Abstract

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Navigation and Control of Mecanum Wheeled Chair for Handicaps

This paper proposes a novel navigational system for handicap wheeled chair with mecanum wheels. The wheels provide a flexible mobility represented with its 3DOF (Three Degrees Of Freedom) ability of mobility. The chair provides assistance for the user according to his/her medical situation. The user can control the chair using joy stick vocal command signals. The main contribution of this work is defined by the platform kinematics, dynamics modeling and its navigational control system. The mobile platform is kinematically and dynamically modeled and tested on the simulation level to illustrate its performance. The chair is able navigate in a smart environment, for example, in handicap house with a known map. The navigation system implemented on the chair will provide position, collision avoidance and local navigation behaviors. The environment is configured as nodes and the chair should follow series of nodes to reach the desired room. Firstly, a node generator will propose a sequence of nodes, which must be reached respectively. The node generator is created using neural networks algorithms. Secondly, the position control will drive from one node to another assuming reference trajectory of a straight line between each two nodes. Thirdly, the fusion between the position control and the collision avoidance will enable each behavior according to the situation. The navigational control system is implemented on a hardware prototype and the experimental results are illustrated to show the acceptable performance of the whole system.