

REPORT ON THE “DISCUSSION ON MAN–MACHINE INTERFACE IN PHOTOGRAMMETRY”, FREDERICTON, AUGUST 7–9, 1972

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The Department of Surveying Engineering at the University of New Brunswick, Fredericton, N.B., Canada, was host of a two-day “Discussion on Man–Machine Interface in Photogrammetry” on 7–8 August, 1972. The purpose of this meeting was to draw the attention of the photogrammetric profession to the increasingly important aspect of on-line photogrammetry, and to stimulate communication between researchers and practical users. The meeting has been timed immediately following the 12th Congress of the International Society of Photogrammetry in Ottawa, to enable participation of interested photogrammetrists from outside the North American continent.

Eight speakers were invited to present their views, speak of their experience, and show their achievements in a field of computational photogrammetry, which has become important and extremely interesting during the past few years. Although the analytical stereoplotter concept has been around for over a decade, and a number of these instruments have been in operation several years, the photogrammetric community has greeted this solution with scepticism. This is attributed both to the misinterpretations of the aims and objectives visualized by the designers of the analytical stereoplotter, and to a general lack of appreciation of an idea that became reality at a much too fast rate. It was not recognized until recently that the gap between conventional analog instruments and modern analytical systems can be and is being bridged by hybrid restitution and general on-line data acquisition systems. As the New Brunswick Department of Surveying Engineering has been actively involved in research and development of analytical stereoplotter software, of interfacing stereoplotters with computers, and of hybrid systems, the organization of such a discussion meeting could be justified.

U.V. Helava from Bendix Research Laboratories, Southfield, Mich., U.S.A., spoke about the *Past, Present, and Future of On-Line Photogrammetry*. As inventor of the analytical plotter, the well-known scientist Helava presented advanced ideas of man–machine interfaces from the systems approach point of view. The expression “photogrammetry” appeared only at the end of his paper. Very general, but instructive flow diagrams were shown to indicate the many connections existing between measurement, data collection and acquisition, data refinement, information retrieval and processing, statistical theory, stochastic processes, data interpretation and analysis. This paper could be considered coming from one side, the higher side of the entire spectrum of on-line photogrammetry.

More into specific problems went Z. Jaksic from the National Research Council in Ottawa, Canada, in this paper *Some Aspects of the NRC Analytical Plotter's Hardware and Software*. The first analytical stereoplotter was designed at NRC a decade ago. Presently, one model is being redesigned at a large scale and specifically for NRC purposes, by incorporating better hardware features, interfacing a different computer, and developing software packages of a higher degree of flexibility. The man-machine interface is separated into two parts, viz., on a viewing panel and on a teletypewriter which latter is mostly responsible for interactive communication.

S.E. Masry of the Department of Surveying Engineering, University of New Brunswick, and J. S. Friedman of O.M.I. Corporation of America, presented a paper *AP/C-3: The New Analytical Plotter*. The AP/C-3 shows a number of improvements in comparison to the previous model AP/C. The programs, developed by the Department of Surveying Engineering staff, are written in Assembler and FORTRAN languages. This facilitates modification of the programs by the users. The plotter utilizes for its control an 8K IBM 1130 general-purpose computer. Memory sizes up to 32K and a number of programs and routines developed by IBM and its users are available.

In a separate presentation, S.E. Masry summarized various research projects carried out at his Department in conjunction with the analytical plotter AP/C-2-IBM System 370 interface. One of the projects is based upon a new concept for the correlation of a stereo-pair of photographs, whereby the stereo model is scanned in epipolar planes thus simplifying the problem of correlation. Other investigations such as infrared imagery, highway design and plotting from two-media photography were explained.

L.O. Herd presented a paper on *Photogrammetry Related Real Time Computer Systems at the Ohio Department of Highways*. The speaker could report about sixteen years of experience with digital data processing in photogrammetry. In a concise way, he talked about the basis for the present systems at his department, particularly about practical considerations. Already in 1964, an AP/C stereoplotter was used for a variety of tasks, even far beyond the duties of a highway department, viz. NASA "Ranger" photographs. Since 1970, the AP/C system has been extended to a real-time data acquisition and communication IBM 1800 system. Future developments are concerned with direct interfacing the two systems, whereby economic reasons plead for off-line plotting and orthophoto production.

B. Makarovic from the I.T.C. in Enschede, The Netherlands, gave an excellent exposé on *Design Considerations of Hybrid Stereorestitution Systems*. Starting from the general idea of man-machine interfaces, the speaker presented a variety of currently available solutions and elaborated on them. Besides the O.M.I.-Bendix Analytical Plotters, he discussed the Galileo DS Digital Stereocartograph, the Bendix Image Space Plotter, the Bendix Hybrid Plotter, and the ITC Hybrid System Concept. Some of his valuable findings may be summarized

as follows: incorporation of an on-line digital computer in a photogrammetric restitution system requires a considerable amount of hardware interfacing; the most critical components are the output motor drives; consistent use of feedback loops seems essential.

*A New Photogrammetric Hybrid Restitution System* was introduced by O. Hofmann, Messerschmitt-Bölkow-Blohm in West Germany. A single basic outfit, in conjunction with several accessories, covers the entire range of photogrammetric stereo compilation. The modular design permits digital and graphical plotting of non-conventional photography. A simple dedicated real-time computer controls the measurement from and the feedback to the photographs. By building as little mechanics as possible, the overall solution seems to represent a good balance between electronic and mechanic hardware.

The "lower end" of the spectrum of on-line photogrammetry was represented by the paper *Low-Cost On-line Photogrammetry* given by E. Dorrer. In contrast to the usual opinion, simple yet quite powerful on-line data acquisition and processing systems can be built for photogrammetric restitution purposes. The speaker reported of a development at his department, where a WANG Model 700 has been interfaced with a Wild A-10 stereoplotter. By taking into account the flexibility and modularity of such a system, conventional dedicated hardware digitizers are found to be obsolete. The discussed hardware and software configurations seem to be particularly attractive for small private enterprises.

Although the attendance of the meeting fell below the expectations of its organizers, the very lively and spontaneous discussions proved to be of immense value for many of the participants. The "unlimited" time for discussion was an agreeable change for the participants from the tightly scheduled and inevitably formal technical sessions at the Congress in Ottawa. The Department of Surveying Engineering demonstrated also its achievements in the field of man-machine interfaces as applied to on-line photogrammetry. The Proceedings of this meeting will be published in early 1973.