World Academy of Science, Engineering and Technology
International Journal of Electrical and Computer Engineering
Vol:11, No:06, 2017

Terrain Classification for Ground Robots Based on Acoustic Features

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Abstract : The motivation of our work is to detect different terrain types traversed by a robot based on acoustic data from the robot-terrain interaction. Different acoustic features and classifiers were investigated, such as Mel-frequency cepstral coefficient and Gamma-tone frequency cepstral coefficient for the feature extraction, and Gaussian mixture model and Feed forward neural network for the classification. We analyze the system’s performance by comparing our proposed techniques with some other features surveyed from distinct related works. We achieve precision and recall values between 87% and 100% per class, and an average accuracy at 95.2%. We also study the effect of varying audio chunk size in the application phase of the models and find only a mild impact on performance.

Keywords : acoustic features, autonomous robots, feature extraction, terrain classification
Conference Title : ICSPC 2017 : International Conference on Signal Processing and Communications
Conference Location : San Francisco, United States
Conference Dates : June 07-08, 2017