Archaeological Real-time Photogrammetric System using Digital Still Camera

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ABSTRACT: Over 8.000 archaeological sites are excavated every year, before the various constractions in Japan. Archaeologists must draw the archaeological sketch maps about so many archaeological remains and they also need these maps in good time. Photogrrammetry using film type cameras need much time to make maps. Therefore, we developed new real-time system to make image maps in the archeological field using Digital Still Camera.

1. Introduction

Archaeologists in Japan usualy used flat table method or grid sketch method in order to make the archaeological maps. If archaeologists like to measure over 10.000m², these methods need so much times and workers. Then, in last 15 years, archaeologists have used the clese-range Photogrammetry in archaeological fields.

But, Photogrammetry needs one/two weeks to make up the maps. Photogrammetry need wet-process to develop the films and plotting machines for stereo-matching. Therefore, we developed Digital Still Camera system instead of film cameras, and also developed Stereo Matching systems instead of plotting machines. Stereo Matching systems use only lap-top type personal computer, therefor, we can use in the archaeological fields or in the cars.
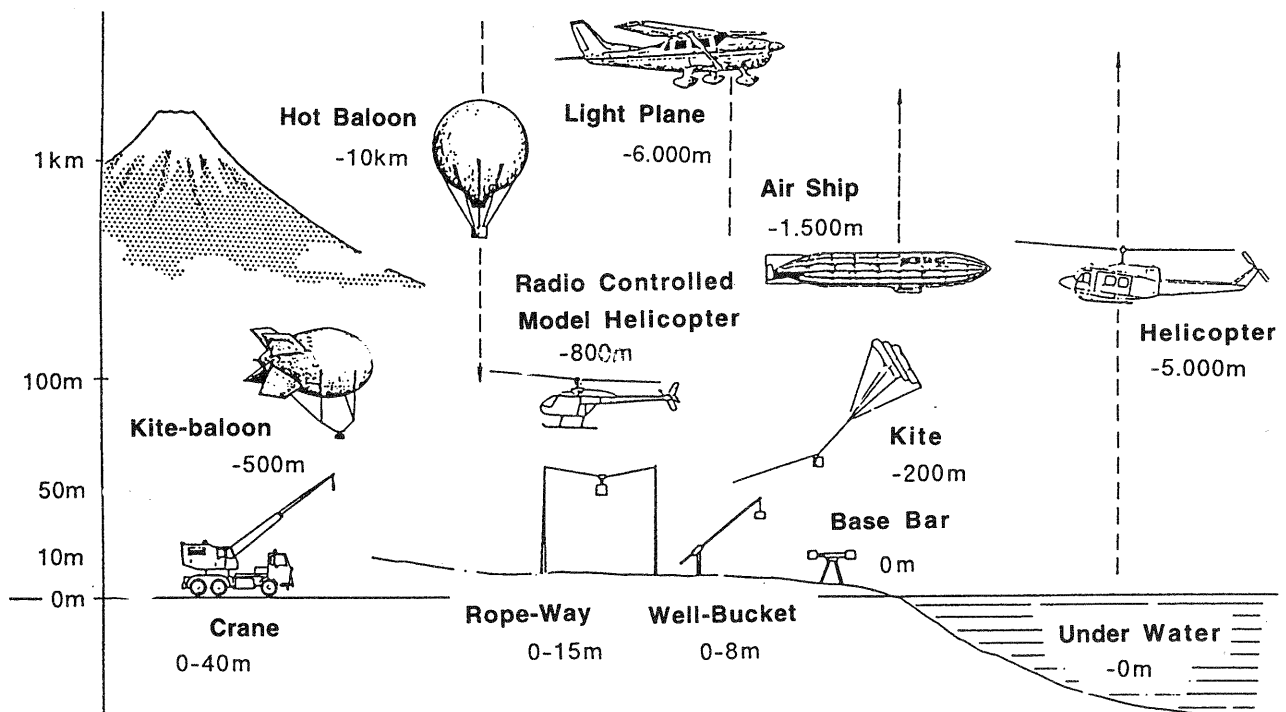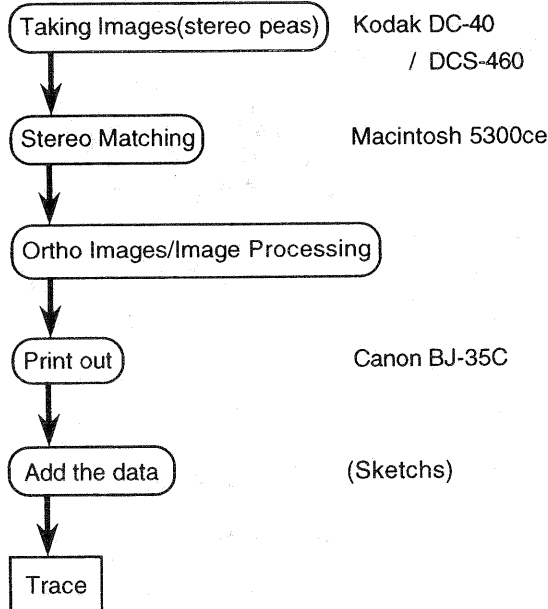

Fig.1 Platforms for Archaeological Photogrammetry

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Fig.2 Digital Still Camera:Kodak DCS 460

300m high. In the case of Kodak DCS-460 with f=28mm lense (Fig.2), image areas or stereo areas (over lap 60%,side lap 30%) are following....,

altitude	Image area	stereo area
10m	5.4*8.1m	2.1*3.2m
20m	10.8*16.2m	4.3*6.5m
50m	27.0*40.5m	10.8*16.2
100m	54.1*81.1m	21.6*32.4
200m	108.2*162.2m	43.2*64.8m
300m	162.2*243.2m	64.9*97.3m

3. Stereo Matching/Image Processing

3.1 Stereo Matching

Stereo Matching systems are down load to personal computer (Macintosh 5300ce) from AUTO-3D (Shimamoto and Uchida 1993). AUTO 3D runs on the SUN work stations. The methods depend on bundle ajustment.

The purpose of stereo matching is to make the ortho images. Archaeologists need the ortho images so quickly. In this case(Fig.3), it took 15 minutes to make this ortho images.

3.2 Ortho Images and Image Processing

Ortho images from stereo matchings are only the images. If the Archaeologists needs like a maps, they can make from this ortho images to image processing pictures (Fig.4) by various soft wares are on the market(ex. Adobe Photoshop).

2. System and Hard wares

Our systems are followings....,

Taking Images(stereo peas) — Kodak DC-40 / DCS-460

Stereo Matching — Macintosh 5300ce

Ortho Images/Image Processing

Print out — Canon BJ-35C

Add the data — (Sketchs)

Trace

3. Platforms

Taking images from low altitude needs various platforms (Fig.1). Lowest platform is the rope-way system. It can carry up the cameras about 12m high above the ground. In the large areas, the best platforms is the radio controlled model helicopter. It can carry up the cameras less than

4. Add the data/Trace

4.1 Add the data

Archaeologists can quickly add/memo the data and the impressions about the archaeological remains on the printed out the papers (Fig.4). In the case of photogrammetry, Archaeologists can add/memo the data etc., after developing the films, or they must sketch by themselves.

4.2 Trace

If the archaeological remains are simple, Archaeologist

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can trace in the field office (Fig.6), in order to need the traced maps on the archaeological maps in Japan.

5. Conclusion

This system can hasten to make the image maps/memos in the archaeological fields. But, it needs more hi-resolution digital still cameras. Kodak DCS-460 has only 600 million pixes, and it is a few pixels compare with HasselBlad Metric Camera.

In the present time, we must use both cameras in order to clear these problems.

References

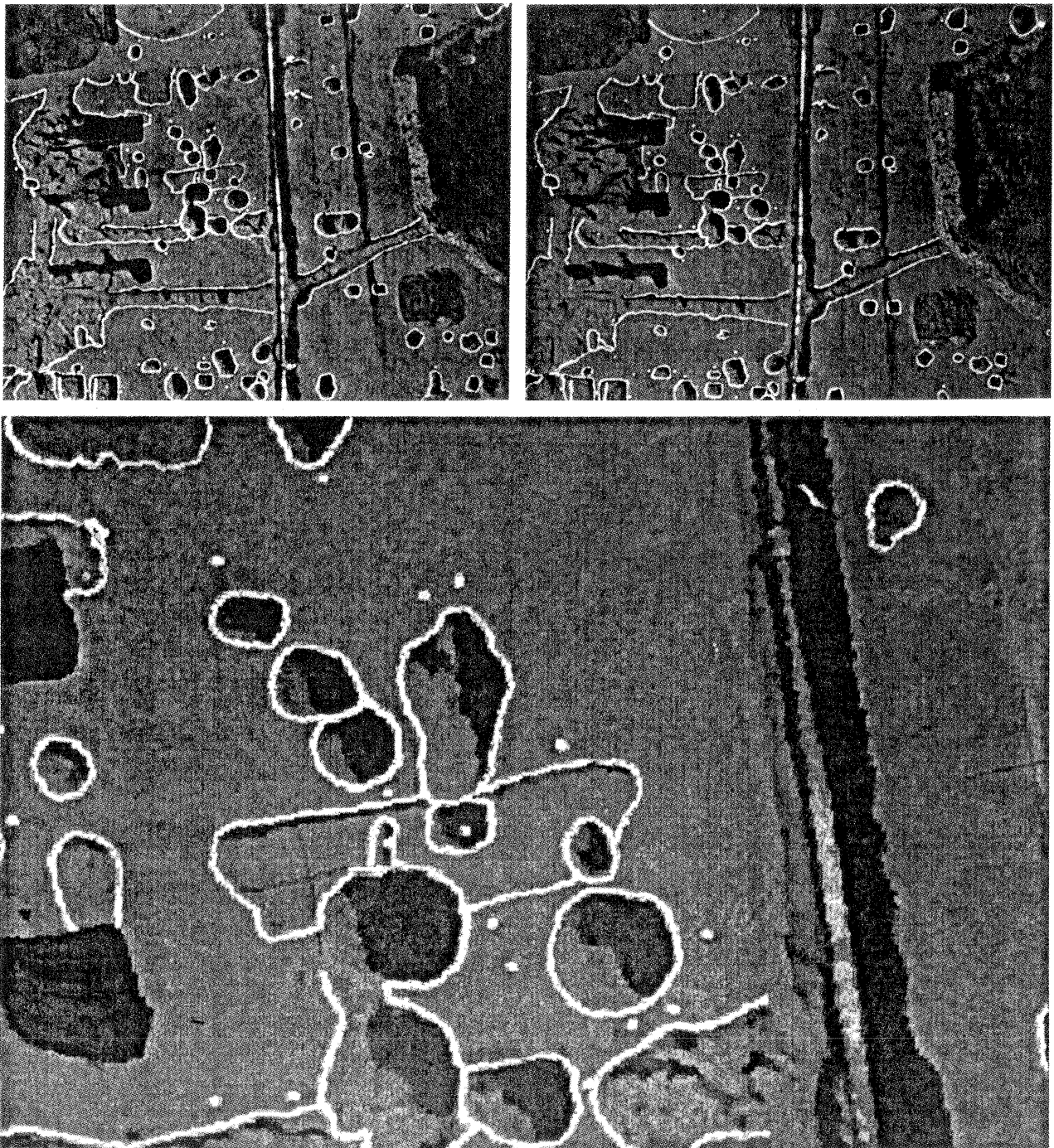K.Shimamoto and O.Uchida "Auto-3d Method" SOKURYO 1993/3 (Japanese)

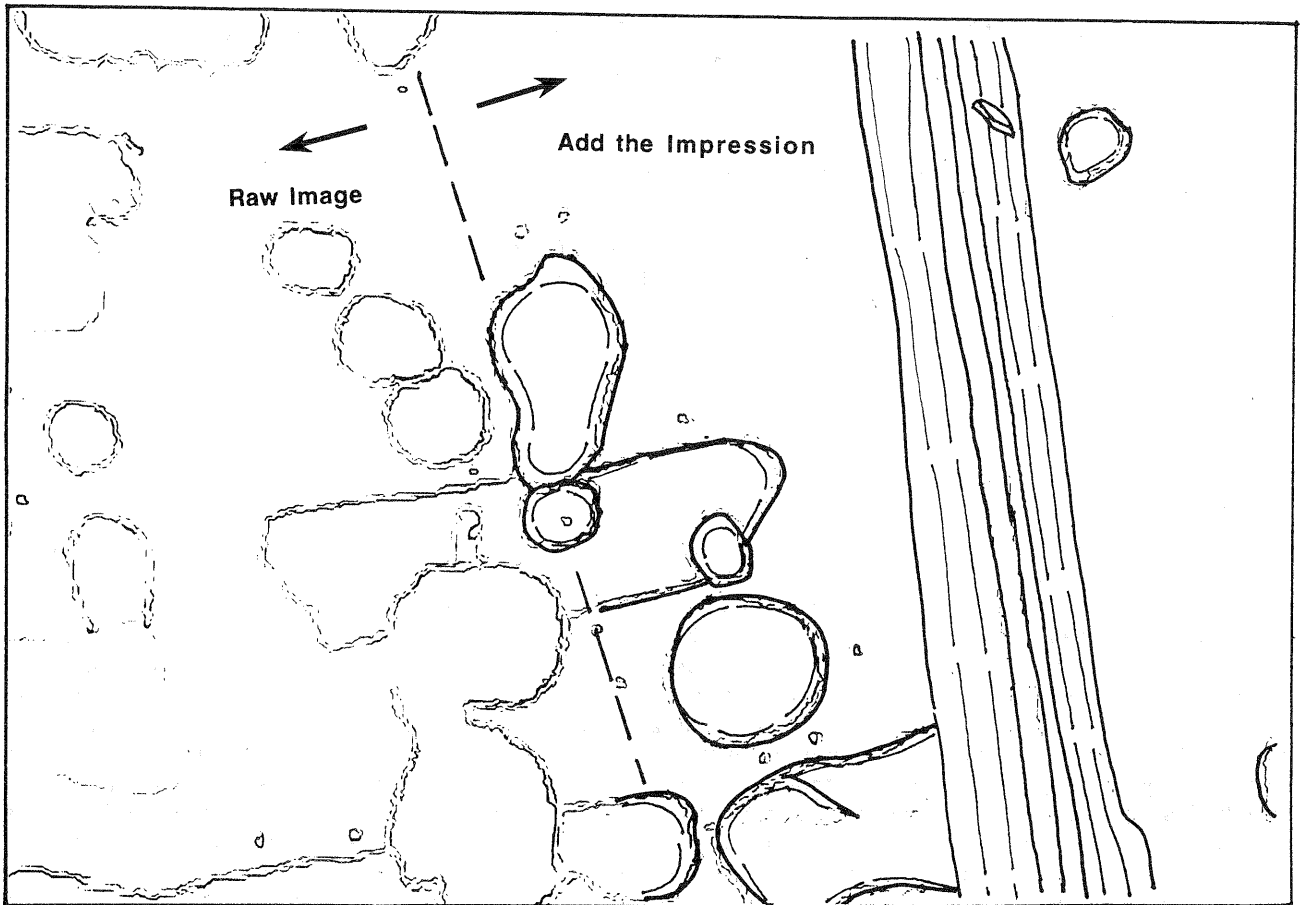Fig.3 Digital Images:Upper Right and Left Images, Lower:Ortho Image

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Fig.4 Image Processing from Fig.3 Lower Image and add impression

Fig.5 Traced Map

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