Registration of UAV Overlapped Image

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Abstract

The goal of this study is to explore the possibility of KLT tracker for tracking the features between two images including rotation and shift. As a test site, Jangsu-Gun area of South Korea is selected and the images taken from UAV camera are used for analysis. The analysis was carried out using KLT tracker developed in a PC environment. The results of the experiment used two images with the large overlapping area are compared with the results of two images with the little overlapping area and rotation. Overall, the research indicates that the integrated features of littlerotation and motion images can significantly increase during the tracking process. But using KLT tracker for extracting and tracking features between images with large rotation and motion, the number of tracked features are decreased.

Keywords: Image registration, KLT tracker, UAV camera, Tracking feature

1. Introduction

At present, the development stage of image registration is entering a new challenging era, the era of so called Unmanned Aerial Vehicle (UAV) platform which is one of the advanced imaging systems that has significant flight performance and autonomous on-board processing capabilities. Moreover nowadays, UAV Video sequences have been widely used for either image mosaic, generating geo-referenced map or obtaining a timely and quick acquisition of the damage-related information. Image registration is the process of matching two or more images taken at different times from different sensors or from different viewpoints.(B. D. Lucas and T. Kanade,1981)

The aim of this study is to explorethe usage of effective and robust KLT feature tracker for extracting features and tracking of them between two images including large translation. Within the framework of the study, we have used the data of real video sequences with frames captured by UAV camera.

2. KLT Feature Extraction and Tracking

In this technical method, feature extraction procedure is made in every image and the feature tracking can only get translation between the two image(Shu Zhilong Ruan Qiuqi, 2000).

nowadays, KLT Tracker proposed by Lucas and Kanade and Shi Tomasi have been widely used in computer vision, image processing and photogrametry(B. D. Lucas and T. Kanade, 1981). A General algorithm of the tracker can be described as follow: 1) to extract good features from the first frame taken from the given frames, 2) to track the features in the next frames, 3) while the feature are being tracked in the next frame if there are lost features they can be replaced by good features using KLT feature detector. And also the second image, which features are tracked, can be stored and recalled the next time as the first image in the each iteration.

3. Test and Analysis

As a test site, Jangsu-Gun of South Korea has been selected. The area represents a residential zone in rural area and a pair of image whose size is 350x240 pixels is selected from images created by UAV video sequence. Four type frames used in experiment include the shrinking and distortion of geometry. Type A of image includes the large motion along to the two directions, X and Y, while a pair of images. Type B has alittle rotation between images used in experiment. And also Type C includes the rotating, shrinking and large motion, While type D include very little motion and rotation. In the results of the tracking process made by KLT tracker, image A and image C used in the experiment show that many lost feature occurs. But the many features could be tracked in case of images B and image D.

4. Conclusion

When the shift between frame are small, the features extracted from the first frame of two images can successfully track through the next image by using iterative implementation of the KLT tracker. But the many features lost in case of large shifted and rotated images and also the corresponding points still included the mismatched points. Future research will be focused on reducing themismatched features.

5. References

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