

THE APPLICATION OF DIGITAL ORTHOPHOTOS TO THE FIXED PROPERTY SERVICES

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ABSTRACT

The residents have been taking an increasing interest in the fixed property services in recent years. For corresponding to this situation, the local municipalities are under the pressure of grasping the status quo of the taxable estates and providing the persuasive information and data for the residents. The Super Viewer System (SVS) is developed to change the situation mentioned above by overlaying the lot number data and the land and house data with the highly detailed images of aerial photos. SVS is such a system that can create the digital orthographic photos by digitizing the color aerial photos directly from the scanned images in a resolution of 1000-dpi with full-color (24 bit). The digital orthographic photographs created can then be displayed in the Geographic Information Systems (GISs) with high speed. To combine this system with the over-the-counter fixed property support system, the lot number maps and the land and house maps can be displayed and retrieved with the imagines of aerial orthographic photos as the background. It can also be used to replace the map locker of various maps. In the fields other than the fixed property services, this system can be applied to and used together in various GISs with the digital technology of aerial photographs.

1. INTRODUCTION

The map creation technique has been progressed from analogous to digital format with the development of the digitization technique, Geographical Informational Systems (GISs) and the office automation

movement in the administrative organizations.

The analogous plotter has been replaced by the analytical plotter in the field of aerial photogrammetry, with the progress of CAD (Computer Aided Design) technology and the aerial photogrammetry, the digital aerial photogrammetry system has been put in use practically. The terrain data used as

reference data by GISs has been changed from one purpose application to multiple-purpose applications with the aerial photographs.

With the development of the computer technology, the users have increased due to the down price of computers, especially the personal computers(PC) that is available with a high processing ability. The GISs software that can be operated on the PC becomes the mainstream.

On the other hand, in order to understand accurately the present condition of land and houses that are the taxation objects, the tax management department in cities, towns and villages began to pay attention to the utilization of aerial photographic image data for getting the understanding of the taxpayer and obtain their trust.

Under such a situation, our corporation discussed the utilization of GISs and digital orthophotos (orthographic project photo image) in the field of fixed property taxation, and developed the Super Viewer System (SVS) by overlaying the vector data of land and house with the raster data of digital orthophotos precisely.

2. THE CHARACTERISTICS OF THE SUPER VIEWER SYSTEM

The Super Viewer System (SVS) is such a application system that can overlay a large mount of the full-color digital orthophotos for a wide area, and can redisplay and retrieve the image data with ultra-high-speed.

Because the full color digital orthophotos data are used, the terrain and other landmarks can be confirmed clearly and sharply, and can be overlay with the vector data without distance shifts.

The horizontal position accuracy in the digital orthophotos created by our company is less than 1mm on the map for the case of map scale 1/500 based on table 1.

Items		Scale		Used for	
		Larger than 1/500	Larger than 1/1,000		
Standard deviation	Horizontal position	Under 0.5mm	Under 0.7mm	Distance on the map	
	Elevation	Height points	Within $\Delta h/4$	Within $\Delta h/3$	Δh is the interval of the main contour
		contour	Within $\Delta h/2$		Same as above

Table 1 The Accuracy of Topographic Map, Topographic Measurement of Working Procedures for Public Measurement by the Ministry of Construction

In order to display the large amount of digital orthophotos (in raster format) for a wide area with a high speed, the Sysimage Viewer of International Systemap company (Canada) is adopted which runs on the MicroStation 95 of Bentley Systems (USA), the OS (Operating System) is the Windows NT of Microsoft.

By SVS, it is released from management of analogous aerial photographs and many kinds of thematic maps because the digital aerial photographs and vector map data are used. Therefore, the storage space can be reduced, and the deterioration such as color fading, spots and scratches peculiar to an analogous map can be prevented.

SVS can be run stand-alone, and can also be

used with other GISs in many fields for providing more information and improving the management efficiency.

The characteristics of SVS are summed up as follows.

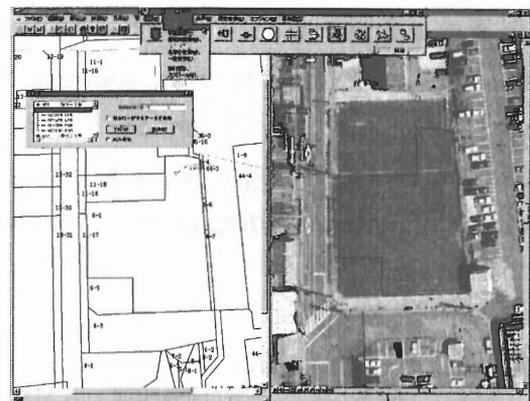
- (1) The full-color digital orthophotos in a large size for a wide area can be displayed with a high speed.
- (2) The full-color digital orthophotos can be overlay with other vector data.
- (3) It can be utilized as a digital map-locker.
- (4) It can be applied with other GISs in many other fields.

3. THE FUNCTIONS OF SVS

The following functions are designed in SVS.

- 1) The aerial photographs can be display freely at any position specified on the screen with high speed (zoom in and out, pan and scroll).
- 2) Several aerial photographs can be displayed by the multiple windows simultaneously, the changing status can be made though the compassion of the aerial photographs in different years.
- 3) The overlay function of vector data and digital orthophotos in raster format.
- 4) The querying and retrieving function of aerial photographs by lot numbers and house numbers (shown in Figure 1). The application to the fixed property services was considered.
- 5) The querying and retrieving function of aerial photographs by index maps.

- 6) The querying and retrieving function of aerial photographs by the landmarks.
- 7) The querying and retrieving function of aerial photographs in any position specified on the map.
- 8) The map management function.
- 9) The simple data base function. By operating the information on city planning, facility management and services to the local residents in different purpose, this system can play an important role in navigating the urban informational to the residents.
- 10) The function of output to printer and plotter



The system For the SuperViewerSystem
Fixed Property Services

Figure 1 . The Simultaneously Display of Aerial Photographs with the Lot Number Searched

4. THE CREATION METHOD OF THE DIGITAL ORTHOPHOTOS

Since it is necessary to display and confirm the terrain and landmarks sharply and clearly, the display must be set to full color mode (24bit, 1.6 million-color) with a high resolution. The data was processed with a

resolution shown in Table 2.

The creation technique of digital orthophotos data is shown below.

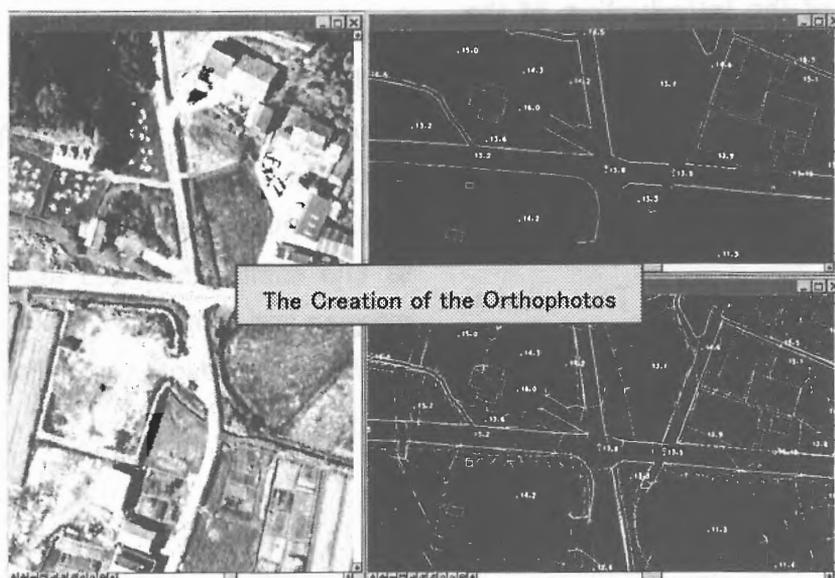
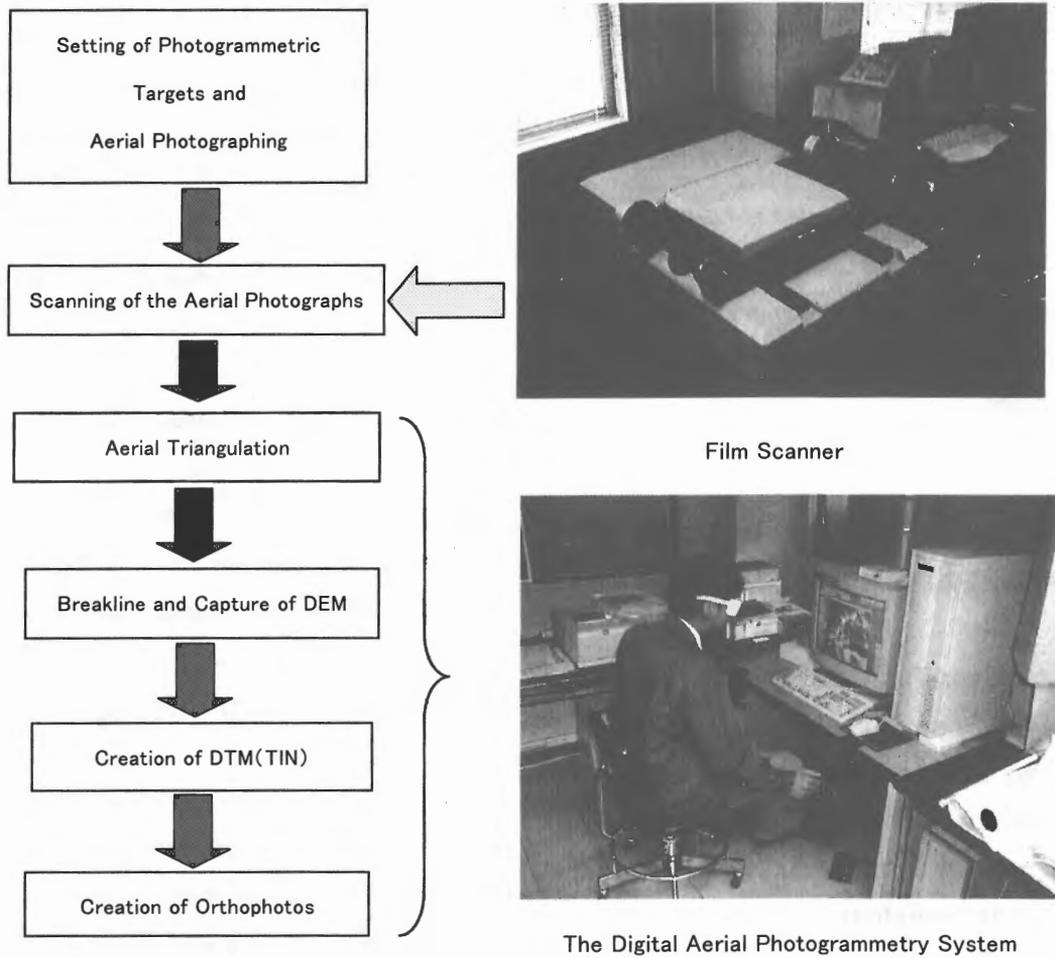


Figure 2. The Creating Method of Digital Orthophotos

	Scanning	Operated on SVS
Resolution	1,000dpi(25 μ m)	600dpi(42 μ m)
The Pixel Size in the Map	10cm/pixel	20cm/pixel

Table 2. The Resolution for Aerial Photographs

- Note) 1. The Resolution Operated on SVS is Decided with the User of System.
2. The Pixel Size in the Map is for the Case of Aerial Photographs in the Scale of 1/4,000.

5. AN APPLICATION CASE TO THE FIXED PROPERTY MANAGEMENT

SVS and the Over-The-Counter Fixed Property Services which is a product of our company are introduced to and operated in Takefu City in Fukui prefecture which has a administrative area of 185 square kilometers. The following is the outline of its operation.

5.1 The Purpose of the Introduction of the system

The purpose of the introduction is to improve the accuracy and the efficiency on the fixed property taxation business and provide better services to the residents. The digital orthophotos were created for all the city area, and the system began on operation in March 1997.

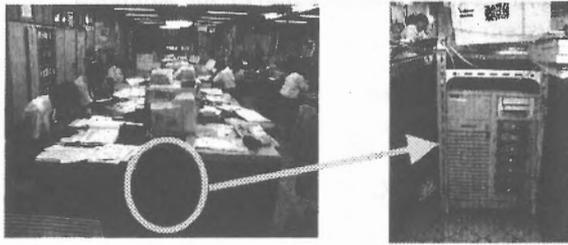
The final outputs for this case are all in the digital format compared with the analogous documents such as the paper-based drawings

and maps and the color aerial photographs presented before. There is no need to worry about the deterioration of the final outputs in quality and the workload of staffs in the checking and confirming process can be significantly reduced. The storage space for paper-based maps and aerial photographs is no more necessary.

5.2 The Operation Status of the System

The system is introduced to the department of taxation business and assets taxation shown in Figure 3. The present operation status is composed of five clients and one server which serves as a database for managing the data related to the fixed property tax and the digital orthophotos. The main business that this system performs is the following.

- 1) The confirmation of the levy condition.
- 2) Inquiry correspondence from the owners, taxpayers and the taxation officers.
- 3) The data creation submitted to the prefectural and national organizations for purpose of statistical examination.
- 4) The data creation submitted to the fixed property valuation and assessment committee. (the printed materials of digital orthophotos)
- 5) Confirmation of building ruins.
- 6) The confirmation and authorization of lots merging and splitting.
- 7) The assumed lots calculation processing.



The Department of Tax,
Takefu City

Server

Figure 3 . The Operation Status

6. SUMMARY

The digital orthophoto is quite different compared with the vector map on the point of the abundance and amount of the informational it contains.

Since the terrain conditions and landmarks are presented by the points, lines, polygons and annotation in the vector map, those kinds of thematic maps can be well applied to the specified purposes. Compared with the thematic mapping, the digital orthophotos keep all the image information that the aerial photographs have, and can be used as the maps with same accuracy.

The SVS can be utilized to visually confirm the information that can not be presented by the vector maps through the accurate overlay with the vector maps. The application of SVS to Takefu City showed that the management efficiency and services to the residents have been greatly improved.

In this case, all the data are managed and updated based on the status quo of taxation

that is setting on January 1 of every year in the fixed property services. The aerial photographs are then taken accordingly, the map data are captured and updated based on the photographs.

It is ideal to create the digital orthophotos and display the original aerial photographs by the steps mentioned above, the taxpayer and tax officers can share the information with mutual trust. However, the cost for creating the terrain data and digital orthophotos functioned just as the background map accounts for the most parts of the cost of the total system development.

More and more effective applications can be expected by combining the digital technology of the aerial photographs with the application of GISs in the field of farmland management, airport management and road planning besides the application to the fixed property services.

Furthermore, the relatively high cost of the data creation can be cut down if the data of digital orthophotos can be further applied and shared with other applications.

References

Japanese Association of Surveyors (an incorporation body), 1996, the Public Measurement Provision by the Ministry of Construction, Supervised by the Technical Investigation division of Minister of Construction, Japanese Association of Surveyors, Tokyo, pp35.