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Contents

(continued on the next page)

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Contents (cont.)

STATE OF THE ART IN DIGITAL PHOTOGRAMMETRIC WORKSTATIONS

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ABSTRACT

Digital photogrammetry workstations have reached a remarkably mature technical status. All basic problems have been solved and brought to practice. The objective of this paper is to list the most important technical achievements of recent years, so as to define the state of the art as of today. The list results from an examination of the developments in which the author has been personally involved. It contains twenty five state-of-the-art items. At the end of the paper, reasons are given for the expectation that the photogrammetric workstation will disappear as a specially designed entity.

INTRODUCTION

During the past half a century, photogrammetry has grown tremendously as an art and a science, and become a dominant mapping tool all over the world. In the field of photogrammetric instruments, we have observed the rise -- and decline -- of "optical train" stereo plotters, the birth of analytical triangulation and block adjustment, and the ascent of analytical plotters to their current position as preferred photogrammetric instruments.

We are now witnessing the advent of a new era, that of Digital Photogrammetry. Its roots are in computer technology, computer imaging and analytical photogrammetry. I've heard it said that a digital photogrammetry workstation is a new type of analytical plotter. In a limited sense that may be so, but the concept of digital photogrammetry has much greater potential. It brings about a bigger revolution than any instrument or methodology development in photogrammetry up to now. When it is fully developed, its effects will be felt also in the associated disciplines such as Remote Sensing and Geographic Information Systems (GIS). Photogrammetry itself will be dramatically different.

In this paper, I'll review the present technical status of digital photogrammetry. I'll do it from a somewhat restricted personal perspective. I'll focus primarily on <u>workstations</u> and <u>systems</u> , because I have been fortunate to have been able to participate in major developments in those aspects of digital photogrammetry. These developments include systems for the U.S.A. Government and for the commercial market place, thus bracketting the entire cost and performance spectrum of workstations. I believe they represent the state of the art in systems developed for mapping purposes. Important developments have taken place in industrial digital photogrammetry, digital sensors, etc., but I am not in a position to deal with them in detail. After the review of the state of the art, I'll discuss briefly my understanding of the trends in workstation developments -- and why I think the "photogrammetric workstation" will become nothing more than sofware running on a standard workstation.

STATE OF THE ART IN DIGITAL PHOTOGRAMMETRY

First, a little history. The concept of a digital (softcopy) photogrammetric workstation has been around for approximately ten years. Publications by Tapani Sarjakoski (1981) and James Case (1982) mark the beginning of the digital photogrammetry era, although several other people have worked earlier on related subjects. Dr. Case described a digital workstation in his paper entitled "The Digital Stereo Comparator/Compiler (DSCC)" (Case, 1982). The description led to the development of the first digital photogrammetry workstation. Detailed specifications for the workstation were defined when the U.S.A. Government placed a contract for the development of the DSCC. The contract was won by the General Dynamics/Helava Associates team. Over one dozen DSCCs were delivered in 1985. Several variants have been developed since then. Hundreds of such workstations are under contract, scores have been built and are in operation.

To my knowledge, the DSCC was the first fully operational photogrammetric "softcopy workstation". Its development project was very ambitious; the resulting instrument had to meet a comprehensive set of capability and performance requirements. Even though it was the first one, it is still a state-of-the-art workstation, except (perhaps) for its display system. Therefore, I'll describe the DSCC in some detail to establish a reference against which the later developments can be compared. I'll comment more briefly on the General Dynamics in-house experimental system, the Digital Image Workstation Suite (DIWS), the DMA Workstation, the HAI-500, the HAI-750, and some significant ancillary devices to give a fuller picture of the state of the art. I'll not deacribe many technical details; rather, I'll identify state-of-the-art features in each, with the objective of developing a list of such features "for the record".

Digital Stereo Comparator/Compiler (DSCC)

Figure 1 shows a group of DSCC workstations. The workstations have binocular viewing systems and the general appearance of a large analytical plotter. The computer system driving the workstations is not shown. It consists of several six feet high cabinets of computer equipment. Each workstation has 56 special computer boards, designed and built by General Dynamics, and a Floating Point Systems 5310 array processor. Two workstations share a VAX 11/780 computer. There is also a substantial amount of other computer equipment shared by all the workstations in the cluster shown in Figure 1.

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