Correct correspondence selection between points on two asteroid images using epipolar constraint

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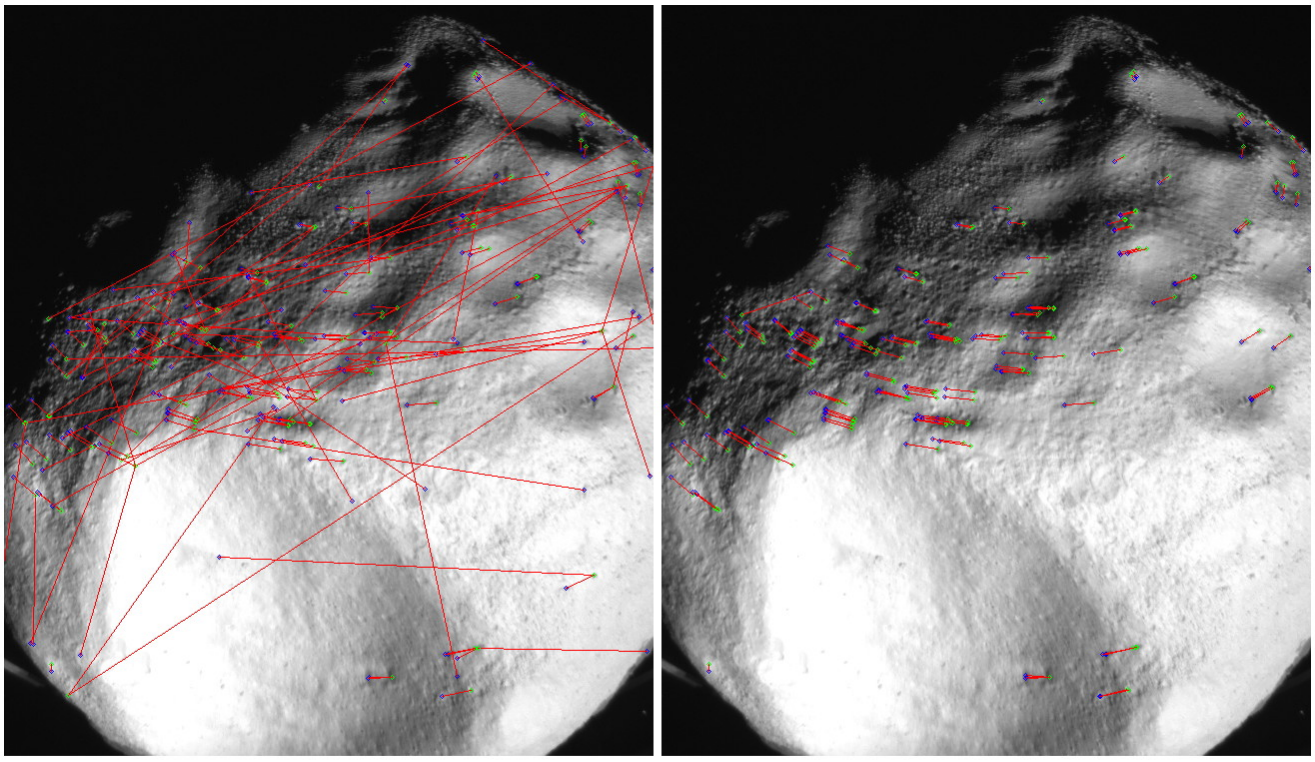
In asteroid exploring missions like HAYABUSA 2, it is often needed to compute the shape of the target asteroid using its images taken after the space craft arrives at the asteroid. In this computation process, correspondences between points on two images taken from different view direction have to be established. In order to accomplish this task automatically, we first extract image features from the two images using image processing techniques, and compute matched pairs of them based upon similarity of the features. However, this similarity based matching produces relatively high rate of wrong correspondence. However, if we use epipolar constraint, which gives the relation between image positions of an object point on two images taken from different view points, it is expected that we can reduce the error rate of the correspondence. This report states the experimental results of this approach. In the experiments, we used images of an asteroid model made in JAXA, and AKAZE (Alcantarilla et al. 2013) as the image feature. The correct matches were selected by human eyes as the ground truth. In the case that the correct matching rate is 68 percents when using only the feature similarity, the correct matching rate increased to 97 percents when using epipolar constraint too. This result suggests using epipolar constraint is effective when establishing feature correspondence between two asteroid images.

Keywords: epipolar constraint, fundamental matrix, asteroid image, point correspondence, AKAZE



correspondances without epipolar constraint correspondances with epipolar constraint

