**HA NOI UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**BACHELOR THESIS PROJECT**

**Serving Mobile Robot Design**

**LY DUC TRUNG**

trung.ld181930@sis.hust.edu.vn

|  |  |
| --- | --- |
| **Mentor:** | Ph. D Le Minh Thuy |
| **Department:** | Instrumentation and industrial informatics |
| **School:** | Electrical Engineering |
| **HA NOI, 01/2022**  **TABLE OF CONTENTS**  **TABLE OF CONTENTS**  **LIST OF FIGURES**  **LIST OF TABLES** GENERAL INTRODUCTION ABOUT MOBILE ROBOTOverall information about mobile robotServing mobile robot design planningGENERAL HARDWARE DESIGN FOR SERVING MOBILE ROBOTHardware componentsMotorsMotor driverEncodersUltrasonic sensorsLidarInertial measurement unitOLED displayInfrared sensorVoltage sensorHardware structure designROS 2 FRAMEWORK FOR DEVELOPING ROBOTSRobot software platformsThe basis for selecting ROS 2ROS 2 introductionFIRMWARE DESIGN FOR SERVING MOBILE ROBOTRaspberry Pi 4 configurationThe change of ROS versionUbuntu versionzRAMROS 2 GalacticMultiple I2C bServing mobile robot firmware architectureFirmware for motor driver blockFirmware for ultrasonic sensorsFirmware for lidarFirmware for inertial measurement unitFirmware for OLED displayFirmware infrared sensorFirmware voltage sensorALGORITHM EXPLANATION FOR FIRMWAREPID controllerFuzzy logic libraryKinematic Model for calculating Odometry dataKalman filterMedian filterOPTIMIZATIONObject oriented programmingMultithreading programmingEXPERIMENT AND RESULTSComparison of PID controller and Fuzzy PID controllerObstacle avoidance using an array of ultrasonic sensors test casesRestaurant serving test casesServing mobile robot design result **CONCLUSION AND FUTURE DEVELOPMENT**  **REFERENCES** | |