



[Table of](#) [Author Guidelines](#)

Journal of Sensors
Volume 2015, Article ID 425732, 14 pages
<http://dx.doi.org/10.1155/2015/425732>



Research Article

Locomotion Strategy Selection for a Hybrid Mobile Robot Using Time of Flight Depth Sensor

Artur Saudabayev, Farabi Kungozhin, Damir Nurseitov, and Huseyin Atakan Varol

Department of Robotics, School of Science and Technology, Nazarbayev University, Astana 010000, Kazakhstan

Received 29 November 2014; Accepted 22 March 2015

Academic Editor: Andreas Schütze

Copyright © 2015 Artur Saudabayev et al. This is an open access article distributed under the [Creative Commons Attribution License](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

The performance of a mobile robot can be improved by utilizing different locomotion modes in various terrain conditions. This creates the necessity of having a supervisory controller capable of recognizing different terrain types and changing the locomotion mode of the robot accordingly. This work focuses on the locomotion strategy selection problem for a hybrid legged wheeled mobile robot. Supervisory control of the robot is accomplished by the terrain recognizer, which classifies depth images obtained from a commercial time of flight depth sensor and selects different locomotion mode subcontrollers based on the recognized terrain type. For the terrain recognizer, a database is generated consisting of five terrain classes (Uneven, Level Ground, Stair Up, Stair Down, and Nontraversable). Depth images are enhanced using confidence map based filtering. The accuracy of the terrain classification using Support Vector Machine classifier for the testing database in five-class terrain recognition problem is 97%. Real-world experiments assess the locomotion abilities of the quadruped and the capability of the terrain recognizer in real-time settings. The results of these experiments show depth images processed in real time using machine learning algorithms can be used for the supervisory control of hybrid robots with legged and wheeled locomotion capabilities.

[About this Journal](#) · [Abstracting and Indexing](#) · [Aims and Scope](#) · [Article Processing Charges](#) · [Bibliographic Information](#) · [Editorial Board](#) · [Editorial Workflow](#) · [Publication Ethics](#) · [Reviewer Resources](#) · [Submit a Manuscript](#) · [Subscription Information](#) · [Table of Contents](#)

[Annual Issues](#) · [Open Special Issues](#) · [Published Special Issues](#) · [Special Issue Resources](#)

Subscribe to
[Table of Contents Alerts](#)



[Jobs](#)

Publish with Us

[Submit Manuscript](#)

[Browse Journals](#)

[For Authors](#)

Work with Us

[Institutions](#)

[Publishers](#)

[Editors](#)

Legal

[Terms of Service](#)

[Privacy Policy](#)

[Copyright](#)

MAGNETOINDUCTIVE COMPASSES 12.1 MECHANICAL MAGNETOINDUCTIVE COMPASSES 12.1.1 Bismore Stargate Magnetic Compass 12.2 FLUXGATE COMPASSES 12.2.1 Zemco Fluxgate Compasses 12.2.2 Watson Gyro Compass 12.2.3 KVH Fluxgate Compasses 12.2.4 Applied Physics Systems Miniature Orientation Sensor 12.3 MAGNETOINDUCTIVE MAGNETOMETERS 12.3.1 Precision Navigation TCM Magnetoinductive Compass 12.4 HALL-EFFECT COMPASSES.