

The well sweep type photograph system

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Abstract

The author developed a new photograph system in order to make records of excavated small archaeological sites such as the pit dwelling.

The microphone boom stand for the TV studio was remodeled into the well sweep type camera suspending equipment. The camera can be brought up 8m high from the surface.

The camera mount to be able to turn on the vertical axis by means of the remote control was constructed. The camera can be installed on it vertically and horizontally against the surface. A small CCD TV camera is mounted aside the photographic camera to serve as a view-finder.

1. Introduction

In Japan archaeological excavations keep on increasing every year. Consequently the photogrammetry has often been introduced as the technique to record excavated features.

As archaeologist's demand such large scale map as 1:20 to 1:50, generally the helicopter is used for a camera station.

It often happens that the helicopter can't fly at any time and at any frequency archaeologists wish to take photographs, because the helicopters is not always free and used to be very expensive.

Archaeologists had better take photographs of their excavating site themselves to make good records. Accordingly it is desired that each excavation team has a handy photographic system which they can operate without particular training.

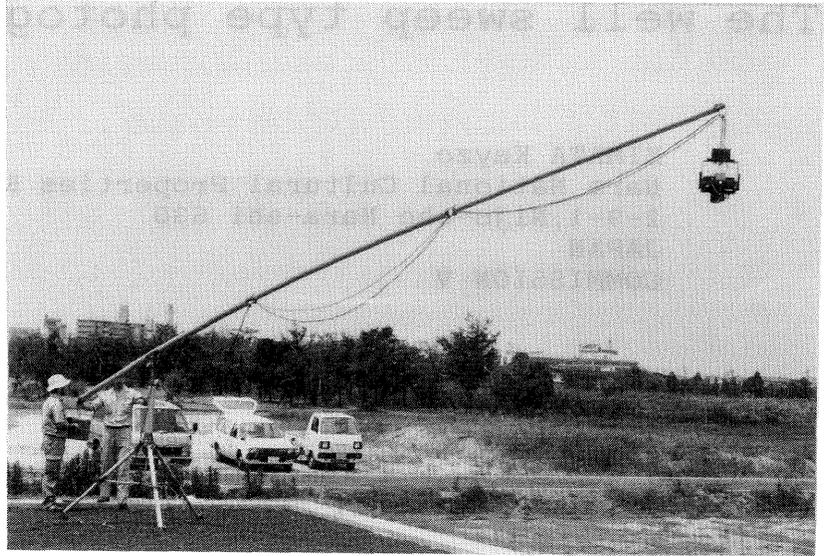
The objective of study is to develop a new photographic system which is designed by archaeologist's demands.

2. Suspension (Photo 1)

The microphone boom which is using at TV studio was remodeled into the well sweep style camera suspension. The length of boom is 8m. Take the maximum angle of elevation 55° , and the camera can be brought up 8m high from the ground surface. So photo-scale as large as 1:200 is obtained with 40mm focal length camera. It is made of duralmin and composed of four parts which can be carried by one person. Figure 1 shows their size and weight.

The suspending load is limited within 5kg by the strength of the boom.

Photo 1
New Photograph
System



3. Camera mount (Photo 2,3,4,5)

The camera mount to be able to turn on vertical axis by means of a micromotor remote controlled was constructed. The photographic camera and CCD TV camera which serve as a viewfinder can be installed on it vertically or horizontally against the surface.

Because of suspending load's limit, camera mount have to be lightened. A Hasselblad MK-70 weighs 2.8kg, and a CCD TV camera 0.7kg, consequently it must be lighter than 1.5kg.

Photo 2

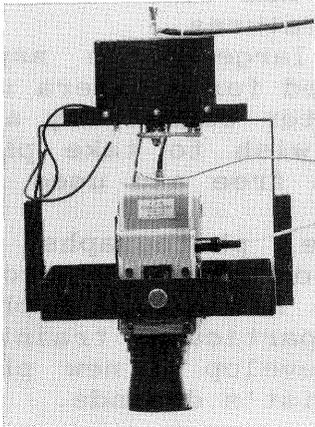


Photo 3

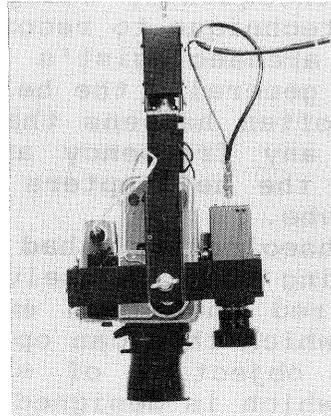


Photo 4

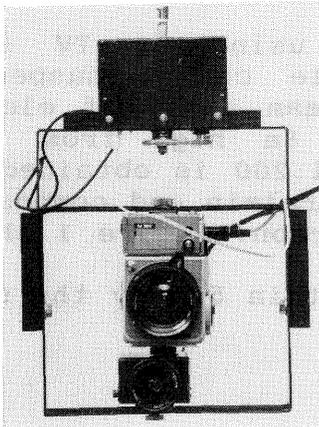
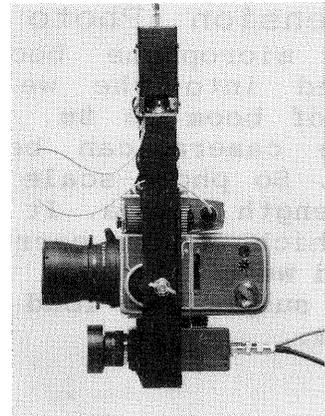


Photo 5



4. Camera

Hasselblad MK-70 and MKW are excellent for the photogrammetry, but archaeologists can hardly get them because of their high prices. Low price camera is the most important factor to generalize this system.

In order to ascertain which camera is better for the photogrammetry, comparative studies on the performance of non-metric cameras (Hasselblad 500EL, PENTAX PAMS645, MAMIYA 645, BRONICA SQAmR) in the analytical orientation has executed and proved that any camera are applicable to the photogrammetry with sufficient accuracy, if the analytical plotter is used. (table 1) By the way, PENTAX PAMS645 has four side fiducial marks and the vacuum system, the reseau plate is built in BRONICA SQAmR.

Table 1. Residual errors (standard deviation) in analytical orientation (PAT-B)

	500EL	MAMIYA	BRONICA	PENTAX	MKW
Xmm	0, 6	0, 8	0. 6	2, 9	0, 3
Ymm	1, 3	1. 7	1, 5	2, 1	0, 9
Zmm	0, 3	0, 5	2, 6	2, 6	0, 1

5. Control (Photo 6, 7)

Turning of the mount and shutter are controlled by using the remote control box. There are four cables between the mount and ground system. Two of them are for electric power supply to the micromotor and CCD TV camera. Others are a shutter release and an image carrier from the CCD TV camera to the monitor. They do not look smart, but easy to make as well as cheap. Radio control system needs two batteries for the CCD TV camera and the micromotor. Adding them to cameras and mount, their weights are far heavier from the limit.

Photo 6 Control Box

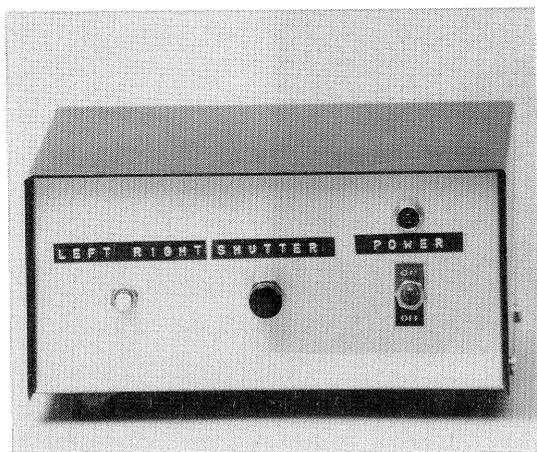
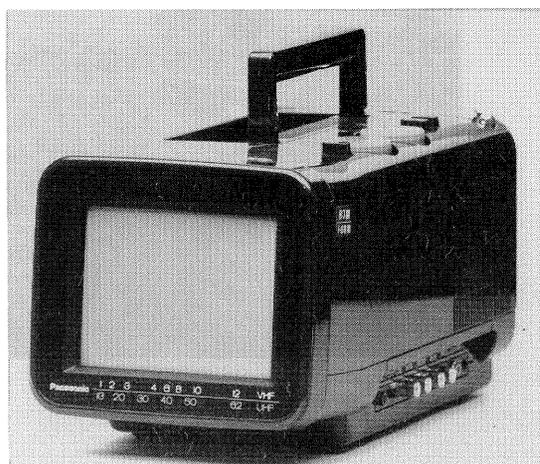


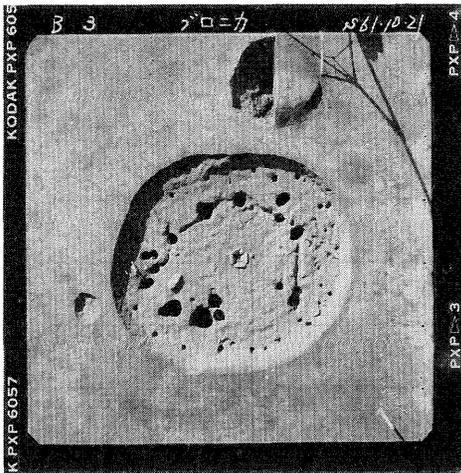
Photo 7 Monitor TV set 6inch type



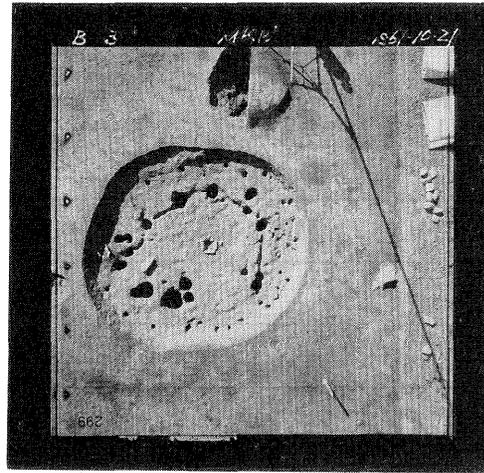
6. Conclusion

This system is possible to set-up in several minutes and to carry by four persons. This is the most suitable system to acquire stereo-photos of small sites such as the pit dwelling. (Photo 8) In the case that walls stand on the steep cliff, and there is no place to set camera. If this system is set on the top of walls and the boom is stretched on the valley, and cameras are turned toward walls, you can obtain stereo-photos of them. (Photo 9) That is a great advantage of this system.

Photo 8 An excavated pit dwelling



BRONICA



HASSELBLAD MKW

Photo 9 Setting this system on walls standing on the cliff

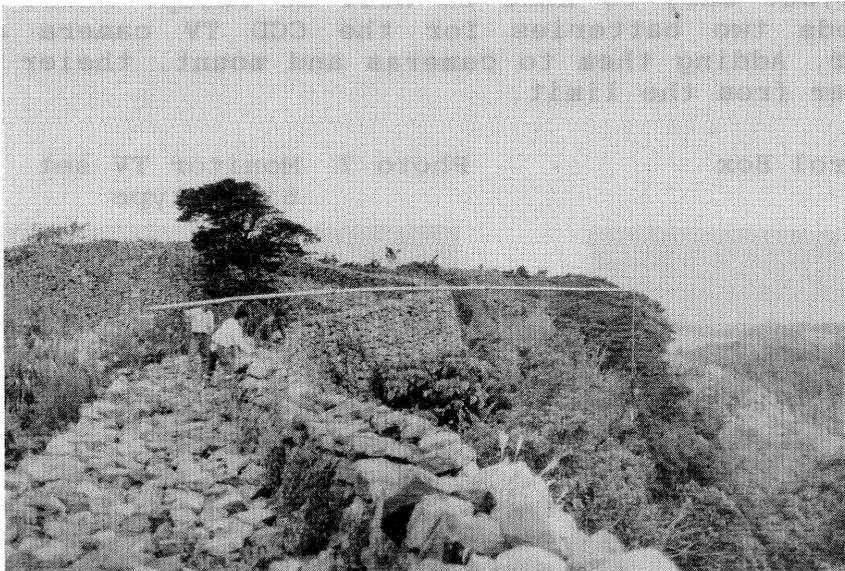


fig 1 size and weight of suspension

