Abstract

Horizon line detection is a demanding problem in various tasks associated with planet exploration, because no standard approaches such as global positioning system is available. Horizon line is a boundary line defined between a sky and non-sky region in 2D images, and it is an important visual clue that can be utilized for calculating the rover's position and orientation during planetary missions. The problem of segmenting an image into sky and non-sky regions is classically referred as "horizon line detection". Subsequently, the localization problem can be solved by matching the detected horizon line in 2D images with virtually generated horizon lines from 3D terrain patterns. In this paper, we propose a new real-time horizon line detection (HLD) method by coupling clustering and classifications, as well as implementing the algorithm on the NVIDIA's compute unified device architecture.
The proposed method has been evaluated on NASA Basalt Hill dataset and on a set of mountainous images that have been collected from the web. The experiments demonstrate high accuracy in determining the horizon line that is proven by provided Receiver Operating Characteristic (ROC) curves.

References

- Kim B., Shin J., Nam H. and Kim J. 2011 Skyline Extraction using a Multistage Edge
Filtering World Academy of Science, Engineering and Technology.
- http://www.ee.unlv.edu/~yazdan/projects.html
- Pour Yazdanpanah A., Regentova E. E., Mandava A. K., Ahmad T., Bebis G. 2013 Sky Segmentation by Fusing Clustering with Neural Networks. 9th International Symposium on Visual Computing (ISVC), 663-672.

Index Terms

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