

ON DEVELOPMENT OF MANAGEMENT AND PLAN SYSTEM FOR MAP PRODUCTION

Kazuya NAKANO, Kosuke TSURU

AERO ASAHI CORPORATION, Toyota division, 3-1-1 Minamidai Kawagoe Saitama Japan
kazuya-nakano@aeroasahi.co.jp

Commission V, WG V/6

KEY WORDS: Cartography, Development, Planning, Photography, Algorithm, Visualization

ABSTRACT:

When creating a public map using digital mapping in Japan at the present time, it is legally specified that it must create according to the following procedure in public survey operation specifications. There are 14 procedures as follows, a work plan, set up pass points, set up air photo signals, photography, pricking, field reconnaissance survey, aerial triangulation, plotting, supplement survey, editing, field supplement survey and supplement editing, creation of digital mapping data, creation of original drawing map and sort out results. Our company has systematized so that work may progress smoothly about processing from the plotting to creation of original drawing map. Moreover, the trial product of a digital field reconnaissance survey system was created in 2000, and the utilization experiment is conducted at the present time. Creation of flight plan map created in a work plan and index map which arranges a photography result is performing analogue processing using the paper map. On the other hand, photography was automated by the navigation system, which used GPS. Since a flight plan map was paper, exposure stations had to digitize in order to import data to a navigation system. Therefore, the planned support system aiming at the increase in efficiency of processing by digitization of a photography flight plan and management of comprehensive map creation was developed. We named the planned support system the Map Square. Map Square expresses MAP² and the origin is extracting the initial of the Management And Plan system for MAP production.

This paper describes the generating algorithm of photography flight plan line in the Management And Plan system for MAP production and the visualization of a flight simulation which used the photography flight plan line as application.

1. CONSIDERATION OF THE GENERATING ALGORITHM

We classified about the photography flight plan line generating method according to the object of map creation. The photography flight plan is classified into two types of a polygon and a route according to the form of the map creation range. In the photography flight plan for a polygon, according to the contents, the plan of three types is needed.

The 3 types are as follows, photography scale priority that adjusts the flight altitude for the large scale map, flight altitude priority that fixed flight altitude for the medium scale map, fix flight datum plane is used for fixed-assets business, and does not take the geographical feature into consideration.

1.1 Geographical feature

Geographical feature information was examined in performing the photography plan in consideration of geographical feature. DEM of 50 m and 250 m mesh was published by the Geographical Survey Institute, and we adopted 50 m mesh, in order to use detailed information. However, since it became the cause of an increase of hypertrophy of geographical feature DB, and processing time, we decided to adopt DEM of 250 m meshes.

1.2 Photography scale priority

Photography scale priority is generated with the following concept in consideration of geographical feature.

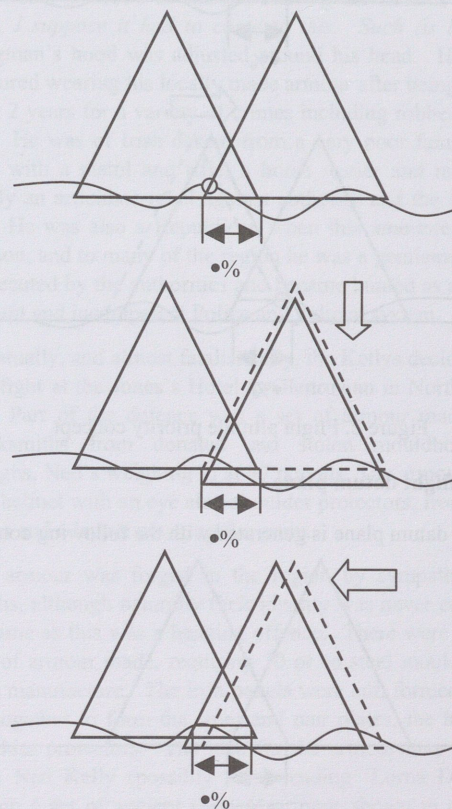


Figure 1. Photography scale priority concept

1. Average altitude is calculated using each temporary photography flight plan line.
 2. Photography flight plan line is determined with the flight altitude according to the average altitude. A highest altitude position is detected in a sidelap zone.
 3. The interval of a photography flight plan line is adjusted so that a sidelap may maintain the specified rate of a sidelap.
- A conceptual figure is shown in Figure 1.

1.3 Flight altitude priority

Flight altitude priority is generated with the following concept in consideration of geographical feature.

1. Flight datum plane is determined using the average altitude in the map creation range.
2. Temporary photography flight plan line is calculated from Flight datum plane. A highest altitude position is detected in a sidelap zone.
3. The interval of photography flight plan line is adjusted so that a sidelap may maintain the specified rate of a lap on the highest altitude position.

A conceptual figure is shown in Figure 2.

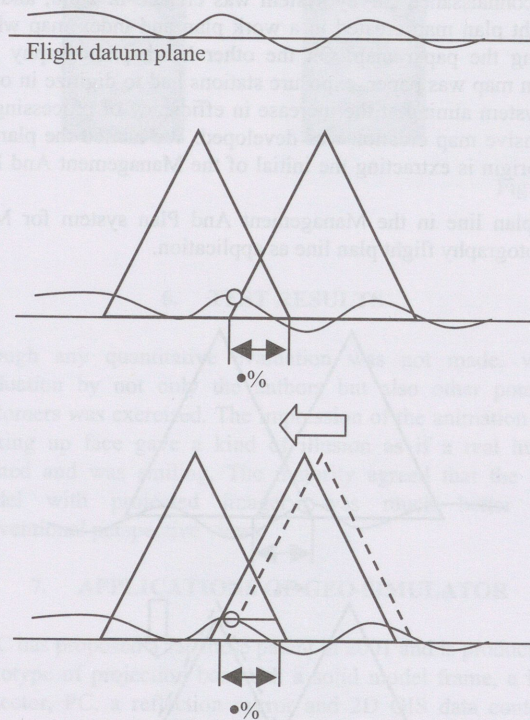


Figure 2. Flight altitude priority concept

1.4 Fix flight datum plane

Fix flight datum plane is generated with the following concept.

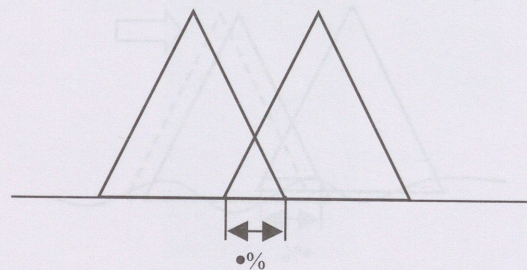


Figure 3. Fix flight datum plane concept

A photography flight plan line is determined using light condition without taking into consideration change of the rate of a lap by geographical feature.

A conceptual figure is shown in Figure 3.

1.5 Common algorithm

The extension of a photography flight plan line to the map creation range adjusts in consideration of control point for aerial triangulation as a precondition which satisfies light condition, after calculating number of exposure stations.

1.6 Independent line movement

It made it possible to move to the perpendicular direction of a plan line, inheriting each generating method, in order to enable artificial fine tuning of a photography flight plan line.

In the case of movement, the sidelap of the both sides of a flight plan line is displayed on a real time. It is warned when a sidelap becomes below a regulation value.

2. APPLICATION

2.1 Flight simulation

The flight simulation was created as application to visualization using the photography flight plan line. Geographical feature was reproduced from the geographical feature information currently used for a photography flight plan, and the simulation was performed.

Simulation result is shown in Figure 4.

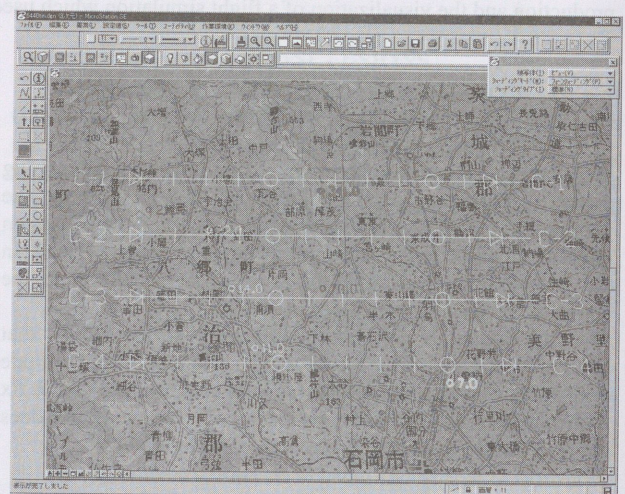


Figure 4. Simulation result

3. CONCLUSION

It became possible to create without depending for a highly precise flight plan map on experience easily by development of Management And Plan system for MAP production.

There are issues, however, for further work. These problems are a development of optimal generating algorithm for photography flight plan, and photography from which height is different.