THE ADVANTAGES OF HIGH DENSITY AIRBONE LASER MEASURMENT

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ABSTRACT

Orthogonal photo images were made by using the data which were measured by using LIDAR system fixed on the aircraft. An image has been processed into various side views by using Computer Graphic. It resulted that it can be used for various simulations such as disaster prevention, environmental investigation. We are to discuss the

1.INTRODUCTION

We have introduced the precision of our LIDAR-system with some practical examples during the two previous ISPRS. In the present paper, we have introduced the possibilities of efficient image processing and the practical methods were taken into consideration.

2.ALTM1025 (LIDAR-system)

The device ALTM1025 which was designed by Optech,Inc of Canada was used. One of the characteristics of this device is that data can be acquired with two high density measuring mode.

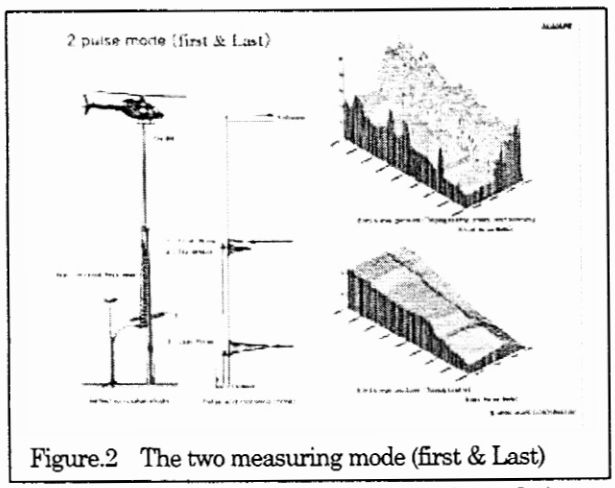


Figure.2 The two measuring mode (first & Last)

Figure.1 ALTM 1025 Helicopter (AS350)

Table.1 specifications

	ALTM 1025
Laser wavelength	1064 nm
Laser repetition rate	25 kHz
Laser pulse divergence	0.25 ,1.2 mrad
Laser pulse duration	13 ns
Rang resolution	1 cm
Rang accuracy	15 cm (singlshot)
Scan amplitudes	22.6 deg.
Scan rate	25 Hz (22.6 deg.)
Scan angle resolution	0.01 deg.
Scan angle accuracy	0.05 deg.

When one shot of laser beam is transmitted, the initial reflected pulse is called the first pulse which is usually used(usually,the diffusion of the laser beam is very low). In the present system, last pulse mode is also used which is the last reflected pulse. When the last pulse mode is logged on more reliable and more precise terrain can be acquired.

3. The development of airbone laser surveying device

The possibility of determination of aircraft tilting, manufacturing of compact laser devise so as to able to fix into a aircraft was a long being requirement. With the advancement of technology, the laser system which was initially used for military purposes or space techniques, turned into civilian use. Computer technology was advanced during the past decades and analysis of large scale data became possible. With the cooperation of our own

engineers and several other researchers, we were able to develop the ALTM 1025(Figure 1).
The characteristic of ALTM 1025 is that the possibility of acquiring data of inaccessible ground surface, possibility of determination of precise X,Y,H coordinates. And also, it is possible to get rid of the influence of forest trees by using the last pulse mode. A good result can be obtained within very short period comparing to traditional methods by means of automation. The displacements can be calculated by repeated measurements. Furthermore, it is possible to get digital data more economically. Also, the system can be used for investigation of range forest, GIS, CG and CAD so on.

4. Difference between traditional photogrammetric system.

When comparing to traditional aerial photography, it became possible to acquire data during a bad weather condition or snowy weather. As data is acquired directly, errors due to the mankind is minimum. Due to the eye vision of different persons is different, there can have some errors when aerial photographs are processed by means of stereography. In case of laser scanning, coordinates of each point where the laser is reflected, can be directly calculated using the angle of reflection and the time of reflection. It is impossible to carry out scanning in a thick forest where the density of tree leaves is very high. If the density of leaves is high, number of lasers that reach to the ground is almost zero. It is recommended to carry out the scanning during the early winter since most of the leaves are fallen. In the case of traditional photogrammetry, Topographic maps were produced by means of contours with the help of analytic plotters. In the case of lasers, contours were produced automatically according to data intervals. When these contours are enlarged, it can be found that they are not straight lines because they were produced by means of grid data.

5. Analysis method

We use first pulse mode when spatial information such as the top of trees, transmission lines etc is required.
When the topographical information are required, last pulse mode is used because it is believed that the last reflected pulse is the pulse that is reflected from the ground surface. According to our experiences, more reliable topographic map of moderately dense forest can be produced by means of last pulse mode. However, unnecessary data could be remained and they can be filtered so as to select the required information. DTM can be made by this filtered data.

6. Examples of processing and output

The image made from the data on the same area is illustrated below.

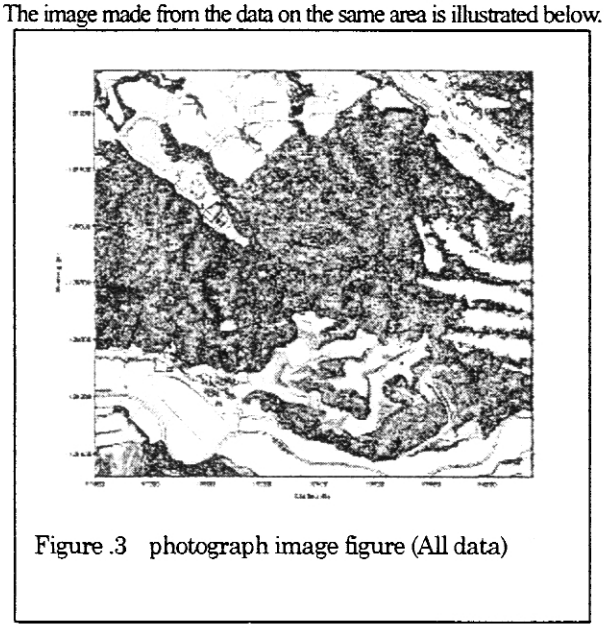


Figure .3 photograph image figure (All data)

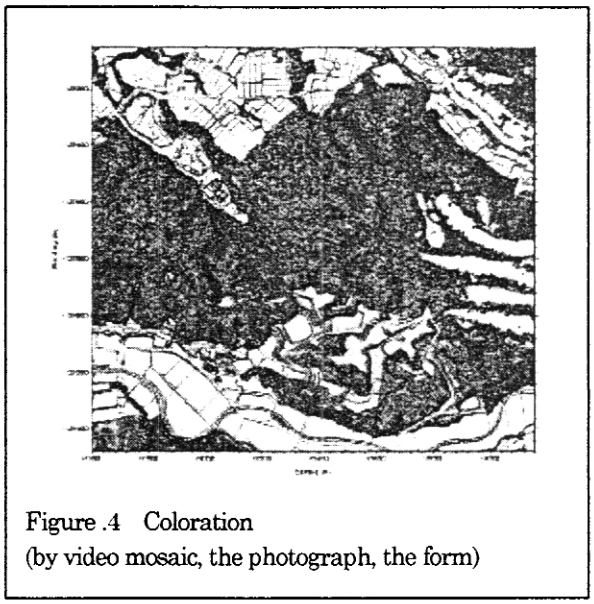


Figure .4 Coloration
(by video mosaic, the photograph, the form)

Figure .3 After processing all data which were measured, monochrome photograph of orthogonal photo image can be made. It is different from the mosaic of the aerial photograph, and has the coordinate of orthogonal from the beginning.

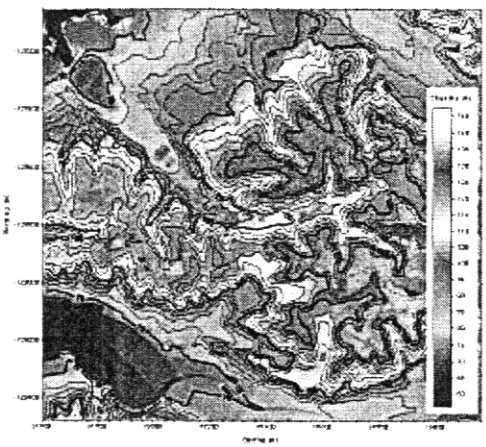


Figure .9 color contour figure

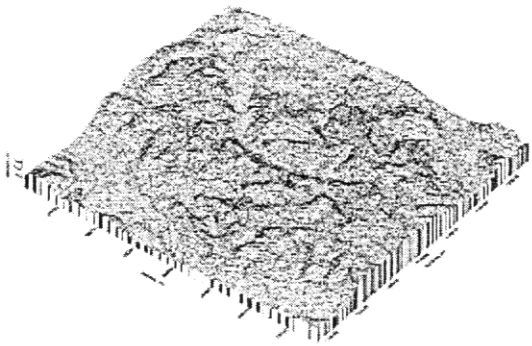


Figure .10 DTM bird's-eye view

Figure .9 ,Data are processed, and Color contour map can be made.
DTM data are piled up with the ALL data, and a red path through a forest on the bottom right of the screen is expressed between the white trees. in the same way drawing bottom part east and west flow river a protection against disasters map 【 whether which area suffers damage by the flood damage due to a heavy rain, distinguishing it by one and so on 】 like simulation use by using the change in coloring by a surrounding difference in height can be done.
Figure .10, DTM data are processed, and it is indicated as a bird's-eye view. When a bird's-eye view is made, an Orthogonal photo images image is composed, and there are various methods to make high CG (stationary 画 · animate cartoon) of the character not only wire frame simply draw but also mode measuring settlement analysis purpose meet data make. A bird's-eye view learns to do the use (in such cases as deciphering) of the rest in detail specially from the ground plan as much as to acquire data on the high density from the viewpoint of surface because information can be distinguished easily when it seems to take skill to read a form.

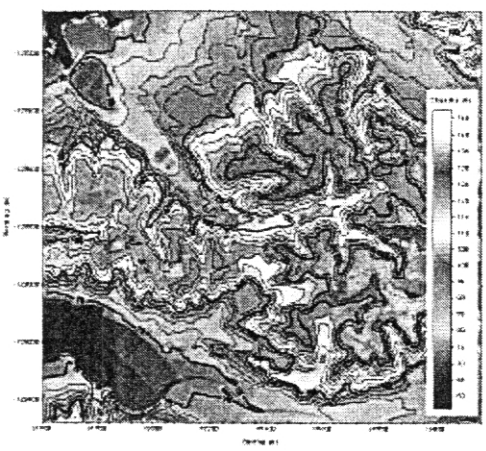
7. CONCLUSIONS

With the advancement of spatial information technology, it became possible the utility of the laser scanning system. Specially, ALMAPS data can be used to digitalize the 3D information of earth surface, trees, buildings, transmission lines and also moving vehicles. These data can be used to analyze the information of selected features of the area because it became possible to select data according to height or horizontal limits. And also, comparing to digitalization process by means of traditional analogue methods, this system can produce high quality products with the advancement of hardware and software.

REFERENCE

K. kimura, T. Fujiwara, and Y. Akiyama, 1998 . ESTIMATION OF ACCURACY OF AIRBORNE LASER PROFILING. Proceedings International Workshop on Mobile Mapping Technology, Bangkok, Thailand. Pp5B-1-1_5B-1-7.

K. Takada, and Y. Akiyama, 1998 . The possibility of water surface slope measurement with airborne laser profiling method. ISPRS Commission V Symposium, Hakodate, Japan. Pp284-289.



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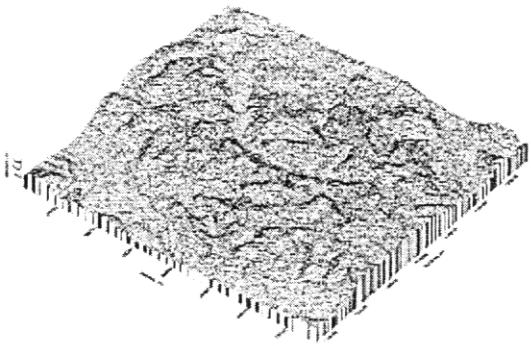

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