Chapter 1
Introduction

1.1 Preliminary

Digital camera is a convenient and common device for image processing. However, different from traditional cameras, digital cameras have a nature limitation of spatial resolution that they map the real world scene to CCD or CMOS sensors and then form the finite number of pixels representing colors with digital values. Because of this limitation of digital cameras, it is impossible to reach both high resolution and wide sight purposes only by capturing a single image. In order to breakthrough the limitation, more and more investigators have paid their attentions and tried to improve the performance of image stitching process. Therefore, the image stitching has become an important and popular research topic.

Image stitching process is generally used to enhance the resolution of scenery or construct a panoramic image by fusing several individual images which have overlapping regions with others. Furthermore, the image stitching process has been successfully applied to many other kinds of image applications such as moving object detection and tracking [7], texture synthesis and transfer [3], and object insertion [9], etc. Therefore, image stitching process is widely used in various aspects of digital image processing.

1.2 The Procedures of Image Stitching Process

In this section, the image stitching process in this thesis is shown in Figure 1.1. At the beginning of the entire procedures of image stitching process, the camera calibration technique with Matlab toolbox is employed to correct the nature distortion caused from camera so-called lens distortion. After the camera calibration, the image registration with feature points extraction and feature matching methods are applied to find the relation between two input images. The feature points extraction obtains the feature points of two input images in gradient domain based on Sobel edge detection. Afterward, the matching pairs are obtained by normalized cross-correlation method and the useless features are eliminated. Afterward, the image mapping technique with a useful mapping model and mapping parameter vector is applied to represent the relation between two input images. Furthermore, random sample consensus can obtain an appropriate mapping parameter vector to save the calculation time base on the probability. Subsequently, image compensation method can successfully compensate the defects of the mapping model and map one image to match up the other such that the overlap region between two input images is detected.

After the relation among the input images with overlap regions are obtained, various image stitching techniques are employed to find the best way to composite them together, such as minimum error boundary cut, optimal partition and proposed novel image stitching technique. Finally, the image blending method is required to smooth and eliminate artificial edges along the border of the combined image. The details of the entire procedures of image stitching process in this thesis are mentioned from Chapter 2 to Chapter 6, respectively.

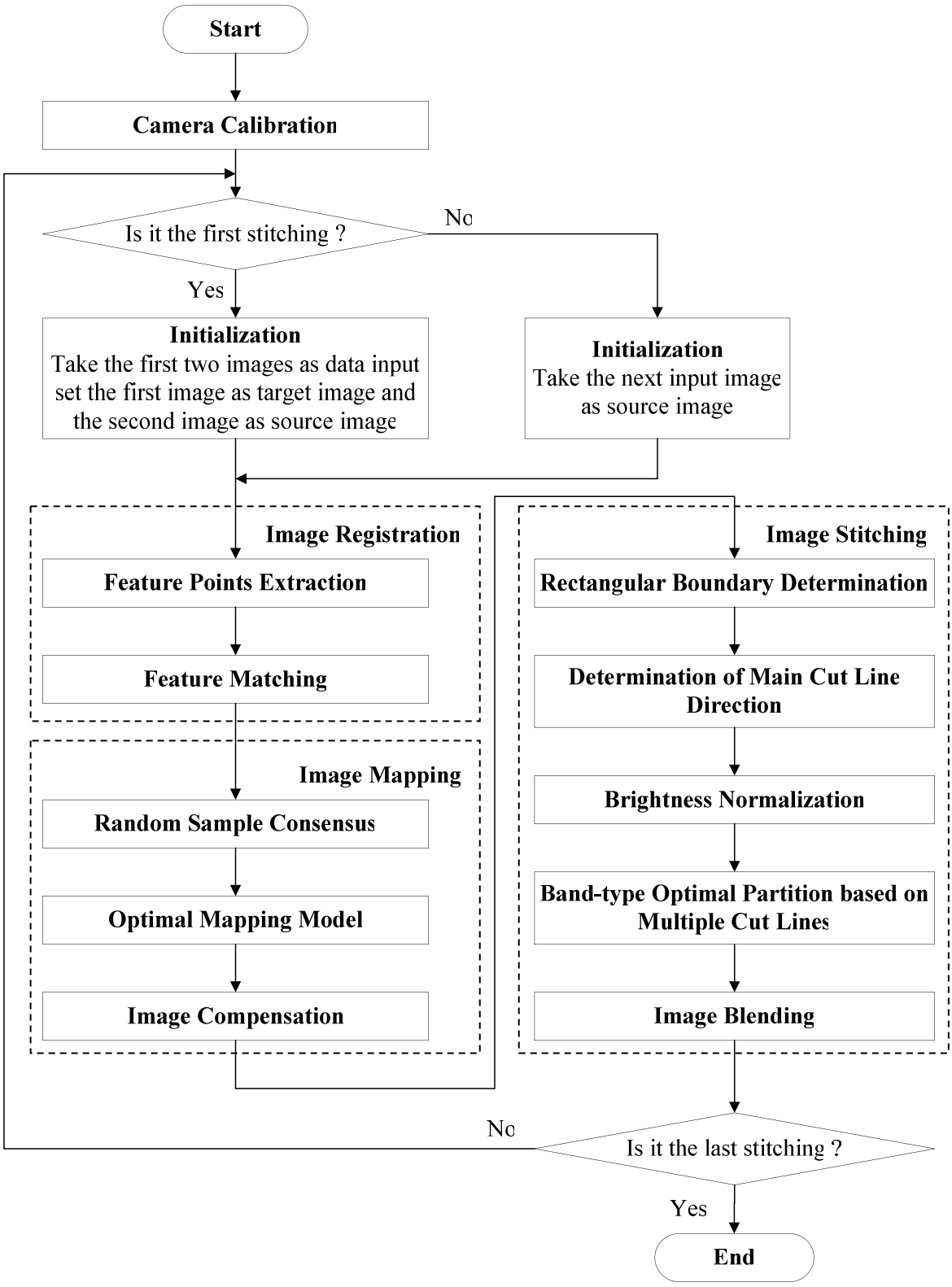

Fig 1.1 Flowchart of the image stitching processes proposed in this thesis