Performance comparison between SIFT and AKAZE for corresponding point computation on asteroid images

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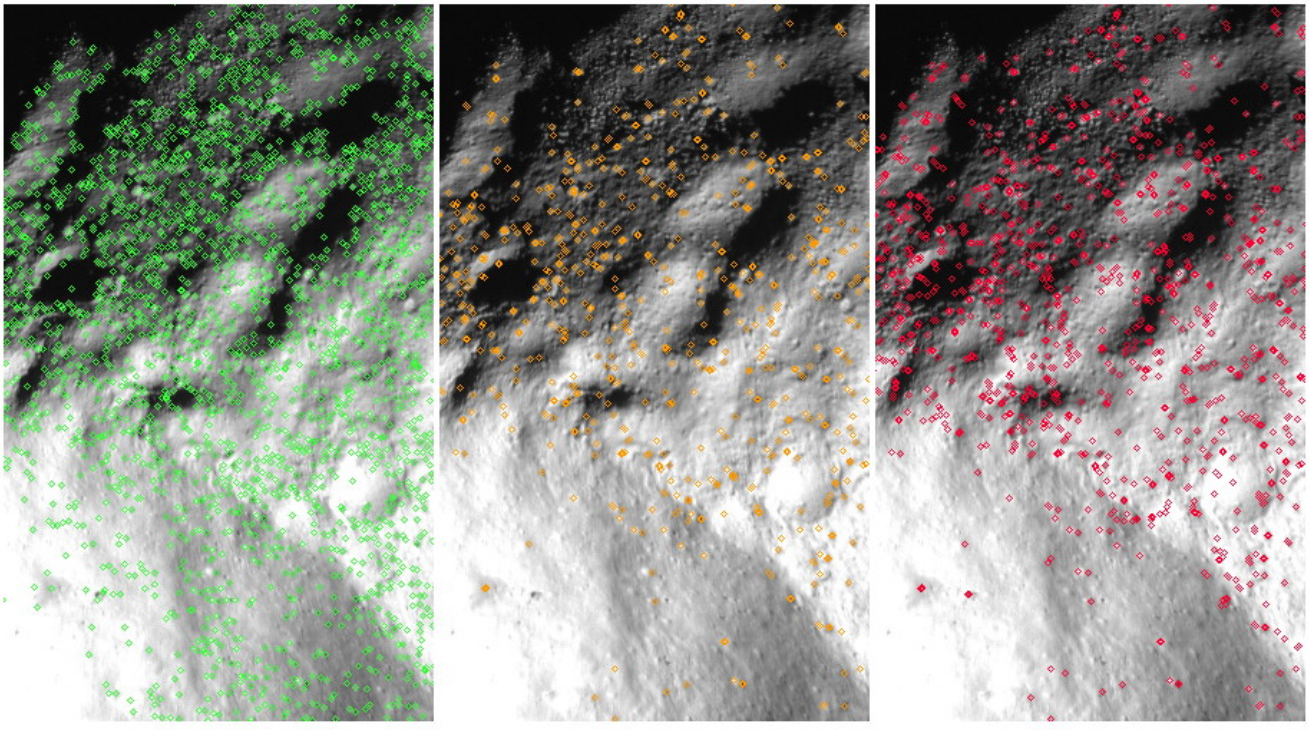
In asteroid exploring missions like HAYABUSA 2, it is often needed to compute the shape of the target asteroid using its images taken after the space craft arrives at the asteroid. In this computation process, correspondences between points on two images taken from different view direction have to be established. In order to accomplish this task automatically, image features computed by image processing techniques are used. Among many image features, it is reported that SIFT (Lowe 2004) has good performance for the current purpose (Takeishi et al. 2015). However, SIFT is protected by patent and this can be an obstacle for some situations. On the other hand, AKAZE (Alcantarilla et al. 2013), which was proposed after SIFT, has no limitation in its usage. So, we have compared the performances of SIFT and AKAZE when using them to asteroid images. In the experiments, images of an asteroid model made in JAXA were used. The number of feature points detected by SIFT (e.g. around 6000) is greater than that by AKAZE (e.g. around 3000), but even the number of points by AKAZE is enough amount for the current purpose. The error rates by SIFT and AKAZE for the correspondence computation between two images taken from different view angles are almost the same (e.g. 30 to 40 percents), and sometime the error rate by AKAZE becomes smaller the rate by SIFT (e.g. 32 vs. 36 persents). From these experimental results, we conclude AKAZE has enough performance for correspondence computation for asteroid images.

Keywords: SIFT, AKAZE, asteroid image, feature point, point correspondence



feature points by SIFT | common feature points | feature points by AKAZE

