

Motion Planning of Multi-docking System for Intelligent Mobile Robots

Kuo-Lan Su¹, Yi-Lin Liao², Shih-Ping Lin³, Chien-Chang Lin³

¹ Department of Electrical Engineering, National Yunlin University of Science & Technology

² Graduate school Engineering Science and technology, National Yunlin University of Science & Technology

³ Graduate school of Electrical Engineering, National Yunlin University of Science & Technology

ABSTRACT: *The article develops a multi-docking system with power detection device, and selects an optimal docking station that provides the charging current to the mobile robot. The system contains some docking stations and a mobile robot. The docking station contains a docking structure, a limit switch, a charger, a power detection module, a landmark and a wireless RF module. The mobile robot contains a power detection module, an auto-switch, a wireless RF module, a charging connection structure, a laser range finder and a main controller. The docking structure is designed with one active degree of freedom and two passive degrees of freedom. The controller of the power detection module is HOLTEK microchip, and acquires measurement values of the real-time current and voltage of the mobile robot and the docking station. The controller of the mobile robot receives these measurement values via RS232 interface, and calculates the power values using the redundant management method and statistical signal estimation method, and uses auto-regression algorithm to predict the residual working time. The power detection module is embedded in the docking station and the mobile robot respectively. The article focuses on the searching process using multiple sensors and a laser range finder for the mobile robots. The laser range finder searches the landmark to guide the mobile robot moving to the assigned docking station. In the experimental results, the power of the mobile robot is under the threshold value. The mobile robot transmits the charging command to each docking station via wireless RF interface. Each docking station transmits the working status to the mobile robot via wireless RF interface. The mobile robot selects the free and nearest docking station. The laser range finder guides the mobile robot moving approach to the assigned docking station. The assigned docking station supplies the charging current to the mobile robot by the charger, and detects the charging current and voltage values of the charging process in the docking station and the mobile robot simultaneously. The power of the mobile robot is enough to be detected by the power detection module working in free space. The docking station turns off the charging current, and trigs the mobile robot leaving the docking station via wireless RF interface.*

Keywords: *Multi-docking system, mobile robots, wireless RF module, laser range finder, HOLTEK microchip*