PHOTOGRAMMETRY AND REMOTE SENSING- A REVIEW OF TRAINING IN AUSTRALIA AND OCEANIA

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Abstract

Report on the present state of teaching of Photogrammetry and Remote Sensing in Australia, New Zealand and Papua New Guinea.

The latest statistics and trends regarding student numbers, level of training, major topics, involvement of industry and career prospects are presented and discussed.

Contents

Photogrammetry since the second world war has developed steadily and in the seventies analytical methods based on proper ground control were introduced.

The new breed of analytical equipment such as the Zeiss Planicomp C100 and the new generation of stereoplotters, such as the Wild BC1, has given photogrammetry a new sophistication and has increased the accuracy and decreased the time required to complete photogrammetric tasks.

Remote sensing because of its wide variety of input data and its many applications has progressed to the stage where it is taught in as many as 12 major disciplines in Oceania and is now a major study area in many courses available in the region.

This paper covers the teaching of Photogrammetry and Remote Sensing in Oceania, using information from three main sources:

a. A Survey of Tertiary Educational Remote Sensing Training in Australia by R.E. Garth and J.A Richards.
b. Yearbooks and Faculty Handbooks.
c. A questionnaire sent by the authors to all major Universities and Institutes in Australia, Papua New Guinea and New Zealand.

Disciplines Seeking Knowledge in Remote Sensing and Photogrammetry

Currently in Oceania some form of Remote Sensing training is offered in 14 universities and 9 colleges while Photogrammetry is offered in 8 universities and 5 colleges.

Photogrammetry is taught as a major component of courses run by the Surveying/Cartography and Geography departments in many universities and colleges. Twenty departments of Geography and thirteen departments of Surveying, in Oceania, have photogrammetric input in their courses.

In addition to this, the following disciplines now have some photogrammetric input in their courses:-

a. Civil Engineering
b. Architecture
c. Town Planning

The teaching of Remote Sensing covers a more diverse range of disciplines with 80% of Surveying/Cartography departments and 75% of Geography departments in tertiary educational establishments in Oceania offering some form of Remote Sensing training or education.

Remote Sensing is taught in the following disciplines listed in approximate order of importance of Remote Sensing in each discipline:-

Geography
Surveying/Cartography
Earth Sciences
Forestry
Agriculture
Environmental Science
Resource Engineering
Geology
Biology
Electrical and Electronic Engineering
Computer Science
Physics

Level of Training and Duration of Course

The courses offering a qualification in either Remote Sensing or Photogrammetry and tabulated below:-

LEVEL OF TRAINING	PHOTOGRAMMETRY	REMOTE SENSING	DURATION OF COURSE (YEARS)
B.Sc.	X	X	3 to 4
Grad.Dip.	X	X	2 P/T 1 F/T
M.App.Sc.	X	X	4 to 5 P/T
M.Sc.	X	X	2 F/T
PhD		X	3 to 5

Some examples of courses under this category follow:-

Grad Dip Photogrammetry - Royal Melbourne Institute of Technology.
Grad Dip Remote Sensing - South Australian Institute of Technology.
Grad Dip Remote Sensing - University of New South Wales.
M App Sc Remote Sensing - University of New South Wales (Centre for Remote Sensing).
M App Sc Photogrammetry - Royal Melbourne Institute of Technology.
PhD Remote Sensing - James Cook University.
PhD Remote Sensing - Monash University.
PhD Photogrammetry - Newcastle University.
PhD Remote Sensing - University of New South Wales.

The level of courses offering Photogrammetry or Remote Sensing as a major study area are tabulated below:-

LEVEL OF TRAINING	PHOTOGRAMMETRY	REMOTE SENSING	DURATION OF COURSE (YEARS)
Short Courses		X	NA
Diploma	X	X	3
Bachelor of Tech.	X		3 to 4
B App Sc	X	X	3 to 4
B Sc	X	X	3 to 4
Grad Dip	X	X	2 P/T 1 F/T

Some examples of courses under this category follow:-

Short Course-Seminar in Remote Sensing (2 days biennially)- South Australian Institute of Technology.

Short Course-Landsat Workshop (5 days as required)-Canberra College of Advanced Education.

Short Courses in Remote Sensing - University of New South Wales (Centre for Remote Sensing).

Assoc Dip in Cartography (R.S.+ Photog.) - School of Surveying, South Australian Institute of Technology.
Assoc Dip in Cartography (Photog.) - Queensland Institute of Technology.
Diploma in Surveying (Photog.) - Papua New Guinea University of Technology.
B. of Technology (Surveying)(Photog.) - Papua New Guinea University of Technology.
B App Sc (Surveying)(Photog.) - Queensland Institute of Technology.
Bachelor of Surveying (Photog.) - University of Melbourne.
B Sc (R.S. + Photog.) - University of New South Wales.
B Sc (Photog.) - James Cook University.
Grad Dip Comp/App Sc (R.S.) - Canberra College of Advanced Education.
Grad Dip Auto Cartog (Photog. + R.S.) - Royal Melbourne Institute of Technology.
M App Sc (Surveying and Mapping)(Research) - Western Australia Institute of Technology.
M Sc (Research) - University of Tasmania.

Photogrammetry and Remote Sensing are also taught as minor subjects in the disciplines listed in the section headed 'Disciplines Seeking Knowledge in Remote Sensing and Photogrammetry'. Some examples of courses under this category follow:-

LEVEL OF TRAINING	SUBJECT NAME	SCHOOL OR DEPARTMENT
BA/BSc/ BEc/BEd	Natural Environmental Studies GE2Ø4.	Geography, James Cook University.
BEnvSc	Mapping and Cartography.	Environmental Science, Murdock University.
BNatRes	Resource Technology 331 Surveying and Aerial Photography.	Resource Management, University of New England.
BEng	Remote Sensing 424	Civil Engineering, University of Western Australia.
BSc-Geol.	Part of Geology 223 - Introductory Mapping Stratigraphy.	Geology, University of Wollongong.

BSc-Biol.	Introduction to APl and Landsat.	Geography, University of Sydney (Serv. Sub.)
BEng-Civil	Surveying II	Engineering, New South Wales Institute of Technology.
MSc Forest Management	Management, Planning and Inventory.	Forestry, Australian National University.
MEnvSc	Environmental Remote Sensing.	Geography, Monash University.
MEngSc	Data Acquisition and Analysis in Remote Sensing 6.380G	Elec. Eng. and Computer Science, University of New South Wales.
MSocSc	Applied Remote Sensing GE 833	Geography, University of Queensland.

Major Topics

The range of topics that can be taught in both Photogrammetry and Remote Sensing is extremely large. The major divisions of learning in Oceania are as follows:-

Photogrammetry

- Interpretation of Air Photographs.
- Project/Flight Planning.
- Photogrammetric Production Processes.
- Analogue and Analytical Photogrammetry.
- Aerotriangulation.
- Computer-aided Methods.
- Non-topographical Applications.
- Rectification and Orthophotography.

Remote Sensing

- Data Acquisition.
- Data Processing.
- Data Analysis.
- Remote Sensing Applications.
- Image Enhancement and Classification.
- Visual Image Interpretation.
- Geographic Information Systems.
- Environmental Remote Sensing.

In the majority of courses where Photogrammetry is seen as a major element of that course the structure of the photogrammetric subject gives equal time to both theory and practice at undergraduate level.

On the other hand Remote Sensing at present is structured in the majority of courses at undergraduate level so that three quarters of the time allocated is given over to lecturing with only one quarter of the time being devoted to tutorials or practical sessions.

Some examples of time allocations follow:-

Papua New Guinea University of Technology - Diploma in Surveying - 2nd professinal year - SU229 Photo Interpretation - 4 hours per week - 1 hour theory, three hours practical.

Papua New Guinea University of Technology - Bachelor of Technology (Surveying) - 3rd professional year - SV 501 Photogrammetry 1 - 4 hours per week - 1 hour theory, three hours practical.

Western Australia Institute of Technology - Bachelor of Applied Science (Surveying and Mapping) - 2nd year/3rd year - Photogrammetry 281/381 - 4 hours per week - two hours theory, two hours practical.

The University of New South Wales - School of Surveying - Photogrammetry 1 - 4 hours per week - two and a half hours theory, one and a half hours tutorial, Principles of Remote Sensing - 3 hours per week - 2 hours theory, 1 hour tutorial.

Equipment Available in Oceania

Equipment available in Oceania ranges from the inexpensive simple equipment such as the mirror stereoscope with parallax bar right through to computer controlled image processing systems of Photog. + R.S., Remote Sensing is the more dynamic discipline of the two and gradually over the last four years, more sophisticated equipment has been purchased by on increasing numbers of universities and colleges for digital image processing.

The range of equipment now available in Oceania is listed below:-

Photogrammetry

Mirror Stereoscope with Parallax Bar.
Analogue Stereoplotters - B8, B9.
Analytical plotters.
Orthophoto Production Equipment.
Mini computers - PDP 11/34.
Digitisers.
Multi Spectral Viewer/Imager.
Hasselblad Camera.

Remote Sensing

University Equipment.

Microprocessor controlled colour monitor (University of Adelaide).
Erman II system for Landsat data analysis (Monash University).
Dipix Aries II image analysis system with A2ASP software, Apple pips system, Landsat and HCMM data tapes (University of New South Wales).

Advanced College Equipment.

Multispectral stereoviewer (Queensland Institute of Technology).
Grinnell GMR-27 image processing system (South Australia Institute of Technology).
Receivers for NOAP and TIROS satellites (Western Australia Institute of Technology).
Ramtek image processor (Western Australia Institute of Technology).
Scanning digitiser and memory store (Western Australia Institute of Technology).

Involvement of Industry

The replies to the questionnaires indicate that there is no involvement with industry at University level and about 10% involvement of industry at other tertiary institutions. This varies from institution to institution but the 10% involvement reflects the attempt to make the courses relevant to industry. An exception is the courses run at the Papua New Guinea University of Technology, where in the third year of each course the students receive industrial training for one year.

In some states of Australia committees have been set up to discuss the future of photogrammetry and remote sensing. These committees seek representation from Government agencies, Statutory Authorities, Universities, Colleges of Advanced Education, Industry and the Photogrammetry and Remote Sensing professional sector. So indirectly, there are ways in which industry is involved in many of the courses run in Australia.

Student Numbers and Career Prospects

The number of students enrolled in courses where photogrammetry is a major part of the course, for example Surveying and Cartography has remained static, although job prospects vary from reasonable to good according to the questionnaires.

The number of students who enter courses involving some form of Remote Sensing training in Oceania is on the increase. There is a wide spread of disciplines that require their students to be trained in Remote Sensing. The following 1982 figures show the break-up of student numbers for Remote Sensing training.

213 undergraduates in wholly Remote Sensing subjects
1022 enrolled in partly Remote Sensing subjects
6 students enrolled for PhD research programmes in in Remote Sensing
9 students enrolled for Masters.

Concluding Remarks

Previously Photogrammetry and Remote Sensing was predominantly taught under the umbrella of surveying and cartographic education. The trend is for Photogrammetry to stay in the area while remote sensing training has been shown to have potential beyond surveying and mapping and now is being taught predominantly through the Geography Departments of Universities and Colleges. Oceania now has a multidisciplinary centre for Remote Sensing at the University of New South Wales.

The inclusion of a Remote Sensing element in a large number of courses has led to more and more students becoming exposed to Remote Sensing and hence bringing more awareness of Remote Sensing to the community. On the other hand the number of students involved in Photogrammetry has remained fairly stable.

Questionnaire - replies received from:-

1. The New South Wales Institute of Technology
   School of Civil Engineering
   Geology Department
2. Monash University
3. A.N.U.
4. University of Sydney
5. University of Melbourne
   Department of Surveying
6. Canberra College of Advanced Education
   School of Applied Science
7. The South Australian Institute of Technology
   School of Surveying
8. Mitchell College of Advanced Education
9. Tasmanian College of Advanced Education
10. The Papua New Guinea University of Technology.

Bibliography

1. Survey of Tertiary Educational Remote Sensing Training in Australia R.E. GARTH & J.A. RICHARDS, University of New South Wales, Centre for Remote Sensing.

2. Yearbooks and Faculty Handbooks of Universities, Colleges and Institutes.

3. Questionnaire Dec 1984.