DR. EDWARD M. MIKHAIL Purdue University Lafayette, Indiana 47906

## Hologrammetric Mensuration and Mapping System

 $\mathbf{S}^{\text{INCE SEPTEMBER 1969, research on the potential applications of holography to}$ mapping has been in progress at Purdue University under contract to the U.S. Army Engineer Topographic Laboratories, Research Institute, Dr. Desmond C. O'Connor, Director. In the March 1971 issue of this journal Dr. G. H. Glaser and I reported the results of the first mensuration systems as applied to special test objects. Last January, in an extensive paper presented to the Symposium on Close-Range Photogrammetry, Urbana, Illinois, we described how we extended the activity from mensuration to mapping and from test blocks to realistic objects of interest. Figure 1 is a contour map and a cross section of a dental casting obtained from a hologram using a modified Autograph A 7. Recent practical application of the developed techniques involved the use of a hologram to digitize three-dimensional bone surfaces to support a biometric study of the



FIG. 1. Toothless dental casting.



FIG. 2. A pair of overlapping aerial photos.



FIG. 3. A photograph of the resulting holographic stereomodel.

design of prosthetic devices.

Although the development of mensuration and mapping techniques for laboratory holograms of close-range objects is useful, the extension of the capability to outdoor objects and terrain views would be of greater significance. It is with pleasure that we report here that a breakthrough has been made. In February, 1971, an interdisciplinary team at Purdue, Dr. E. M. Mikhail and Col. M. K. Kurtz, Jr. (from the photogrammetry area), and Dr. W. H. Stevenson and Mr. N. Balasubramanian (from the engineering optics area), successfully produce *holographic photo*-

(Continued on page 454)

PHOTOGRAMMETRIC ENGINEERING, 1971

data. The magnitude of population change was also mapped. Such maps may be used as guidelines for regional and urban planning and development within the study area.

## References

 An example of such effort for Jamaica was in Eyre, L. A.; Adolphus, B.; and M. Amiel, "Census Analysis and Population Studies", *Photogrammetric Engineering*, Vol. 36, No. 5, (May, 1970), pp. 460-466. Earlier references to the applicability of air photos in sociometrics can be found in M. M. Witenstein's papers: "Photo Sociometrics—The Application Of Aerial Photography To Urban Administration And Planning Problems", *Photogrammetric Engineering*, Vol. 20, No. 3, (June, 1954), pp 419-427; "Use And Limitations of Aerial Photography In Urban Analysis And Planning", "*Photogrammetric Engineering*," Vol. 21, No. 4, (Sept., 1955) pp. 566-572; and in Roscoe, J. H., "Photo Interpretation In Geography" in Manual Of Photographic Interpretation (American Society Of Photogrammetry) Washington, D.C. p. 764-765.

- Regional Photo-Maps, Atlanta, Georgia, 1968, Vols. I, II, and III (Atlanta, Georgia: Thomas M. Lowe, Jr. & Assoc. Inc., Consulting Engineer, 1969).
- United States Census of Population: 1950, Vol. III, Chapter 2 (Atlanta, Georgia) (U.S. Dept. of Commerce, Bureau of the Census, 1952).
- United States Census of Housing: 1950, Vol. V, Part 9 (Atlanta, Georgia) (U.S. Dept. of Commerce, Bureau of the Census, 1952).
  Atlanta Standard Metropolitan Statistical Area
- Atlanta Standard Metropolitan Statistical Area Population: Housing As of April 1, 1968 (Atlanta, Georgia: Atlanta Region Metropolitan Planning Commission, 1968). Tables 6 and 9.
- 6. Ibid. Table 6.
- 7. Ibid. Tables 6 and 9.

## (Continued from page 447)

grammetric stereomodels from pairs of overlapping photographs. The new technique has been applied to photographs of small objects as well as to regular aerial photographs such as the pair shown in Figure 2.

The resulting holographic image (Figure 3) captures the relative orientation and allows

one to discard the photographs. An important characteristic to point out is that each small area of the holographic plate contains information about the *entire* stereomodel. Current efforts include the use of developed techniques for mapping the newly formed holographic models of terrain.

American Society of Photogrammetry	
This is to certify that	
Having met the requirements of the Society's Constitution and By Laws	
wasgranted Corporate Membership in 1934 By Authority of the Board of Directors	
President	Chairman, Membership Committee
Secretary Treasurer	

Illustrated above is the certificate that is available to members of the American Society of Photogrammetry. The original, suitable for framing, is 8½ by 11 inches with the name of the member attractively hand engrossed. The price is \$2. Orders should be sent to ASP, 105 N. Virginia Ave., Falls Church, Va. 22046.

## 454