A SYSTEM FOR THE NORMAL CASE OF CLOSE-RANGE PHOTOGRAPHY WITH TERRESTRIAL CAMERA

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ABSTRACT

The normal case of close-range photograph is realized by using WILD P32 terrestrial camera in which the base is changeable and known. With a system that has been developed for this purpose, photographs have been obtained by using a single metric camera which is capable of sliding on two steel bars ranging from 1 mm to 400 mm. While the base can vary from 1 mm to 400 mm if the photographs are taken 12 cm base, it will provide technical characteristics of WILD C12 and C120, and it allows user to obtain drawing outputs of 1/50, 1/100 and smaller scales by using WILD A40 Autograph. Also if photographs are to be taken at 400 mm base, larger-scale drawing outputs can be achieved. This system has been successfuly in use in the close-range photogrammetric applications, such as archaelogical and architectural projects.

KEY WORDS: Close-range photogrammetry, Terrestrial Camera, Design

1. INTRODUCTION

Many methods of close-range photogrammetry require special equipment, both for taking of the photographs and their subsequent measurement, and the availability of these special cameras and plotting instruments has allowed the full potential of close-range photogrammetry to be realised in many branches of science and engineering. Non-topographic applications of photogrammetry are made in the areas of medicine dentistry, architecture, human locomotion, archaelogy, experimental analysis of structures, hydraulics, ship building, animal husbandry, deformations of dams, glacier and earth slide movements, vehicle motion, missile tracking, accident reconstruction, and underwater events, to name but a few. In most of the applications listed above, a ground-based camera is used. Close range metric cameras include single cameras and stereometric cameras.

There are three main problems to be resolved in ground-based cameras. These are respectively camera position, camera-object distance, and the orientation of the camera image plane. Single cameras, in original using, mounts directly on the telescope of a theodolite to overcome these problems. On the other hand, because the camera position can be determined precisely and the orientation of the axis of the camera set to any desired direction, much more can be known of the relative and absolute orientation of a pair of photographs in close-range photogrammetry than in aerial work, and this offers advantages. Some situations call for stereometric cameras, where the axes of the two cameras are parallel, and a special instrument has been developed and designed to exploit fully this known geometry by using one single metric camera.

2. STRUCTURE OF THE ORIENTATION SYSTEM

If a stereoplotter is used to form an optical model of the object space, and if the photographs taken are of the normal case, then only the direction parallel to the direction of the camera axes will be subject to affine deformation. If the photographs are not at the normal case, then the affine deformation will occur in the three directions.

The Wild Autograph A40 is designed to plot from photographs taken in the normal case. The plate holders have no rotational motions, although equal elevation or depression angles at the two ends of the base can be accommodated. This instrument is used most efficiently for plotting from photographs taken with the stereometric cameras or the system that resembles it. The Wild P32 terrestrial camera accepts either glass plates or film and provides a format size 60 by 80 mm. It has an offset principal point and can be rotated about its optical axis in order to make the format fit the object space. The principal distance is fixed at 64 mm, and focused at 25 m. the depth of field is from 7.3 m to infinity at f/8, and from 3.3 m to infinity at f/22. An orientation system is designed and proposed to take photographs in the normal case of photogrammetry by using Wild P32 terrestrial camera. This system incorporates a camera carrier and two parallel steel bars (x-bars) (Fig. 1)

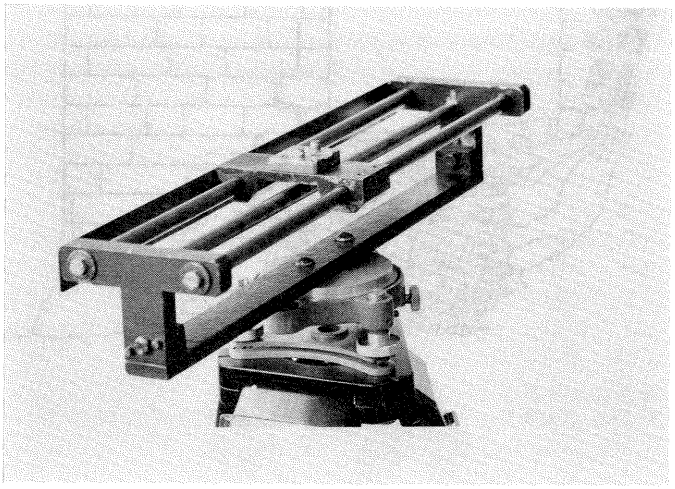

Figure 1. The Orientation System

The camera carrier is capable of sliding on two steel bars ranging from 1 mm to 400 mm. The orientation system mounts directly on the Wild thodolite tribrach and supports on the Wild tripod. The respective tilting and rotations of the photograph are adjusted at zero by means of a level buble and tribrach foot-screws. When the system carrier slides on X-bar to take a second photograph, the optical axes of the stereo-pairs remains parallel to each other and perpendicular to the base. This system, also has a steel rule at the back and the base length can readily be measured. Two samples of drawing output are given in Fig. 2 and Fig. 3.

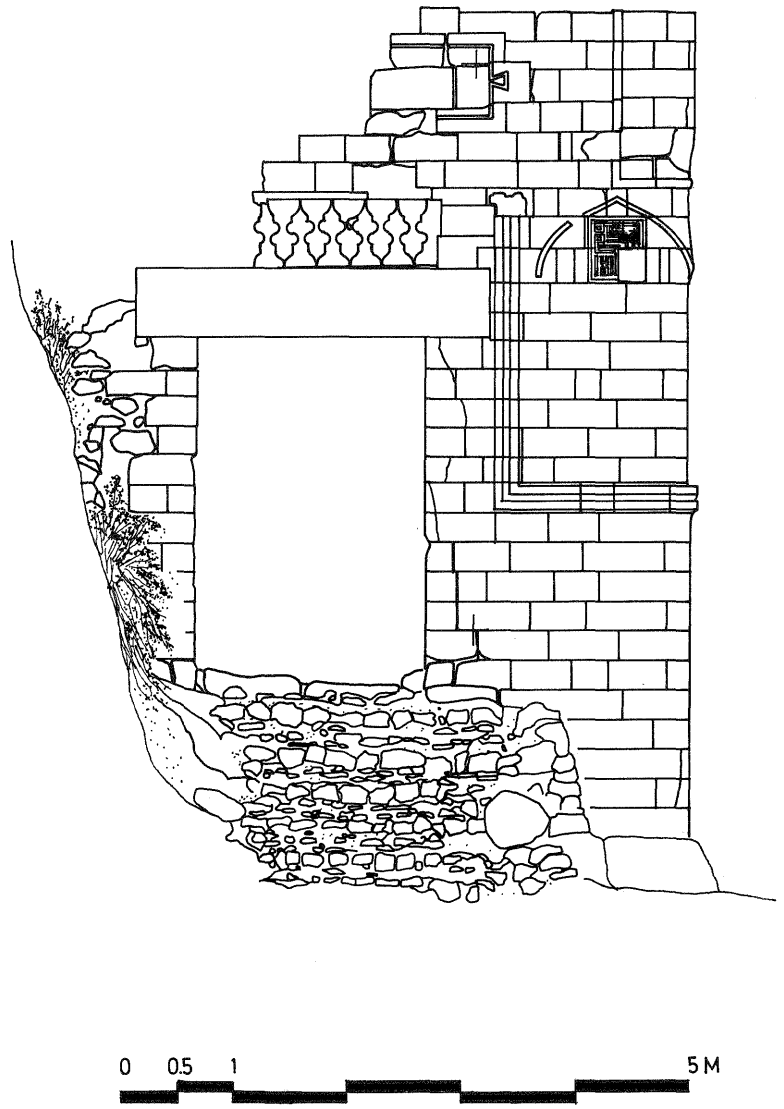

Figure 2. A Detail of Hasankeyf Castle, Batman. Original Scale 1:50

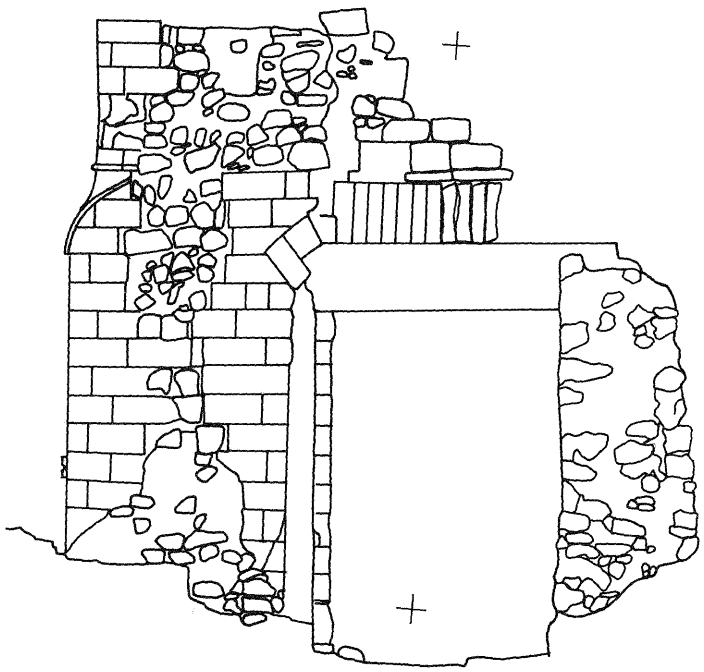

Figure 3. A Detail of Hasankeyf Castle, Batman. Original Scale 1:50

3. CONCLUSION

Based on the results obtain in this investigation a number of conclusions can be drawn regarding the use of this system;

* The relative orientation does not entail a seperate operation as it spontaneously occurs while taking photographs.

* The base can vary from 1 mm to 400 mm.

* Photographs taken with 12 cm base will provide technical characteristics of Wild C120, and it allows the user to obtain drawing outputs of 1/50, 1/100 and smaller scales by using Wild A40 Autograph. Also if photographs are to be taken at 40 cm base, larger-scale drawing outputs can be archieved.

* This system has been succesfully in use for close-range photogrammetric applications, such as archeological and architectural projects.

* As this system is lighter than the steometric cameras it is easier to carry it from one place to another, requaring less manpower.

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