A CLASSIFICATION OF GENERAL PROBLEM TYPES IN PHOTO INTERPRETATION*

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ABSTRACT

Problem analysis and decision making about the use of photo interpretation are difficult processes for both the interpreter and those seeking information. Even with adequate statements of problem there appear to be many possible answers. A classification of general problem types in photo interpretation is proposed to aid in problem-analysis and to present a concise picture of the jobs photo interpretation can do.

INTRODUCTION

IN CONNECTION with some recent work in photo interpretation the author was reminded of a problem which has concerned him for some years. Simply stated it is to provide a concise logical answer to the question "What jobs can photo interpretation do"? This question is usually the first and typical one asked by those considering the use of photo interpretation.

Assuming that most interpreters are "selling" photo interpretation as a service, they must make a case for its use in a given project. In presenting this case there is usually some form of problem analysis or discussion similar to the exchange between two scientists described by Colonel R. W. Philbrick in the March 1954 JOURNAL of this Society.[1] As he pointed out, if this step is properly carried out we have an adequate statement of the problem. This can be a difficult process, but without it there is a good chance of "no sale" or there will be a dissatisfied customer. However, assuming that the problem is adequately stated as a question involving the use of photo interpretation, it is important to supply an adequate yes or no answer.

Professor C. W. Churchman in a significant book on scientific problems says "a question remains ambiguous until one can state what the possible answers are like."[2] At present the "possible answers" from photo interpretation would appear to be those from individual experience plus the list of problem solutions published in the literature. With this situation prevailing, problem-analysis—an adequate statement of the problem and selection of an adequate solution procedure from a choice of possible answers—does not appear to be the orderly, logical procedure that it should be if photo interpretation is to attain its highest potential use.

Over a period of years it has seemed to the author that *something is lacking* in this phase of photo interpretation. There seem to be too many "possible" answers, and in many cases we may not be putting our best foot forward in a specific case. It appears that this lack of something is shared by other people, including at least one who has expressed his concern as a criticism of the 1953 Photo Interpretation Panel Program of the Society. Dr. Robert Colwell mentioned this criticism in the introduction of his paper[3] at the 1954 Panel which is as follows:

> "One criticism of the past photo interpretation programs has been that the full significance of each speaker's report could not be appreciated because little was done to integrate the individual reports into an over-all analysis of the photo interpretation problem."

The quoted statement is perhaps another way of expressing the feeling that something is lacking. Perhaps the key to this problem is the word "integrate" which he used. It has occurred to the author that what is needed to "integrate" all the "possible answers" is a framework

[1] Philbrick, Col. R. W., "The Approach to Long Range Research for Photogrammetry," PHOTOGRAMMETRIC ENGINEERING, Vol. XX, No. 1, March 1954.

[2] Churchman, C. W., "Theory of Experimental Inference," The MacMillan Co., 1948.

[3] Colwell, R. M., "A Systematic Analysis of Some Factors Affecting Photo Interpretation," PHOTOGRAMMETRIC ENGINEERING, Vol. XX, No. 3, June 1954, p. 433.

* This is a part of the Panel on Photo Interpretation held on March 8, 1955 during the Society's Annual Meeting.

† See News of Photogrammetrists.

or classification of general problem types which can be handled by photo interpretation. It seems that with such a classification the process of problem-analysis and decision-making about the use of photo interpretation would be more logical and serve both the interpreter and his client.

The author will submit such a classification but with some qualifications. In the first place the proposals set forth in this paper may be only a preliminary form to be added to or revised. The general problem types reflect the author's experience, both military and civilian, as well as the experience of others from published material. In addition, the development of the problem types was also considered from a theoretical approach. Given aerial photos of a portion of the earth's surface, what are all the possible approaches to provide information? It is hoped that most of the possibilities have been included, and with the above qualifications granted, the classification of general problem types is submitted.

Classification of General Problem Types

Before discussing the details of the classification it is necessary to mention some principles which would prevail:

1. Topographic photo interpretation applies generally to the surface of the earth, including both natural and man-made features.
2. Information from photo interpretation of surface features can range from none (0 per cent) to precise (approaching 100 per cent in accuracy).
3. Photo interpretation is generally considered for use in solving problems involving one or a combination of the following reasons:

   Size of area
   Remoteness of area
   Time available
   Secrecy
   Expense of field survey
   Lack of survey personnel
   Estimate required
   Up to date information

The author believes that there is a tendency to overlook the above items in discussion about the use of interpretation in the literature. These factors may have a strong influence on the problem and largely determine the type of answer. While there are situations where one of the above items may be the controlling factor, usually they prevail in combination. In addition, in some situations the factors may tend to merge and have the same meaning. In many cases expense and remoteness can mean the same thing. Detailed field surveys are costly and this can mean detailed information on areas in the United States may be as scanty as similar information for the African jungle. In turn, limited field surveys may be possible in a given project but the area involved may be large. A study of the literature indicates that interpreters have been generally concerned with accuracy of work and have preferred generally to confine their efforts to identification of characteristic features. This is understandable, but in many cases there is a great need for estimate data, particularly where time is also an important consideration. In a recent experience, typical of others described in publication, factors of time, limitation of funds and available personnel would have precluded detailed data except by the use of photo interpretation.[4]

These factors have been emphasized since they may determine the type of problem and answer in a given situation. With the above conditions granted, the author submits the classification of general problem types for photo interpretation, shown in Table 1.

Discussion

Before discussing the items in the table it should be emphasized that the classification is not intended to be rigid. While there are problems which will fall in one type only, there are others which will be a combination of the three main types. For example, a set of criteria could be established for selection of an airfield site. A large area could then be examined and possible sites located. This would be a combination of Problem Types II and IIIc.

With reference to the items in the table the following comments are submitted.

[4] Dill, H. W., Jr., "Photo Interpretation in Flood Control Appraisal," Photogrammetric Engineering, Vol. XXI, no. 1, March 1955, pp. 112–114.

TABLE 1

A CLASSIFICATION OF GENERAL PROBLEM TYPES IN PHOTO INTERPRETATION

	Problem Type	*Form of Question*	*Form of Answer**	*Accuracy**	*Comment*
I(a)	"Positive" Identification Problem	Are there steel plants in the area?	Will vary from yes to qualified yes there are.	Up to 100%	Will generally include problems dealing with single, characteristic objects.
(b)	Non-Identification	As above	As above negative	Up to 100%	
II	Problem Area Reduction	We are interested in cedar swamps for field study in this large area.	Actual or probable cedar swamps are located as follows:	Up to 100% based on criteria established	Provides optimum use of time, funds and personnel for field survey.
III	The "Best Estimate" Problem				
(a)	Identification of less distinct items	How much of area X is in woods?	About ___% of area X is in woods.	Will vary depending on definition of items to be identified	This problem differs from I(a) since category is less definite.
(b)	Classification of area into "conventional" categories (i.e. from scientific and governmental usage)	We need an estimate of land use in area X to show: cropland, hayland, good and poor pasture, and idle land.	Area X has ___% cropland ___% hayland	Will vary depending on definition of categories	This procedure has some statistical advantage over field sampling since whole area is studied using photo interpretation.
(c)	Classification of area into special categories previously determined with more than one class	We need estimate of cropland, hayland, pasture and woods by deep, shallow, imperfectly drained and poorly drained soils for area X.	Area X has ___% cropland with deep soil; ___% cropland with shallow soil, etc.	Similar to III(b) above but error probably increased by additional class	Same as III(b) above.
(d)	Area measurement of problem types (a) (b) (c) above by planimeter, grid or dot grid.				
(e)	Problem types (a) (b) (c) above carried out by photo interpretation sampling.				

* These items will be affected in varying degree by photo characteristics and skill of interpreter in all problem types.

PROBLEM TYPES

Perhaps the most obvious difference between the three major Problem Types is that Type I generally would deal with single objects and Types II and III involve areas. Problem Types Ia and IIIa are similar but Type IIIa was set up to take care of items that may be difficult to identify as "positively" as single objects with distinctive characteristics. For example, compare the identification procedure in the case of a blast furnace contrasted with that of a land use class, such as pasture. In the case of the blast furnace there are characteristic items that can be identified "positively" which would be generally acceptable to most experts. In comparison pasture has distinctive characteristics but less "positive." In addition, it is necessary to establish the boundary between the pasture and other land use classes, so the answer involves area. In this process there could be a difference in expert opinion even in field mapping. In consideration of the above factors the two Problem Types were established.

With reference to Problem Types II and III in general, the user of data from photo interpretation has the answer in his own terms. As mentioned above this is perhaps not as the interpreter would prefer it; but in many cases this procedure can supply much needed information. There was some question of placement of Problem Types IIId and IIIe in the classification and whether in fact they are separate problems. It was decided to list them as such so that use of these procedures would not be overlooked.

FORM OF QUESTION AND FORM OF ANSWER

The questions and answers shown in the table under these items are only to illustrate the problem statement and the form of the answer. For any given special field of study appropriate questions and answers could be formulated. Again it should be mentioned that the form of the answer may be very important to the user of information.

ACCURACY

Accuracy is a difficult subject with reference to photo interpretation, but it is included, since this question comes up in problem analysis. In the case of Problem

Type I, accuracy can be expressed as a percentage in many cases. For the rest of the Problem Types the accuracy will be that acceptable to the user based on the factors prevailing for the situation, time, funds, etc., as well as the variables of photography and skill of the interpreter.

Summary

In summary, it is hoped that the classification of general problem types may serve the following purposes:

1. Assistance in problem analysis and decision making about the use of photo interpretation.
2. Assistance in presenting a concise picture of the jobs that photo interpretation can do.
3. Help in integrating or cataloguing the successful solutions to photo interpretation problems that have been published.
4. Help in widening the use of photo interpretation particularly for the "Best Estimate" type of problem.

NEWS OF THE SECTIONS

Northern California

The first six months of this year have been rather active. Under the leadership of Dr. Robert N. Colwell, the section held five interesting and informative meetings.

R. H. Moore and C. A. Biever have been appointed Co-Chairmen of the Program Committee and Mr. Moore has been selected to serve with L. D. Packard as our Section's representatives to the Engineering Council. This Council, of which the Section is a charter member, is composed of Sacramento area sections of Civil, Photogrammetric, Electrical, Heating, Mechanical, Structural, Professional, Illuminating, Safety and Industrial Engineering Societies. It was formed for the purpose of carrying on activities beneficial to the Engineering profession. The Section feels the Council is a very worthwhile organization and will further strengthen the position of photogrammetrists in the engineering field.

Those who have been interested in the progress of registration for photogrammetrists in the State of California will be disappointed to learn that the study by the State Legislature has been shelved for a two year period. This leaves the registration situation exactly where it has been. Meetings held in 1955—January 3: "The Growing Importance of Photogrammetry for Both Topographic and Non-Topographic Purposes"—Arthur C. Lundahl; February 10: "A Summary of the Seven Papers Given Last December 29 at the Photogrammetry Symposium in Berkeley, California"—Dr. Robert N. Colwell; March 3: "Photogeology and the U. S. Geological Survey"—William A. Fischer, Bryon Kent, W. H. Condon; April 5: "Highlights of the 1955 Annual Meeting" (A Panel Discussion) Panel Participants—Dr. Robert N. Colwell, Tracy Atherton, Frank Moffitt; May 26: "The Bay Barrier Story"—Herbert Howlett.

Puget Sound Section

Myron B. Savage, outgoing President, has sent in official notification of the new officers of the Section. They are: President—Prof. Harry Bell; Vice-President—Prof. H. Chittenden; Treasurer—Prof. Harry Smith. As in the past, the Puget Sound Section rotates its president and secretary between Canadian and American members. This year the new President and Secretary are Canadian and the Vice President is American. Mr. Savage stated that it has been a pleasure to serve as President of the Section and in behalf of the old and new officers of this section, he wishes much success to President Park in leading the Society to ever increasing professional dignity and scientific advancement.

Rochester (Pa.) Section

The Board of Direction on July 13 granted the petition and approved this new section, subject to later agreement on boundaries. This is the first addition to the list of Sections since the administration of Talbert Abrams. It is believed that other applications are seriously contemplated.