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 ± 0.05m 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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