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PERCEPTION BASED AUTONOMOUS TARGET SELECTION FOR CLIMBING ROBOTS

Abstract

Our past missions of robotic exploration on Mars has been quite successful. This success has inspired us to take next steps in robotic planetary exploration. The craters of the moon and caves or lava tubes on Mars remain difficult to explore because the conventional wheeled robots are unable to reach these environments. The exploration of these secluded regions will bring us an opportunity for new scientific discoveries.

This paper presents development of perception based robust robotic grasp for climbing robots for autonomous planetary exploration. The climbing robots that have a mechanism to grip on the rocky surface can be an effective solution to explore on steep slopes, cliffs, and caves. The work described in this paper uses the open source Dex-Net-2.0 dataset developed by AUTOLAB. We are using this dataset to develop a Grasp Quality Convolution Neural Networks model that could predict the probability of success of grasp.

To identify a particular robotic grasp is challenging because of inaccuracy in actuation and sensing, which leads to uncertainty about properties such as object's pose, shape, mass, and material properties. The analytical grasp planning method involves processing 3D point cloud data by training such images as segmentation, classification, and geometric pose estimation in order to precompute grasp. However, this multi stage approach requires many hyperparameter tuning which can lead to errors in the prediction. The approach presented in this paper is to use deep learning on depth images taken by RGB-D sensors to estimate 3D object shape and pose.