

The Survey Method by Using Aero-Video Data and it's Application

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Abstract

Recently, videotaped images are widely used for business and private purposes because they are easy to record and use compared to ordinary photographs. In some fields they even started to replace ordinary photographs. The progress of video image recording and related techniques has been remarkable. Asia Air Survey has been interested in the application of videotaped image for aerial survey and has made a series of experiments. As the results of the experiments, Asia Air Survey developed a video data acquisition system for aerial survey purposes.

In this paper, outline of this system is explained. Three examples of the application of the system for actual surveys are also explained.

1 Introduction

The idea of using videotaped images for surveys is not new. However, it's application has been limited because of the low image quality and expensive video equipment.

With the improvement in the image quality and hardware, it became technically and financially possible to use video image for various survey purposes.

The application of videotaped image to surveys has started from using them for monitoring and observation purposes only. In the next step, application for rough measurement was tried. And finally, videotaped image has started to replace ordinary survey methods in case it is technically and/or financially difficult to use ordinary survey method. After a series of research and experiments Asia Air Survey has developed practical video data acquisition system for aerial survey.

2 Asia Air Survey's Video System for Aerial Survey

2-1 Outline

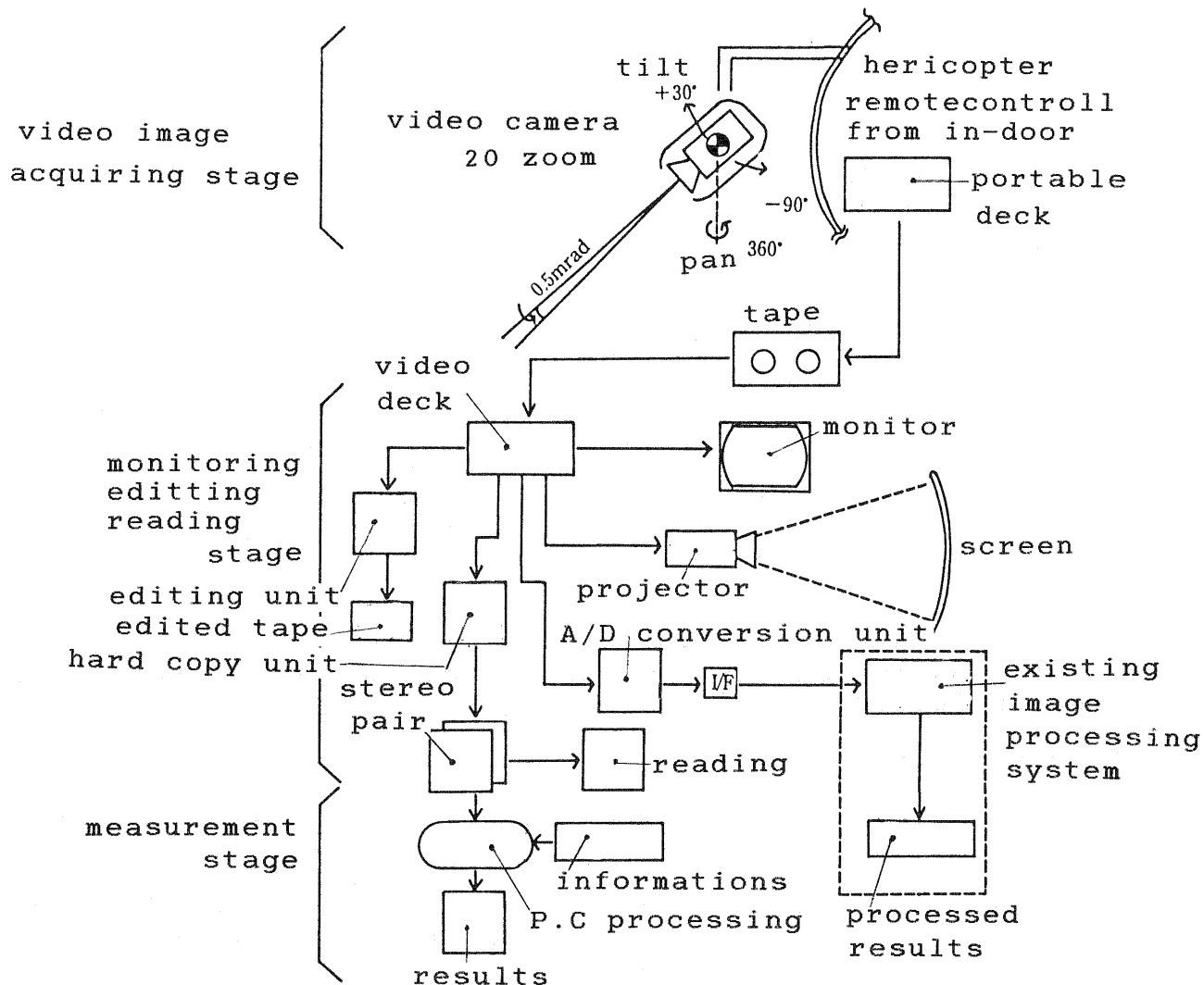
Features of Asia Air Survey's video data acquisition system are as follows.

a) Platform

As a platform, a helicopter is used instead of fixed wing aircraft.

b) Data acquisition

Video camera is installed in an outboard camera stabilizer



which is attached outside of a helicopter. Instead of primitive stabilizing device such as spring or shock absorbers, g yroscope system is used for the better stabilization of a camera. Video camera in the stabilizer is remote controlled.

c) Data processing

Recorded image is processed by using monitor CRT, tape deck and video projector. Hardcopy instrument is also used to get hard copies for image check. Conversion of analog data to digital data is also possible.

2-2 Advantage of the system

Advantage of Asia Air Survey's video data acquisition system are as follows:

1) Better flight chance

Under Japanese regulation, helicopters have better chance to fly under unfavorable weather conditions, such as cloudy or hazy weather, compared to fixed wing aircrafts.

2) Arbitrary scale

By using video camera, we can set focal length freely. This is impossible if ordinary photographic camera is used.

3) Continuous data acquisition

Video tape is a continuous data recording device. Therefore, video data acquisition system is suitable for data collection of phenomena which is quickly and continuously changing.

4) Quick check

Recorded data can be checked instantly even during flights

3 Application

By making full use of the advantages of video image recording explained above, the system was actually used for the following three types of survey work. First, factors required for each type of survey are explained and then actual survey method is described.

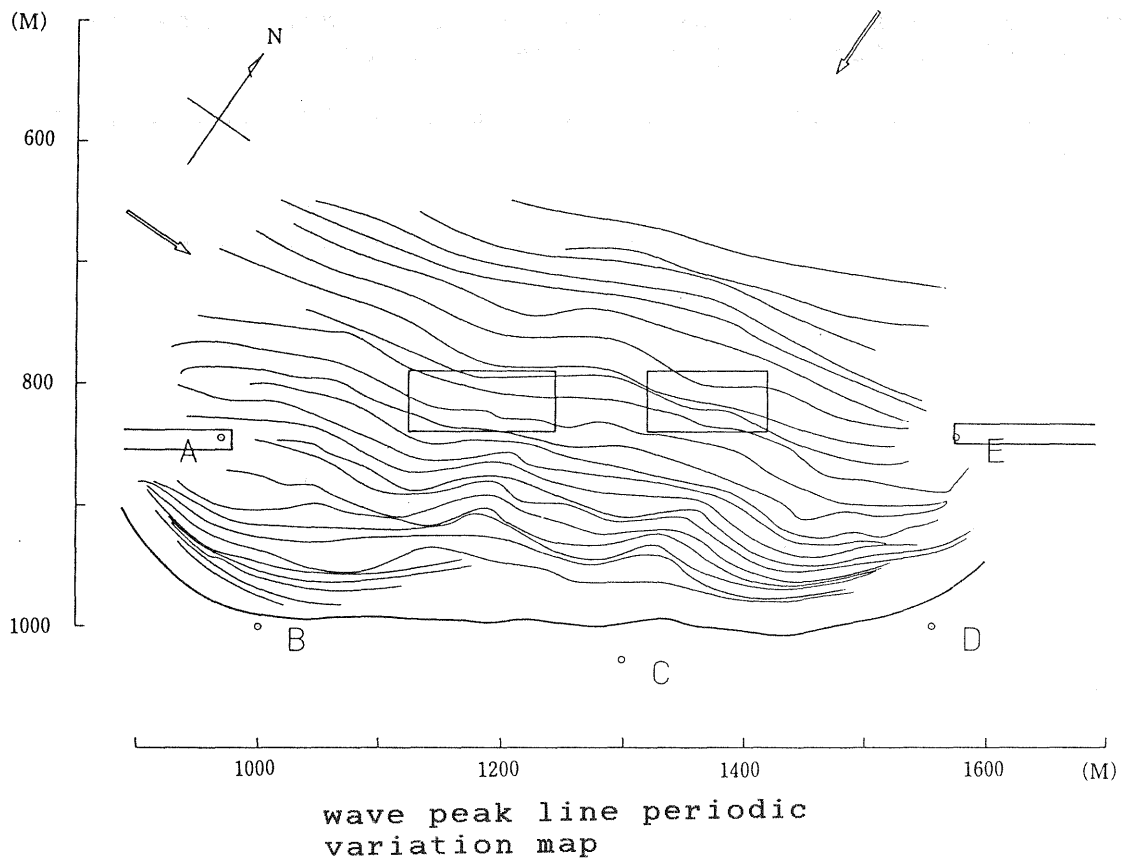
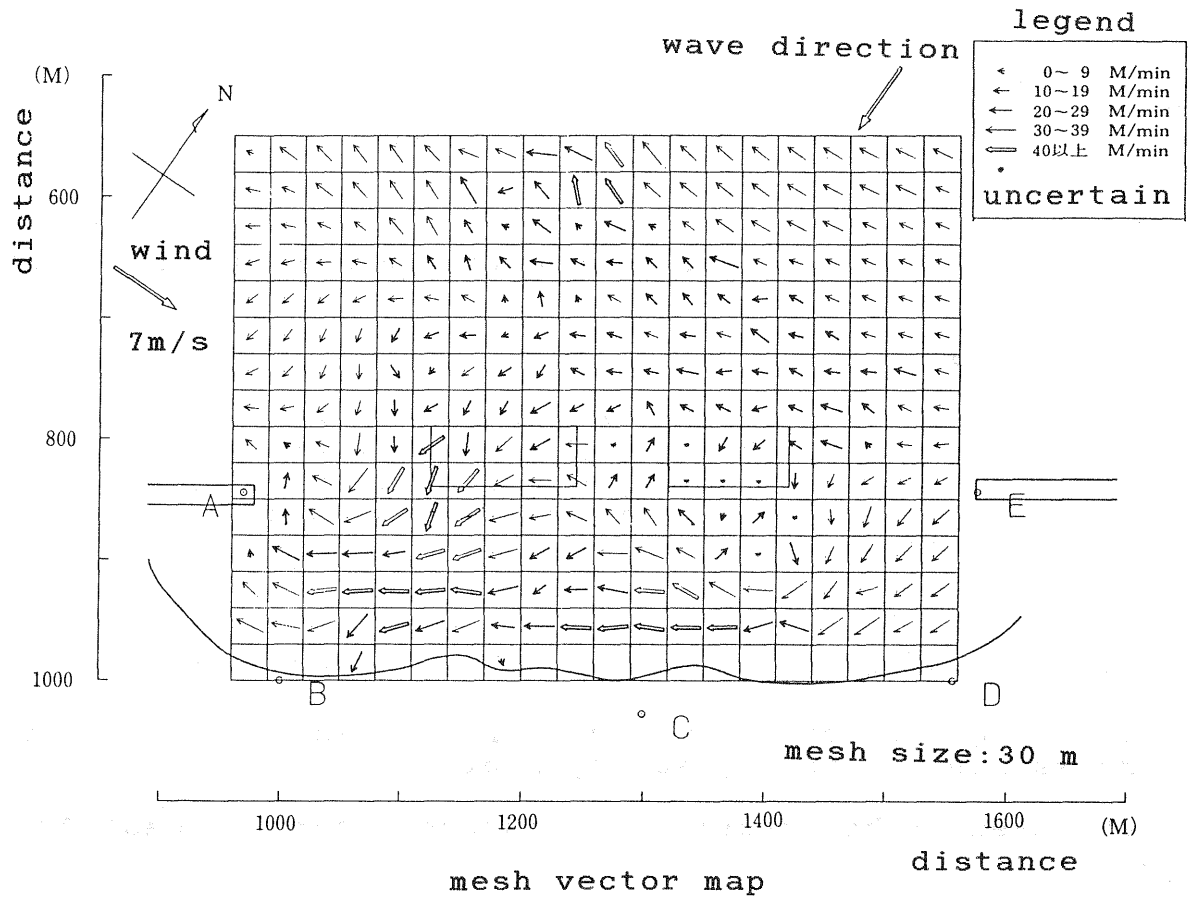
3-1 Coastal Flow Survey

1) Requirements

- * Wave height is over 2 meters. Under this condition, it is impossible to use any survey boat.
- * Data need to be recorded continuously for at least 30 minutes.
- * Analysis need to be done at 1 minute interval for vector map and 2 seconds interval for wave peak line map.

2) Method

- * Two helicopter are used. One is for video image recording and the other for dropping target floats.
- * Special video image processor is used to make high resolution hard copy.
- * Using this hard copy, locations of target floats, ground control points, and wave peak lines are digitized.



3-2 Snow Avalanche Survey

1) Requirements

* Location of survey areas

Avalanches occur in mountain areas during snow melting season (from March to April). It is very dangerous and therefore practically impossible to enter mountain areas for the survey during this season. Aerial survey is an alternative method but fixed wing aircrafts cannot fly sufficiently low to obtain large scale photos required for detailed survey.

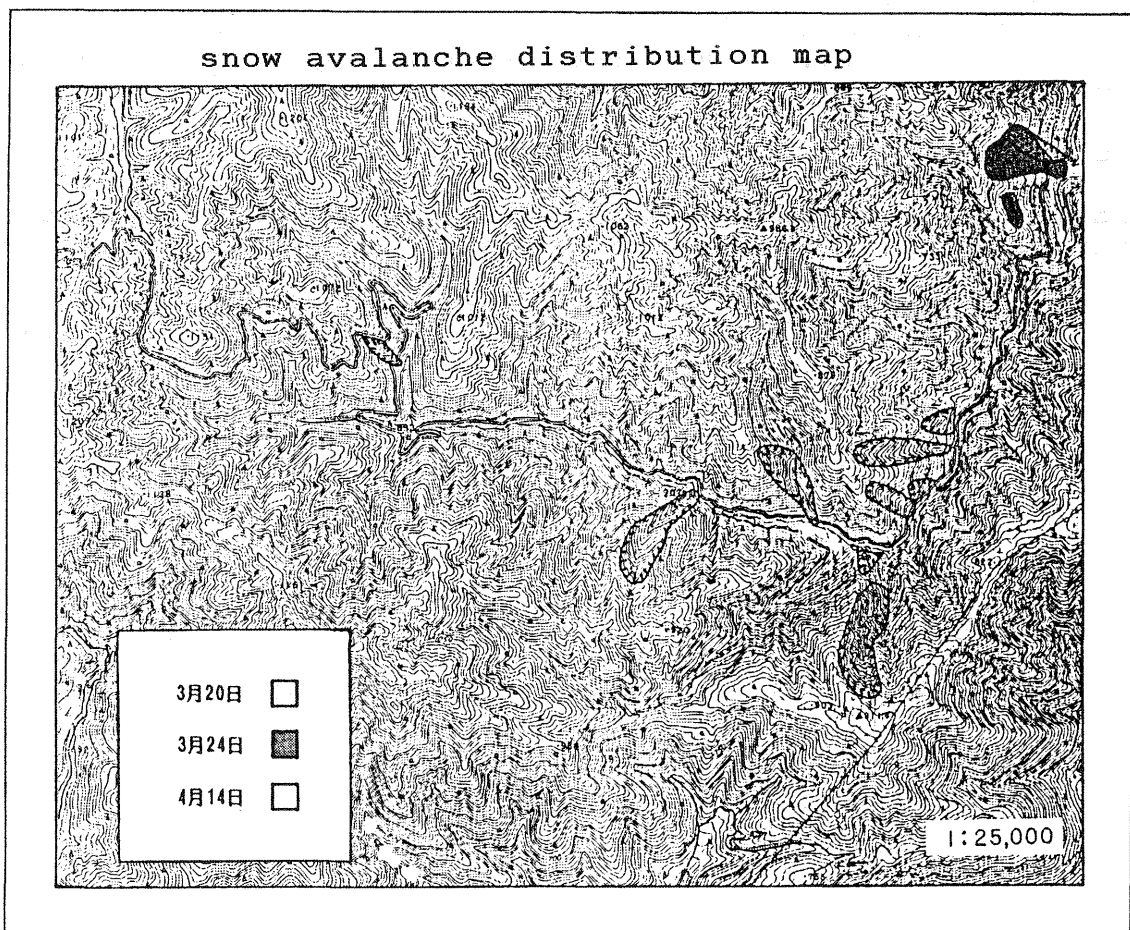
* Periodic surveying

Data collection needs to be done every 7 - 10 days. Because of unfavorable weather conditions during snow melting season, fixed wing aircraft has only small chance to comply with this requirement.

2) Method

* Using monitor CRT or video projector and topographical maps, avalanche points are identified and their sizes are measured.

* Results are snow avalanche distribution maps and snow avalanche periodic variation maps in the scale of 1/25,000 or 1/50,000.



3-3 Snow depth survey

1) Requirements

* For the snow depth survey it is necessary to get snow depth data of a number of points in mountain areas when the snow is deepest. However, during February and March when the snow depth is maximum, direct measurement of snow depth in mountain areas is impossible.

2) Method

* Before snow fall, snow poles are set at snow depth observation points.

* When the snow is deepest, video image of snow at each snow pole will be recorded by video data acquisition system using helicopter as a platform.

* Using monitoring CRT or video projector, snow depth at each snow pole is read.

* Based on these data, expected snow depth distribution map of large area was completed.

4 Future view of video survey

In Japan, number of scanning line for video image is fixed as 525 by NTSC format. But by introducing high quality television system it is possible to have higher grade image.

On the other hand, as far as a video camera is concerned, CCD is getting inexpensive. If CCD can be used, use of high speed shutter is possible which makes the high resolution still image possible.

5 Conclusion

Nowadays, saving human power and saving costs are expected in many aspects of human activities. This is also true for survey business. We believe that the use of videotaped image for various survey job has great possibility provided that it's application is well studied and planned for the most efficient use of this technique.