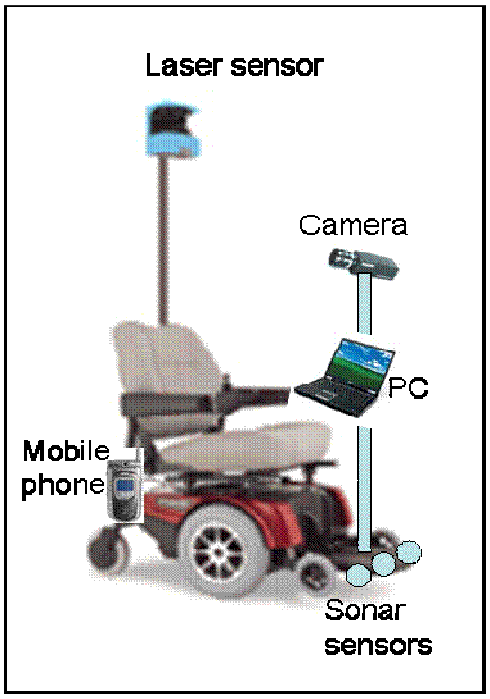
Department of Computing & Electronic Systems

Intelligent RoboChair: Improve Quality of Life for the Disabled and Elderly

Introduction

The current commercial wheelchairs have very limited functions and can not fully meet the need of the disabled and elderly whose autonomy and independence are seriously affected by decline in the function motor and cognitive performance. At the same time, robotic technology is currently going through a major revolution because of cheap and fast computers and minimised sensors that are available. We are now moving closer than ever to the deployment of intelligent wheelchairs that can assist the elderly and disabled in their daily living activities.

We are interesting in the development of high performance and low-cost intelligent wheelchairs which enables the elderly and disabled to gain necessary mobility to live independently and improve their quality of life in the society. These new intelligent wheelchairs will have user-friendly interface and the ability of avoiding collision and planning a path autonomously, which are not available in current commercial wheelchairs.



Essex Robotic Wheelchair

Objectives

The main aim of this joint project is to explore and develop the advanced technology needed for a high performance low-cost RoboChair which enables the elderly and disabled to gain necessary mobility to live independently and improve their quality of life in the society. This RoboChair should have a user-friendly man-machine interface and the ability of avoiding collision and planning a path. It will be equipped with a new vision system and a wireless communication system so that its carer or relative can monitor and tele-operate it when necessary.

The project is focused on two levers of complexity: One is an intelligent control system to achieve good control stability, fast image processing capability and autonomous navigation. Another is an interactive user interface for voice control, emotion and gesture detection, as well as a 3G mobile phone for carers or relatives to monitor and communicate remotely. The project is jointly funded by the Royal Society and the Chinese Academy of Sciences.

Research Plan

- New mechanical design -- To satisfy the needs of an ordinary home, the RoboChair should be foldable and light in weight so that it can be easily transport such as put into a car or a train when necessary.
- Low-energy consumption -- To realize this objective, new embedded control system and sensor systems will be developed based on the DSP and EPLD techniques. The research work on efficient battery management technique will also be investigated.
- User friendly interface -- We will explore various command input methods, such as hands-free control based on voice, head/hand gesture, facial emotion, BCI , EMG, etc.), etc. in order to meet the needs of different users.
- New control methods for reducing the burden of manual operation -- New methods for map-building, path planning, obstacle-avoidance, self-localization and trajectory generation, etc. will be developed.
- Real-time tale-operation using a 3G mobile phone -- A 3G mobile phone will be used to communicate with users who are sitting on the RoboChair. New vision data compression and transformation algorithms will be developed to cope with the limited bandwidth.
- Reduce cost and enhance reliability -- The problems of how to reduce the cost and enhance reliability will be the main issues to be considered so that the RoboChair can be put into the practical use in the near future.

Team members

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