A Study on Video Stitching Method for Effective UWV Video Production

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ABSTRACT

In this paper, we propose a video stitching method for creating panoramic contents using videos captured by two different smartphone cameras. We stitch video using SURF (Speed Up Robust Feature) and multi blending algorithm. In order to improve the accuracy of video stitching, sensor data (e.g., inertia sensors) of smartphone was used and linear homography matrix generation method was applied to stabilize the shaking of the resultant video. Finally, the experiment was conducted to find shooting constraints (e.g., the distance from the subjects and shooting angle requirements) required for producing continuous stitching contents captured by smartphones.

Keywords: Ultra-wide viewing, video stitching, inertia sensor

1. INTRODUCTION

Current panoramic content should use the cameras with fixed angles or specially designed cameras. However, in this paper, we propose a video stitching method which uses videos captured by two different smartphone cameras. The proposed stitching method uses smartphone sensor data, linear homography matrix generation method, SURF(Speed Up Robust Feature) and multi-band blending algorithm[1][2].

2. VIDEO STITCHING METHOD

The image stitching method utilizing the inertial sensor data on 3DoF images produces smooth stitching results when visually evaluated by naked eyes[3][4]. However, when the stitched frames are played as a video, there occurs substantial shaking during play because each frame has different homography matrix. In order to solve this problem, we applied the linear homography matrix generation method [5] that uses homography matrix and sensor data. The feature extraction was performed by the SURF algorithm, and the blending method was performed the multi-band blending method. Figure 1 shows a flow chart of the proposed stitching process.

![Figure 1. Flow chart of proposed stitching method](image)
3. EXPERIMENT METHOD
In this experiment, two smartphone cameras were placed on the same line, and the stitching results of the video taken at different angles between the two smartphones were evaluated. Also, the distance between the two smartphones was placed differently which are 15cm, 30cm and 45cm, respectively. The angle of each smartphone was changed gradually by 10 ° between 70 ° and 110 °. The video stitching was performed at 100 frames for each distance and angle combination. The video stitching accuracy was evaluated based on good (3), fair (2), and poor (1) (Fig. 2).

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(a) | (b) | (c)

Figure 2. Stitching results by camera angle, (a) the distance between two smartphones is 15cm, (b) the distance between two smartphones is 30cm, (c) the distance between two smartphones is 45cm.

4. CONCLUSION
In this paper, we propose a video stitching method for the production of panoramic video using smartphone. Based on this, we have experimented on videos taken from different distances and angles between two smartphones. The video stitching test showed that the stitching accuracy was higher when the distance between the smartphones was less than 30cm compared to the distance of 45cm. Also, the stitching accuracy is lowered when the angle difference between the two smartphones is more than 20 °. Future research is needed to measure the optimal distance and angle of panorama video using smartphones.

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REFERENCES