

**IMPLEMENTATION OF VISUAL INERTIAL ODOMETRY CONCEPT FOR
OUTDOOR AUTONOMOUS MOBILE ROBOT LOCALIZATION AND
NAVIGATION BASED ON ROS2**

By

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.




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ABSTRACT

IMPLEMENTATION OF VISUAL INERTIAL ODOMETRY CONCEPT FOR OUTDOOR AUTONOMOUS MOBILE ROBOT LOCALIZATION AND NAVIGATION BASED ON ROS2

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Logistical operation in various industries are progressively getting replaced by the utilization of Autonomous Mobile Robots (AMR), that majorly focus on last-mile delivery in an indoor environment. On the other hand, demands of operating AMR in an outdoor scenario gradually increase over time. Thus, this thesis focuses on the development of AMR based on ROS2, that is suitable for operation in outdoor settings, with a specialization of implementing the concept of Visual Inertial Odometry (VIO) by using Intel Realsense T265 tracking camera as an alternative approach for mobile robot localization and navigation that usually utilizes a fusion of mechanically driven rotary encoders and IMU unit. The odometry data generated from the tracking camera displays an idle pose deviation of $\pm 0.05\text{m}$ with an average error percentage of 28.60% when subjected to linear movement and operated outdoors under a sunny condition. Ultimately, the outdoor AMR is capable to localize itself by projecting its pose by utilizing the odometry data generated by the tracking camera, with a further integration that successfully enables the operation of autonomous navigation. On the whole, the results of this thesis are feasible as findings and source of data that could be further elaborated on associated mobile robot developments.

Keywords: Autonomous Mobile Robot, Robot Operating System 2, Robot Localization, Robot Odometry, Visual Inertial Odometry.



DEDICATION

I dedicate this work to God,
my family members and dear friends who have supported and inspired me throughout
this challenging journey,
Swiss German University,
and,
the technological advancements in the field of Mechatronics Engineering.

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TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR.....	2
ABSTRACT.....	3
DEDICATION.....	5
ACKNOWLEDGEMENTS.....	6
TABLE OF CONTENTS.....	7
LIST OF FIGURES.....	12
LIST OF TABLES.....	17
CHAPTER 1 - INTRODUCTION.....	18
1.1 Background & Problem Statement.....	18
1.2 Thesis Problems.....	21
1.3 Thesis Objectives.....	21
1.4 Significance of Study.....	22
1.5 Research Questions.....	22
1.6 Hypothesis.....	22
1.7 Thesis Structure.....	23
CHAPTER 2 - LITERATURE REVIEW.....	24
2.1 Theoretical Perspectives.....	24
2.1.1 Self Driving Car (SDC) and Autonomous Mobile Robot (AMR).....	24
2.1.2 Outdoor Navigation.....	26
2.1.3 Robot Localization.....	27
2.1.3.1 Extended Kalman Filter.....	28

2.1.3.2 Particle Filter / Adaptive Monte Carlo Localization (AMCL)	29
2.1.5 Simultaneous Localization and Mapping (SLAM)	30
2.1.5.1 slam_toolbox	33
2.1.6 Visual-Inertial-Odometry (VIO)	34
2.1.6.1 Intel Realsense T265 Tracking Camera	35
2.2 Previous Work or Design	36
2.2.1 Development of Scaled-Down Self-Driving Car for Last-Mile Delivery Based on ROS2	36
2.2.2 Investigating Simultaneous Localization and Mapping for an Automated Ground Vehicles	37
2.2.3 Seamless Indoor-Outdoor Autonomous Navigation for Unmanned Ground Vehicles (UGV)	39
CHAPTER 3 - DESIGN AND METHODOLOGY	42
3.1 System Overview	42
3.2 Components of Design	43
3.2.1 Mechanical Design	43
3.2.1.1 Cameras Bracket	44
3.2.2 Electrical Design	46
3.2.2.1 Battery Design Justification	47
3.2.2.2 PSU Design Justification	49
3.2.3 Hardware Design	53
3.2.3.1 Main Computers (NUC Mini PC)	55
3.2.3.2 Microcontroller (Teensy 4.1)	56
3.2.3.3 Obstacle Detection (Intel Realsense D415)	57
3.2.3.4 Primary Localization (RTK/GNSS)	58
3.2.3.5 Primary Robot Odometry (IMU and Rotary Encoder)	59

3.2.3.6 Visual Inertial Odometry (Intel Realsense T265)	59
3.2.4 Software Design	61
3.2.4.1 ROS2 DDS Firewall Setup	63
3.2.4.2 Robotic Framework	63
3.2.4.3 Intel Realsense Cameras	66
3.2.4.4 RTK/GNSS Packages	68
3.2.4.5 Localization	71
3.2.4.6 Autonomous Navigation	72
3.3 Design Modelling	73
3.3.1 GNSS Data to Cartesian Coordinate System Conversion	73
3.4 Performance Test	75
3.4.1 Depth Camera Image Capture Test	75
3.4.2 Robotic Framework and Firmware Optimization	75
3.4.3 SLAM and Mapping	75
3.4.4 Tracking Camera Configuration and Optimization	76
3.4.5 Localization Test Across Different Sensors	76
3.4.6 Autonomous Navigation Test	76
3.4.7 Outdoor AMR Development Summary	76
CHAPTER 4 - RESULTS AND DISCUSSIONS	77
4.1 Depth Camera Image Capture Test	77
4.1.1 SDK Configuration and Test	77
4.1.2 Rviz2 Test	79
4.2 Robotic Framework and Firmware Optimization	80
4.2.1 Firmware Configuration	80
4.2.1.1 Configuration Header File	80

4.2.1.2 Firmware Code Configuration	81
4.2.2 Teleoperation Test	84
4.3 SLAM and Mapping Test	88
4.3.1 SLAM Launching Procedure	88
4.3.2 SLAM Test	89
4.4 Tracking Camera Configuration and Optimization	92
4.4.1 Tracking Camera SDK Pose Test	92
4.4.2 Tracking Camera Package Configuration for ROS2	94
4.4.3 Tracking Camera and Linorobot2 Integration	95
4.4.3.1 Odometry Topic Substitution	96
4.4.3.2 IMU Calculation Problem and Topic Substitution	96
4.4.3.3 robot_localization Package Termination	97
4.4.4 Tracking and Depth Camera Combination	100
4.4.5 Tracking Camera Package Development Summary	101
4.5 Localization Test Across Different Sensors	102
4.5.1 Straight Line Odometry Test - Local Odometry	102
4.5.2 Straight Line Odometry Test - Tracking Camera	106
4.5.4 Square Path Odometry Test - Local Odometry	108
4.5.5 Square Path Odometry Test - Tracking Camera	111
4.5.6 Odometry Test Result Comparison and Summary	113
4.6 Autonomous Navigation Test	115
4.6.1 Nav2 Configuration	115
4.6.2 Nav2 - Rviz2 User Interface	118
4.6.3 Autonomous Navigation and Obstacle Detection Test	119
4.7 Outdoor AMR Development Summary	121

CHAPTER 5 - CONCLUSIONS AND RECOMMENDATIONS	123
5.1 Conclusions	123
5.2 Recommendations	125
GLOSSARY	126
REFERENCES	128
APPENDIX A - DATASHEETS	131
APPENDIX B - ROS2 TERMINAL LOG RESULTS	138
APPENDIX C - AMR RQt GRAPH	141
APPENDIX D - BILL OF MATERIAL	142
CURRICULUM VITAE	144

LIST OF FIGURES

Figure 2-1	Example of AMR in an Outdoor Environment	25
Figure 2-2	Example of Robot Localization in A Cartesian Based Map	27
Figure 2-3	Illustration of EKF-Based Localization	29
Figure 2-4	Illustration of Particle Filter Based Localization	29
Figure 2-5	SLAM Processing Flowchart	30
Figure 2-6	Pre- and Post-SLAM Operation Comparison	31
Figure 2-7	2D-Based SLAM Mapping Result	
Figure 2-8	3D-Based SLAM Mapping Result	32
Figure 2-9	slam_toolbox Mapping Result	34
Figure 2-10	Illustration of Visual-Inertial-Odometry Concept Operation	35
Figure 2-11	Intel Realsense T265 Tracking Camera	35
Figure 2-12	Electrical and Hardware Diagram (Existing Research 1)	36
Figure 2-13	Hardware Diagram (Existing Research 2)	
Figure 2-14	Sensors Placement (Existing Research 2)	38
Figure 2-15	Trajectory Results Across Different SLAM Methods (Existing Research 2)	39
Figure 2-16	Graph Error Representation of AMCL vs EKF	
Figure 2-17	Path Visualization of AMCL vs EKF	40
Figure 3-1	Task Division Diagram	42
Figure 3-2	Outdoor AMR Mechanical Design Overview	44
Figure 3-3	Bracket for Intel Realsense Cameras	44
Figure 3-4	Cameras Setup on The Outdoor AMR	45
Figure 3-5	PCB Design of The Outdoor AMR	46

Figure 3-6	Battery Duration vs Load Current at 12V	47
Figure 3-7	Sketch of Acting Forces when Turning (Top View).....	49
Figure 3-8	DC Motor Performance Curve	51
Figure 3-9	GPS-Based Configuration Hardware Diagram	53
Figure 3-10	Tracking Camera-Based Configuration Hardware Diagram	54
Figure 3-11	Intel NUC6CAYH	
Figure 3-12	Intel NUC7I7BNH-16S480	55
Figure 3-13	Teensy 4.1	56
Figure 3-14	Intel Realsense D415	57
Figure 3-15	GPS-RTK2 Module	58
Figure 3-16	HE50-B Rotary Encoder	
Figure 3-17	MPU9250 IMU Unit	59
Figure 3-18	Intel Realsense T265	60
Figure 3-19	GPS-Based Configuration Flowchart	61
Figure 3-20	Tracking Camera-Based Configuration Flowchart	61
Figure 3-21	RTK/GNSS System RQT Graph	68
Figure 3-22	Configuration Saving	
Figure 3-23	USB Port Configuration	69
Figure 3-24	NTRIP Client Settings	
Figure 3-25	NTRIP Receiver - Client Connection	69
Figure 3-26	Longitude and Latitude Lines	
Figure 3-27	WGS84 Ellipsoid Earth Model	73
Figure 4-1	Depth Camera Testing Scenario	77
Figure 4-2	Low Exposure Setting of The Image Capture Result	78
Figure 4-3	High Exposure Setting of The Image Capture Result	78

Figure 4-4	Raw (Left) and Depth (Right) Image Results in RViz2	79
Figure 4-5	Two Motors and Encoders Utilization - Configuration File	81
Figure 4-6	Micro ROS Arduino Library Inclusion - Firmware	81
Figure 4-7	Micro ROS Serial Function Disablement - Firmware	82
Figure 4-8	Two Motors and Encoders Utilization - Firmware	82
Figure 4-9	Terminal Log Messages of A Successful Bringup	83
Figure 4-10	RQT Graph of The AMR after Bringup	84
Figure 4-11	Teleoperation Test Setup	85
Figure 4-12	Linear and Angular Velocity Multipliers - Firmware	85
Figure 4-13	PID Constants - Configuration File	86
Figure 4-14	RQT Graph of Depth Camera and Laser Scan Conversion	88
Figure 4-15	Outdoor SLAM Test - With Walls	
Figure 4-16	Outdoor SLAM Test - Without Walls	89
Figure 4-17	SLAM Map Result - With Walls	
Figure 4-18	SLAM Map Result - Without Walls	90
Figure 4-19	Google Cartographer SLAM Map Result	91
Figure 4-20	Tracking Camera SDK Indoor Test Setup	92
Figure 4-21	Pose Results of The Tracking Camera SDK Test	93
Figure 4-22	Incomplete Pose Loop Closure Occurrence	94
Figure 4-23	D435 Depth Camera Package Exclusion - realsense_launch.py ...	95
Figure 4-24	RQT Graph of The T265 Tracking Camera	95
Figure 4-25	/odom/unfiltered Section Comments - Firmware	96
Figure 4-26	RQT Graph of The Additional IMU Package	97
Figure 4-27	/rs_t265/odom and /odom Plot Test Result	97
Figure 4-28	/rs_t265/odom and /odom Plot Test Result - Stationary	98

Figure 4-29	RQt Graph of The T265 Tracking Camera and Combined with Linorobot2	99
Figure 4-30	Unison Launch File of All Camera--Based Packages	100
Figure 4-31	Terminal Message Logs after Launching cam_combined_launch.py	101
Figure 4-32	Straight Line Odometry Test Scenario	102
Figure 4-33	Odometry Multiplier Adjustments - Firmware	103
Figure 4-34	11.76 Odometry Multiplier Plot (Test 1)	
Figure 4-35	11.11 Odometry Multiplier Plot (Test 1)	105
Figure 4-36	Sunny Condition Tracking Camera Odometry Plot (Test 1)	107
Figure 4-37	Tracking Camera Pose Data Deviation Plot	108
Figure 4-38	Square Path Odometry Test Scenario	109
Figure 4-39	Square Path Local Odometry Plot	109
Figure 4-40	Square Path Tracking Camera Odometry Plot	111
Figure 4-41	Blank Map.pgm	115
Figure 4-42	Map Selector Section - navigation2.launch.py	116
Figure 4-43	Static Transform Code Section for The Tracking Camera - realsense_launch.py	117
Figure 4-44	The Full RQt Graph of The AMR's System	117
Figure 4-45	Navigation2 Panel in RViz2	118
Figure 4-46	Obstacle Detection in Nav2	119
Figure 4-47	Autonomous Navigation and Obstacle Detection Test Scenario .	120
Figure 4-48	AMR Initial Navigation Path	
Figure 4-49	AMR Alternative Navigation Path due to Obstacle	120
Figure A-1	T265 Tracking Camera - Datasheet 1	131
Figure A-2	T265 Tracking Camera - Datasheet 2	132
Figure A-3	D415 Depth Camera Datasheet	133

Figure A-4	ZED F9P RTK/GNSS Module - Datasheet 1	134
Figure A-5	ZED F9P RTK/GNSS Module - Datasheet 2	135
Figure A-6	PSU Datasheet	135
Figure A-7	12V Battery - Datasheet 1	136
Figure A-8	12V Battery - Datasheet 2	137
Figure B-1	Combined Camera Launch File Terminal Log	138
Figure B-2	Linorobot2 Bringup Launch File Terminal Log	138
Figure B-3	Nav2 Launch File Terminal Log	139
Figure B-4	Turtlebot3 teleop Terminal Log	140
Figure C-1	Full RQt Graph of The AMR	141

LIST OF TABLES

Table 3-1	Rated Output Current Across Different Electrical Components	48
Table 3-2	AMR Physical Assumptions and Values of Design	49
Table 3-3	Parameters for WGS84 Model	74
Table 4-1	Depth Camera Image Result Conclusive Table	79
Table 4-2	AMR Motor Tuning Summary Table	87
Table 4-3	/rs_t265/odom and /odom Plot Description	98
Table 4-4	Tracking Camera Development Summary Table	101
Table 4-5	Straight Line Odometry Test Data Table - Wheel Odometry and IMU Fusion	104
Table 4-6	Straight Line Odometry Test Data Table - Tracking Camera	106
Table 4-7	Ideal Plot Conjecture of Odometry Data in a Square Motion	110
Table 4-8	Quantitative Odometry Test Summary	113
Table 4-9	Qualitative Odometry Test Summary	113
Table 4-10	Summary of Current Status of Outdoor AMR Development	121
Table D-1	Outdoor AMR Bill of Material	142