CHAPTER I

Introduction

1.1 Motivation

A lot of effort has been carried out to reconstruct the spatial geometry of scene using binocular stereovision systems. Most of the algorithms used a certain similarity measure between both stereoscopic images in order to match the correspondences. Unfortunately, matching homologous points between images is not always possible and false matches may appear. Thus, given a point in one image prediction algorithms must be used to fine the position of the homologous point in the second image. A computationally effective solution to overcome these difficulties relies on the use of multiple cameras vision system to reduce the amount of false matches. However, using multiple cameras represents a great deal of effort, since there are a lot of image data to be processed and there are many cameras to be calibrated. To realize a vision-based multiple cameras system which satisfies real-time tracking requirement, a high-performance hardware and fast image processing algorithm are needed. To overcome this requirement, a PC-cluster using fiber optic connection through PCI-to-PCI data mover interface is used.

1.2 Objective

To develop vision system that uses multiple cameras for tracking a moving object in 3-D space. The developed system uses multiple computers to increase both speed and efficiency. It can tracks the object in real-time.

1.3 Specifications

1.3.1 Developed system is a real-time system which can evaluate 3-D position of moving target.

1.3.2 Developed system has PC to PC communication component. This component increases efficiency and speed of the system in processing of multiple images captured by multiple cameras.

1.3.3 Developed system is multiple cameras system. It can increase and decrease number of camera in used, but number of camera must greater than three.

1.3.4 Developed system has computer user interface. It can display the path of moving object with 3-D visualization.

1.3.5 Progressive cameras have been used and they do not move.

1.3.6 The object that used as target will be specified with a specific shape such as spherical ball.

1.3.7 Developed program can run under Microsoft's operating system.

1.4 Procedures

1.4.1 Literature review

1.4.2 Specify details of all processes in vision-based 3-D tracking.

- 1.4.2.1 Camera calibration process.
- 1.4.2.2 Camera image capturing process.
- 1.4.2.3 Noise filtering process.
- 1.4.2.4 3-D reconstruction process.

1.4.3 Design programming modules of following system.

- 1.4.3.1 Real-time system.
- 1.4.3.2 Computers communication system for increase efficient of processing.
- 1.4.3.3 Systems which relate to the vision-based 3-D pose estimation such as camera calibration, noise filtering and 3-D reconstruction.
- 1.4.3.4 System which handles increment or decrement of the number of camera.
- 1.4.3.5 Graphic user interface.

1.4.4 Code the designed program.

1.4.5 Test overall system.

1.4.6 Readjust the system if some error occur and debug program.

1.4.7 Conclude this research.

1.4.8 Writ the completed thesis document.

1.5 Benefits

1.5.1 Developed system can be used for 3-D tracking of the moving object in real-time.

1.5.2 Developed system can be applied to a various applications such as 3-D measurement of complex surface, Auto navigation system, vigilance system, medical image analysis and computer user interface.

1.5.3 Developed system can be applied to other research in this field.