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Static and dynamic obstacle avoidance behaviour for powered wheelchair control system

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Disabled and elderly people are to manoeuvre the powered wheelchair smoothly due to frail and lack in dexterity in handling joystick movement. Wheelchairs users require efficient transition in preventing and avoiding collisions to minimise fatigue and to reach destination safely. The collision cone approach has been proven to avoid static and dynamic obstacles successfully by researchers in mobile robots. This paper proposes an improvement to the static and dynamic obstacle avoidance behaviour for non-holonomic semi- autonomous powered intelligent wheelchair control system. The velocity obstacle approach (VO) is proposed because it is considered an easy and simple method for avoiding dynamic obstacles while collision cone approach is used to detect collision situation between two circular shaped objects. However, the challenge takes place in detecting non-circularshaped objects from sensor data. The collision avoidance behaviour has been further improved with integration of collision cone approach and fuzzy inference system. Experiments on various environmental scenarios such as partly cluttered areas have been demonstrated with the aid of player/stage simulation on Ubuntu12.04 LTS. A Saitek Cyborg Evo wireless joystick with 6 axes is used to drive the wheelchair in the player/stage simulation. The experimental results show significant improvement in detecting and avoiding collisions.

Biography

Jaya Degala is currently pursuing his Doctoral studies in the field of intelligent Mechatronics control under the School of Mechanical and Systems Engineering, Newcastle University, United Kingdom. He has completed his Diploma Studies in the field of Industrial Automation at German-Malaysian Institute, Kuala Lumpur, Malaysia in 1997. He also holds a degree in Mechatronics Engineering from University of Leeds, United Kingdom in 1999. He obtained Master's Degree in Mechatronics at Newcastle University, United Kingdom in 2003. Then, he worked as a Lecturer at German-Malaysian Institute Kuala Lumpur, Malaysia for 5 years. After that, he continued working as a Lecturer at Universiti Kuala Lumpur, Malaysia for another 5 years, majoring in Mechatronics subjects. He has successfully designed and patterned Automatic Multi-Peeler Machine. He also completed a project on Automatic Tyre Inflation System for vehicles.

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