MACHINE LEARNING BASED LOCOMOTION STRATEGY SELECTION FOR A LEGGED WHEELED HYBRID QUADRUPED

A.Saudabayev, F.Kungozhin, D.Nurseitov, H.A.Varol*

School of Science and Technology, Nazarbayev University, Astana, Kazakhstan; *ahvarol@nu.edu.kz

INTRODUCTION.

Mobile robots can navigate different terrains using *legs, wheels, articulated mechanisms (e.g. snakes) and hybrid configurations*. Hybrid mobile robots with the ability of executing different locomotion types can significantly enhance the performance of mobile robots in unstructured mixed terrain environments. For these types of robots, it becomes vital to have a supervisory controller with terrain recognition and locomotion strategy selection mechanisms.

RESULTS AND DISCUSSION.

In this work we present the Nazarbayev University Hybrid Quadruped (Fig. 1) – four legged and four wheeled mobile robot platform capable of navigating in both configurations avoiding the shortcomings of robots with single locomotion mode. The major novelty of the robot is the implementation of the supervisory controller which selects a locomotion mode associated with particular terrain types based on the classification of depth images acquired by a RGB-Depth camera. The accuracy of the terrain classification for the testing database in a five class terrain recognition problem (Level Ground, Non-traversable, Stair Down, Stair Up, Uneven terrain types) is 96.7% percent. Majority voting filter technique is used to increase the reliability of the terrain recognizer decisions.

Series of experiments, including the real-time locomotion experiment, conducted in different terrain and mixed terrain environments evaluate the capability and efficiency of the system. Results obtained during the experiment show that the classification of terrain depth images might serve as an efficient instrument for locomotion strategy selection for hybrid robots mobile robots.

Figure 1. Nazarbayev University Hybrid Quadruped