TRAINING AND EDUCATION FOR PHOTOGRAMMETRY AND REMOTE SENSING IN KOREA

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COMMISSION VI, 186

ABSTRACT

In Korea, photogrammetry is widely applied in various construction projects, photo interpretations for land use and environmental problems as well as in mapping of topograpical maps. In the field of remote sensing, it is at the begining stage and there is much demand for technical manpower.

This paper examines the present aspects and problems of photogrammetry and remote sensing both in professional and academic education. Future visions are also discussed.

I. INTRODUCTION

Photogrammetry and remote sensing have been useful methods in mapping and data acquisition for the effective manipulation and control of land and natural resources. In Korea, education and training have been accomplished to meet the increasing demands of manpowers and researches.

In Korea the education and practical training for photogrammetry and remote sensing has chiefly been executed by universities and National Geography Institute (NGI). Photogrammetry had been initiated practically to train and to supply the manpowers needed for producing the national base maps which were compiled by aerial photogrammetry since 1960's. Lectures on photogrammetry had been established in universities since 1970's. At the early stage, the technical experts participating in all the photogrammetric projects have been supplemented by ITC traning course. The basic courses on photogrammetry have been set up independently in many universities and colleges, and more advanced education has been done in graduate courses.

Remote sensing has been established in the universities as one part of the graduate courses since the late 1970's. Korea Advanced Institute of Science and Technology (KAIST) and some universities have been concentrated on the research of remote sensing.

II. Academic Education

Though photogrammetry and remote sensing are established as lectureship in the department of civil engineering, geography and geology, etc., they are generally set up in surveying part of civil engineering. Because there are no other departments majoring in only photogrammetry and remote sensing in Korea, the primary and overall educations of those subjects are carried out by those departments.

On the other hand, the recent tendencies of photogrammetry and remote sensing have been actively studied in graduate school and research institutes. Through the lectures like advanced photogrammetry, analytical photogrammetry, advanced remote sensing, applied photogrammetry, and applied remote sensing, etc., the most interesting and researchable topics to that period are studied and dicussed.

Table 1 shows relevant subjects to photogrammetry and remote sensing at the representative 22 universities (12 national and public, 10 private) in Korea. Two - year colleges which give the lectures on photogrammetry are not included here. This table also shows that photogrammetry is generally set up in numerous undergraduate courses but remote sensing is not so. While relatively various subjects pertinent to photogrammetry and remote sensing are established in graduate courses.

Nowadays lectures relevant to photogrammetry and remote sensing are opened in 30 universities or more among over 100 universities in Korea, and 900-1000 students study the subjects pertinent to photogrammetry and remote sensing as required or an elective curriculum in undergraduate course. Graduate courses on photogrammetry and remote sensing are established in about 10 universities. Among these universities doctoral course is concentrately set up in Yonsei Univ., Chung-Nam National Univ., Seoul National Univ., Seoul Municipal Univ., Dong-a Univ., Hanyang Univ., 20-30 masters and 2-5 doctors have acquired their degrees from these universities each year since 1980's.

The number of relevant subjects to photogrammetry and remote sensing is 32 (21 in photogrammetry , 9 in photo interpretation , 2 in remote sensing) and amounts to 27% of total 119 subjects including 87 related disciplines. This number corresponds to about 4% of major subjects in science and engineering departments. Photogrammetry (17.6%) commands an overwhelming majority and remote sensing (1.7%) is not set up except in some departments. Photo interpretation (about 7.6%) is chiefly established in geography, geology, forestry, landscape architecture , agriculture , etc.

The subjects on photogrammetry, photo interpretation and remote sensing are much more offered (52 %) in graduate course in countrary to that of undergraduate course. This holds about 15% of the whole offered subjects in the graduate courses of engineering and sciences.

Table 1. Courses on Photogrammetry and Remote Sensing Relevant Disciplines offered by Universties and Colleges in Korea , 1987

Course subject	Discipline a*	b	c	d	e	f	g	h	i	j	Total
PHOTOGRAMMETRY											
Principles of photogrammetry	17+	1				1				1	20
Advanced photogrammetry	(18)†								(1)	(1)	(20)
Non-topographic photogrammetry	(1)										(1)
Close-range photogrammetry	(1)										(1)
Terrestrial photogrammetry	(1)										(1)
Exercise in photogrammetric surveying	1 (2)										1 (2)
PHOTO-INTERPRETATION											
Principles of photo-interpretation	(2)										(2)
Advanced photo-interpretation	(1)										(1)
Aerial photo-interpretation	3			1	1	1					6
Photogrammetric application : Engr.	(1)										(1)
Photogrammetric application : Forestry				1(1)							1 (1)
Photogrammetric application : Geology			2								2
REMOTE SENSING											
Principles of remote sensing	1 (3)			(1)							1 (4)
Analytical remote sensing	(3)										(3)
Advanced remote sensing	(8)	(1)							(1)		(10)
Remote sensing application : Engr.	(2)										(2)
Digital image processing							(3)				(3)
Satellite meteorology							1				1
RELATED SUBJECT											
GIS / LIS	(4)										(4)
Cartography	1 (3)	4(9)							1	1(1)	7 (13)
Theory of observation	(11)								(1)	(1)	(13)
Graphical analysis	(3)						(3)				(6)
Geodesy	2 (5)		(2)							(1)	2 (8)
Surveying	67			1	1	2			2(1)	5(3)	78 (4)
Total	89 (69)	8(10)	2(2)	3(2)	2	4	(6)	1	3(4)	7(7)	119 (100)

* (a) Civil engineering (b) Geograqphy. (c) Geology.
(d) Forestry. (e) Landscape architecture. (f) Agriculture.
(g) Electronics/Computer science. (h) Atmosphere science.
(i) Oceanography. (j) Cadastre.

\+ Numbers without parentheses are for undergraduate courses.

† Numbers within parentheses are for graduate courses.

Table 2. Academic educational courses in Korea by discipline and by subject, 1987.

course subject	Discipline										Total	
	a*	b	c	d	e	f	g	h	i	j	Under grad.	Post grad.
Photogrammetry	18(23)‡	1†				1			(1)	1(1)	21(17.6%)	(25)(25%)
Photo -interpretation	(4)	3	2	2(1)	1	1					9(7.6%)	(5)(5%)
Remote sensing	1(16)	(1)		(1)			(3)	1	(1)		2(1.7%)	(22)(22%)
Subtotal	19(43)	4(1)	2	2(2)	1	2	(3)	1	(2)	1(1)	32(26.9%)	(52)(52%)
Related discipline	70(26)	4(9)	(2)	1	1	2	(3)		3(2)	6(6)	87(73.1%)	(48)(48%)
Total	89(69)	8(10)	2(2)	3(2)	2	4	(6)	1	3(4)	7(7)	119(100.0%)	(100)(100%)

*†‡ same as Table 1.

It is known that the department of civil engineering offers the most numerous courses : 75% (89 of 119) in undergraduate and 69% (69 of 119) in graduate. This is not only because a lot of investigation data are obtained from the department of civil engineering but because, in Korea, photogrammetry and remote sensing are introduced studied as a subject associated with surveying and civil engineering. However it can be regarded that this is actual trend, because photogrammetry and remote sensing are not yet widely offered in any other departments.

The features according to the fields are as follows. It is evident from Table 1 that courses on photogrammetry are mostly offered by civil and a few offered by agriculture , oceanography and cadastres. The Pinciples of Photogrammetry deals with overall basic contents of photogrammetry. While the advanced photogrammetry deals with the topics like analytical orientation , strip & block adjustments, gross error detection and deformation analysis, etc.

Photo interpretation & remote sensing courses are offered in undergraduate course of geography, forestry, landscape architecture, electronics, computer science and agriculture , etc. for the purpose of the application in each descipline. While remote sensing courses are intensively offered in graduate courses.

For the related disciplines surveying is most numerously offered, while cartography , theory of observation, graphical analysis and geodesy are offered relatively evenly.

GIS / LIS which is recently introduced are offered by the graduate courses of civil engineering.

III. TRAINING FOR PROFESSION

Nowadays in Korea, all of the national base maps such as 1:5,000 large-scale maps, 1:25,000 land use maps and 1:50,000 topographic maps are manufactured by aerial photogrammetric technology. The manufacturing works are carried out by NGI, Ministry of Construction, in coorperation with aerial survey companies. Besides these nation-wide mapping operations, aerial photos are needed so much in the fields of highway construction, urban planning, complex river developing project, etc. For the completion of these projects, there has been continuous and growing demands of manpowers of photogrammetric specialist.

Training for photogrammetric profession in practical affairs has been carried out by NGI through a short course program. This program is mainly oriented to the learning of

Table 3. Subjects of Photogrammetric Training Course at NGI(National Geography Institute), Korea, 1987

Number	Subject	Required hours
1.	Introduction to Geodesy	3
2.	Introduction to Photogrammetry	16
3.	Cartography	4
4.	Photo - interpretation	14
5.	Ground control survey	4
6.	Aerial triangulation	4
7.	Theory of errors	4
8.	Principles of Plotter	4
9.	Operation of plotter	3
10.	Coordinate plot	2
11.	Maintenance of instrument	2
12.	Instrumental orientation exercise	24
13.	Plotting operation exercise	34
14.	Evaluation	6

Table 4. Trained persons through the NGI Program, Korea

	Year																			
Persons	66	67	69	70	71	73	75	76	77	78	79	80	81	82	83	84	85	86	87	Total
Trained persons	18	10	16	16	18	14	28	16	22	14	21	14	17	23	20	20	20	10	9	326
Employed by NGI	1				1			3	9	2	2	3	3	4	3	7	4	2		44
Employed by aerial survey co.	1			4	2	1	3	1												12

basic theory and practice needed to the topographic mapping with aerial photos. Trained persons completed this program will have the chance to acquire the national lisence of photo mapping techinician through a qualificational examination, and they maybe employed by NGI or aerial survey companies. Any other advanced programs for training do not offerd in general, however one can improve their techniques in the practical process of mapping or interpretational operation.

Table 3 shows the subjects of photogrammetric training course at NGI. The numbers of persons completed the course during the period of 1966 to 1987 are given in Table 4.

IV. PROBLEMS AND FUTURE VISIONS

As mentioned above, the present stage of educational courses are considerably engineering oriented and a large portion of that are held by civil engineering. Especially in contrast with the world-wide increasing recognition that photo interpretation and remote sensing are regarded as very useful and essential means to the study of geography , geology , forestry and the other environmental and resources problems, there are somewhat difficiency in the application of photo interpretation and remote sensing to these fields in Korea.

Such problems are thought to be caused by two view points as follows. One is the fact that aerial photos and satellite images, which are needed for the purpose of academic study or commercial activities, have been under the control of and restriction of authorities for military security. And therefore they are not in usual easily acquired to the civilians. The other is economic problems. Few national universities or research institutes can afford to assure the expenditure and instruments for study.

In spite of these circumstances, universities and research institutes such as Seoul National University, Korean Advanced Institute of Science and Techonology, Korean Institute of Oceanography, and Korean Institutes of Energy and Resources, etc. are gradually appyling the photo interpretation and remote sensing techniques for the academical studies and solving the practical problems.

And upon these positive tendency, it is expected that the more wide distribution of materials and equipments and the training and education for the photo interpretation and remote sensing will be actively executed in the near future.

Especially, some societies like Korean Society of Geodesy, Photogrammetry and Cartography, Korean Society of Remote Sensing, Korean Association of Surveying and Mapping are endeavoring for the improvement of training and education. On the other hand, the government now gives some concerns on the photogrammetry and remote sensing, for example, the Ministry of Science and Technology has selected remote sensing as one of the six fields which are designated as the most advanced ones for the development of Korean science and technology in the 2000's. And the plan for establishment of satellite information receiving station within a decade is sincerely studied.

So, regarding all these aspects, it can be said that the future of photogrammetry and remote sensing in Korea is rather positive, and the improvement of education and training is highly expected.