3D MODELING OF URBAN AREA BY USING VIDEO CAMERA

Tsukasa Hosmura [a,*], Tetsuo Ohta [b], Masaaki Shikada [c]

[a] Tokyo Denki University,Ishizaka, Hatoyama-machi, Hiki-gun, Saitama, 350-0394, Japan
hosomura@ia.dendai.ac.jp
[b] Taiyo Survey, 2-114-8, Imaisurugi-machi,Oyabe,Toyama, 932-0051,Japan
[c] Kanazawa Institute of Technology, Ohgigaoka, Nonoichi-machi, Ishikawa, 921-8501,Japan

Commission V, WG V/6

KEY WORDS: Video Camera, Rotation, Measurement, Distance

ABSTRACT:

By putting the video camera on the mount, which rotates at the steady speed, and taking the images of 360 degrees. It would be able to easily realize the 3D measurement of the object. In this study, such system was produced experimentally, and measurement accuracy was examined.

1. INTRODUCTION

Generally, 3D measurement of most equipment uses the principle of the triangular measure. There are several methods for example stereo method using the binoculus, spot projected method, pattern projected method and moire topography, etc. Stereo method is the passive method, other methods are active method, which projects the light. Stereo method using two cameras is called the binoculus stereoscopic vision. This method can be got 3D information of all points in the scene. However, it is difficult to find out the corresponding point in both scenes. In 3D modeling of the landscape, distance measurement of plural point on the object is sufficient for modeling in most cases. It is possible to calculate the distance to the corresponding point, which has reflected on the scene obtained from many directions on the horizontal surface. But, it is difficult to get many directions from stile camera. It was considered to use of video camera for this situation. By putting the video camera on the mount, which rotates at the steady speed, and taking the images of 360 degrees. It would be able to easily realize the 3D measurement of the object. In this study, such system was produced experimentally, and measurement accuracy was examined.

2. OUTLINE OF THE SYSTEM

This system has been composed of 3 components. These are digital video camera (SONY, Digital 8 Handycam, DCR-TRV310K), servomotor (FUJI ELECTRIC, GYC101DC1-S) and decelerate gear system. This gear system is used to rotate the camera in fixed minutes. This system is shown in Figure 1. Lower part is servomotor. Rotating time of camera can be changed several steps. Middle part is decelerate gear system. Rotating speed of servomotor is too fast for obtaining object images. Decelerate gear system can be slow down the rotating speed of servomotor. Top part is video camera. This camera can get object images by 720pixels x 400 lines at 30 scenes per one minute.

Figure 1. Video camera system used in this study

3. MEASURING METHOD OF THE DISTANCE

This equipment is set at plural positions (for example, camera A, camera B, camera C and so on) on the identical circumference, and video scenes of 360 degree circumferences are obtained, and the images are incorporated in personal computer by the frame rate (30 scene/second) equal to the general television system. By putting the video camera on the mount, which rotates at the steady speed, and taking the images of 360 degrees. It would be able to easily realize the 3D measurement of the object. By counting the scene number of one camera (for example camera A), the angle from the direction of other camera (for example camera B) to the target marker can be calculated. Angle from the direction of camera A to the same target marker can be calculated by using the other camera B. As the result, distance from camera A to the target marker can be found out. The distances from each camera to the markers are calculated by using the above method.

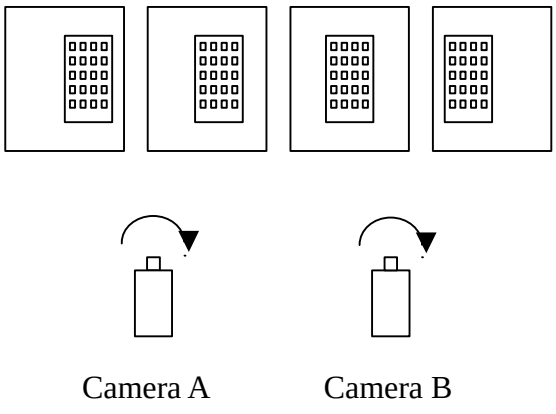

Figure 2. Image sequences of obtained movie

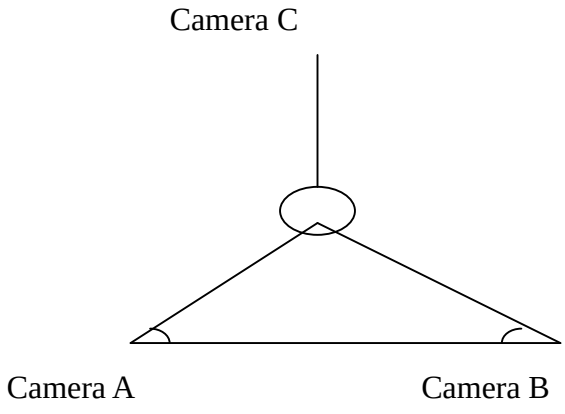

Figure 3. Measuring method of the angles

4. COMPARISON BETWEEN EXPERIMENTAL RESULT AND MEASURED DISTANCE

The measurement was carried out using this system. Analysis of image sequence did not finished. We will show the experimental result at the workshop. Measurement accuracy will be also examined. If we have time, we can show 3D model of the building.

Figure 4. Experiment executed in Kanazawa Institute of Technology

5. SUMMARY

In this system, there are some merits compare with conventional surveying method. Only one stuff is sufficient for measurement. Images obtained from video camera can be memorized. The object can be freely chosen.

REFERENCE

Hosomura, T., 2001. 3D Modeling of Earthenware by Using Video Camera. Proc. of International Workshop on Recreating the Past –Visualization and Animation of Cultural Heritage- Ayutthaya, Thailand, Vol. XXXIV, Part 5/W1, pp. 141-142.