Chapter 5.

Conclusions and Future Works

5.1 Conclusions

In this thesis, a real-time distance-scanning system based on manifold projection is developed. To speed up the estimation of camera motion between continuous frames in a video sequence, a winner-update strategy for block matching is adopted to achieve real-time requisition. Because it is unavoidable to misestimate motion vectors by using block matching, a robust motion vector estimation technique, referred to as the projected median, is performed to refine the final estimated motion vector. As a result, we can construct panoramic mosaics with good performance in real-time.

We have done a theoretical study by proposing new geometric equations for reconstructing wide-field drawings automatically. Instead of using multiple images taken with perspective cameras, we use a video camera (moving along a track) to acquire a manifold mosaic, and a linear pushbroom camera model is employed to model the mosaic images obtained in this way. Mathematical models are conducted for the case that multiple linear pushbroom cameras are used to take a planar scene, which is a relatively unexplored area and has not been well studied in the past. We have shown that, by giving a sufficient number of corresponding image points, other image correspondences can be exactly determined, and this property is used to stitch two partial LP-mosaics and an affine reconstruction can be achieved. Then, by assuming the drawing is of rectangular shape, a Euclidean reconstruction can be achieved when the ratio of the width and height of the drawing is given. Several mosaic images are combined for obtaining a complete wide-field image. Advantages of using such an approach include less burden of stitching and much more efficiency.

5.2 Future Works

Several future works are listed as follows:

1. Exploring geometric relationships by using corresponding one-to-one curve-to-curve lines between several LP-mosaic images: Unlike finding

corresponding matching points to determine the *LP-planar homography* matrix H_{LP} in this work, if we can use corresponding curve-to-curve lines between a pair of LP-mosaic images, it will be more accurate for estimating H_{LP} and the property of a drawing, rectangular shape, can be used to reconstruct a drawing with four right-angles and four straight border lines.

2. Finding ratio of width to height automatically from LP-mosaic images: In this thesis, we assume the ratio *r* of width to height is a prior knowledge and which can be measured in advance. We plan to loose this constraint by calibrating internal parameters of the linear pushbroom model (*f*, P_v, and **V** in Eq. 1.14) in advance.