

JICA NET Distance Education on Remote Sensing and GIS for Developing Countries

Shunji Murai* and Hideki Murayama**

* Professor Emeritus, University of Tokyo; sh1939murai@nift5y.com

4-21-9 Mejirodai, Hachioji, Tokyo 193-0833, Japan, Tel and Fax: 0426-63-0858

** Japan International Cooperation Agency (JICA), Tokyo International Center;
Murayama.Hideki@jica.go.jp

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ABSTRACT

Japan International Cooperation Agency (JICA) has initiated JICA NET Distance Education on remote sensing (RS) and GIS for developing countries since 2004 in cooperation with Japan Society of Photogrammetry and Remote Sensing (JSPRS). The teaching contents were prepared by the project team of JSPRS which are consisted of 12 modules each of remote sensing and GIS.

JICA NET Distance Education has been implemented five times since 2004 as follows.

1st Round: October-December, 2004: Thailand, Malaysia and Turkey

2nd Round: January-March, 2005: Vietnam, Philippines and Laos

3rd Round: May-July, 2005: Kenya, Sri Lanka and Thailand

4th Round: October-December, 2005: Jordan, Turkey, Vietnam and Philippines

5th Round: January-March, 2006: Malaysia, Cambodia and Laos

Three more rounds are scheduled up to the end of March 2007.

A module of the distance education is composed of 30 minutes lecture presented with power point images with video and voice, 30 minutes video conference for question and answer (Q&A) session. Three modules will be provided in a session of three hours and half. On the fourth day of each RS and GIS course, an examination is implemented in cooperation with a site facilitator in each country.

So far, the JICA sponsored distance education is successful in terms of systematic education to governmental staff in developing countries who are working in the field of remote sensing and GIS with a focus of better management of natural resources and environment.

INTRODUCTION

JICA initiated RS course once a year since 1978FY with full sponsorship to invite 10-15 trainees per year from developing countries. JICA expanded to mapping & surveying, hydrographic survey, GIS etc. However JICA has changed the policy to introduce partially e-learning system in 2004 to improve the cost-efficiency. The reason is that the cost to invite a person from a developing country used to be 10,000 US dollars per month in average.

JICA plans to expand JICA NET, a telephone-line based communication system to about 30 developing countries to enable TV conferences between Japan and developing countries. They include Indonesia, Cambodia, Thailand, Philippines, Vietnam, Malaysia, Laos, China, Sri Lanka, Pakistan, Bangladesh, Turkey, Jordan, Palestine, Kenya, Argentine etc.

The objectives of JICA Distance Education are;

- 1) To supplement or replace "Face to Face" training courses which had been adopted by JICA in the past.
- 2) To increase cost performance with respect to number of trainees, high quality lecture materials and lecturers.
- 3) To promote advanced education using IT.
- 4) To support capacity building in developing countries.

JICA contracted with Japan Society of Photogrammetry and Remote Sensing (JSPRS) in 2003 that the fundamental frame work should be proposed by Technical Committee on Strategic Plan for JICA NET Distance Education under the chairmanship of Prof. Shunji Murai on remote sensing and GIS including the mission and goals, modules and contents, teaching methods etc. In 2003 FY, JSPRS prepared six CDs in total with 3 CDs for RS and another 3 CDs for GIS respectively including power point teaching materials with video and voice and English text for explanation.

JICA started JICA NET Distance Education from 2004 FY in cooperation with JSPRS, JICA Offices in developing countries and a site facilitator representing from each developing country. Until now, five rounds have been implemented and the sixth round is being executed.

PROBLEMS OF CONVENTIONAL JICA TRAINING COURSES

The conventional "face to face" teaching style in a class would be the best if the teacher and the teaching materials were perfect. But this condition will be difficult to acquire in many cases.

The following problems are recognized by the Technical Committee.

- 1) It is too expensive for JICA to continue to invite trainees from developing countries to Japan. The cost as mentioned before will be about

10,000 US Dollars per person per month, which makes about 200,000 US Dollars if JICA invites 10 trainees for two month course.

- 2) There will be a limitation in term of the number of trainees; say 10 to 15 trainees per year for a course.
- 3) As there is also a limitation that JICA can find Japanese resource persons who can speak English fluently, some instructors prepared poor teaching materials without the aid of IT, which resulted in low quality lectures without inspection.

In order to overcome those problems, JSPRS recommended JICA to prepare high quality teaching materials and select eminent lecturers or resource persons, who can speak English well.

GOALS OF JICA DISTANCE EDUCATION ON RS AND GIS

Realizing the requirements of developing countries particularly in Asia, JICA and JSPRS agreed to set up the following two goals.

- 1) To promote capacity building for human resource development to support sustainable development of natural resources and environment using RS & GIS.
- 2) To provide self learning materials through e-learning to upgrade the capability of applicability.

The main target of trainees will be governmental staffs, who are operating RS and/or GIS on daily base or are going

to introduce RS and GIS in their technical projects. Teaching faculty and researchers of universities will be also accepted as trainees.

BASIC DESIGN OF A COURSE

- 1) Power Point materials: 25-35 slides per module for 11 modules in total. The 12th module is a special module on application of RS or GIS which is composed of 20 applications respectively. Each module except the 12th module will take about 30 minutes lecture with voice and video. The lecture will be delivered at each site using CD and LED projector. The text of explanation in English is distributed to each participant.
- 2) After watching the power point materials with voice and video, about 30 minutes will be given to Q&A session through TV conference for three or four developing countries. A resource person should be responsible for answering questions on site. E-mail services will be also provided in case when there are some more questions which are not accepted at TV conference due to time limitation.
- 3) The contents of Q&A session are recorded in writing materials and distributed to the participants afterward. Q&A session will be supported by a facilitator at each

site, whose knowledge will be high enough to bridge between the resource person and participants.

- 4) A course on a day will be three hours and half which accommodate three modules including Q&A sessions. In consideration of time difference between Japan and a developing county, the time difference of six hours in maximum will be the limitation to accept the JICA NET Distance Education. Those limited countries include Kenya, Jordan, Turkey etc.
- 5) 12 modules each for RS and GIS can be managed for four half days including examination on the fourth day.
- 6) Those who attended 75 % and more the lectures and passed examination with more than 60% completion will be conferred Certificate of Successful Completion in the name of JICA and JSPRS.
- 7) Three or four developing countries are selected under the condition that JICA local office is requested by the developing country and a facilitator can be assigned who will call for participants and serve as an assistant through all courses.
- 8) The maximum number of each country will be less than 40.

OUTLINE OF RS and GIS COURSE

RS Course:

- Module 1: Fundamentals of RS
- Module 2: Remote sensors
- Module 3: Platforms for RS
- Module 4: Microwave RS
- Module 5: Data to be used in RS
- Module 6: Image interpretation
- Module 7: Image processing system
- Module 8: Image processing (1)
- Module 9: Image processing (2)
- Module 10: Image processing (3)
- Module 11: High Resolution Satellite Imagery (HRSI)
- Module 12: Applications of RS (20 applications)

GIS Course

- Module 1: Fundamentals of GIS
- Module 2: Data model and structure
- Module 3: Input of geospatial data
- Module 4: Spatial Database
- Module 5: Required hardware & software
- Module 6: Plan for installation
- Module 7: Spatial analysis
- Module 8: Coordinate transformation
- Module 9: Interpolation techniques
- Module 10: DTM
- Module 11: Output of GIS products
- Module 12: Applications of GIS (20 applications)

A full course of RS and GIS, which are given once a week are as follows.

1st Day: Module No. 1, 2 and 3 of RS

2nd Day: Module No. 4, 5 and 6 of RS

3rd Day: Module No. 7, 8 and 9 of RS
4th Day: Module No. 10 and 11 of RS, and examination for RS
5th Day: Module No. 1, 2 and 3 of GIS
6th Day: Module No. 4, 5 and 6 of GIS
7th Day: Module No. 7, 8 and 9 of GIS
8th Day: Module No. 10 and 11 of GIS and examination for GIS
9th Day: Applications of RS and GIS

COURSE FOR APPLICATIONS OF RS AND GIS

The application module has been added since 2005 FY. This module was designed without a pressure of examination.

The objectives of application module are as follows.

- 1) To follow up those courses on theories and techniques from Module No. 1 to No. 11,
- 2) To introduce a variety of examples of typical and interesting applications in remote sensing and GIS for better management of environment and natural resources,
- 3) To demonstrate how remote sensing and GIS have been successfully used in the actual projects as well as research and development, and
- 4) To make decision makers, managers, scientists and graduate students understand how remote sensing and GIS can be applied with success.

The list of applications for RS and GIS is shown below.

RS Applications

1. Land Cover Map based on Satellite Imagery
2. Countrywide Land Cover Mapping
3. Monitoring of Urban Growth in Hanoi
4. Urban Change Study in Mongol
5. Updating Forest Map
6. Height Measurement of Trees by Lidar Data
7. Flood Damage Map in Bangladesh
8. Flood Damage Mapping for Rice Fields
9. Monitoring of Water Quality
10. Monitoring Shrimp Farming
11. Application to Fishery
12. Topographic Mapping from IKONOS Stereo Imagery
13. Automated Extraction of Roads
14. 3D Measurement of Volcanic Crater
15. Monitoring Earthquake Damage
16. Earthquake Damage Detection using HRSI
17. Monitoring Rice Growth by SAR
18. Global Mapping
19. Assessment of Desertification in Arid Area
20. Image Mapping System using Kite Balloon

GIS Applications

1. Suitable Land Selection for Agricultural Development
2. Optimum Vehicle Routing
3. Real Time GIS Data Capturing

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|---|--|
| 4. Environmental Study with GPS, Digital Camera and GIS | GIS: 55/64=88% |
| 5. Flood Hazard Map | 2 nd Round: January to March, 2005 for Vietnam, Philippines and Laos |
| 6. Flood Free Route Location | The total participants: 77 participants for RS and 79 for GIS |
| 7. Flood Simulation with Lidar Data | The ratio of successful completion for RS: 58/77=65% |
| 8. Shelter Suitability Analysis | The ratio of successful completion for GIS: 67/79=85% |
| 9. GIS Database for Management of Irrigation Facilities | |
| 10. Drought Risk Assessment | |
| 11. Height Measurement of Buildings with Lidar Data | 3 rd Round: May to July, 2005 for Kenya, Sri Lanka and Thailand |
| 12. Contour Mapping with Lidar Data | The total participants: 71 participants for RS and 77 for GIS |
| 13. 3D City Model with IKONOS and Lidar Data | The ratio of successful completion for RS: 57/71=80% |
| 14. Superposition of Historical Maps onto Present Map | The ratio of successful completion for GIS: 75/77=95% |
| 15. Visibility Analysis of Mt. Fuji | |
| 16. Crime Mapping and Analysis | 4 th Round: October to December, 2005 for Jordan, Turkey, Vietnam and Philippines |
| 17. Disaster Management System for City Gas Network | The total participants: 92 participants for RS and 91 for GIS |
| 18. GIS Map for 1995 Kobe Earthquake Damage Assessment | The ratio of successful completion for RS: 78/92=85% |
| 19. Time-space Mapping | The ratio of successful completion for GIS: 89/91=98% |
| 20. Scheduling for Day Care Service | |

IMPLEMENTATION

The following five rounds were implemented since October 2004 until now.

1st Round: October to December, 2004 for Malaysia, Thailand and Turkey
 The total participants: 68 participants for RS and 64 for GIS
 The ratio of successful completion for RS: 50/68=75%
 The ratio of successful completion for

5th Round: January to March, 2006 for Malaysia, Cambodia and Laos
 The total participants: 55 participants for RS and 46 for GIS
 The ratio of successful completion for RS: 26/55=47%
 The ratio of successful completion for GIS: 36/46=78%



Figure 1 Class rooms shown in TV screen

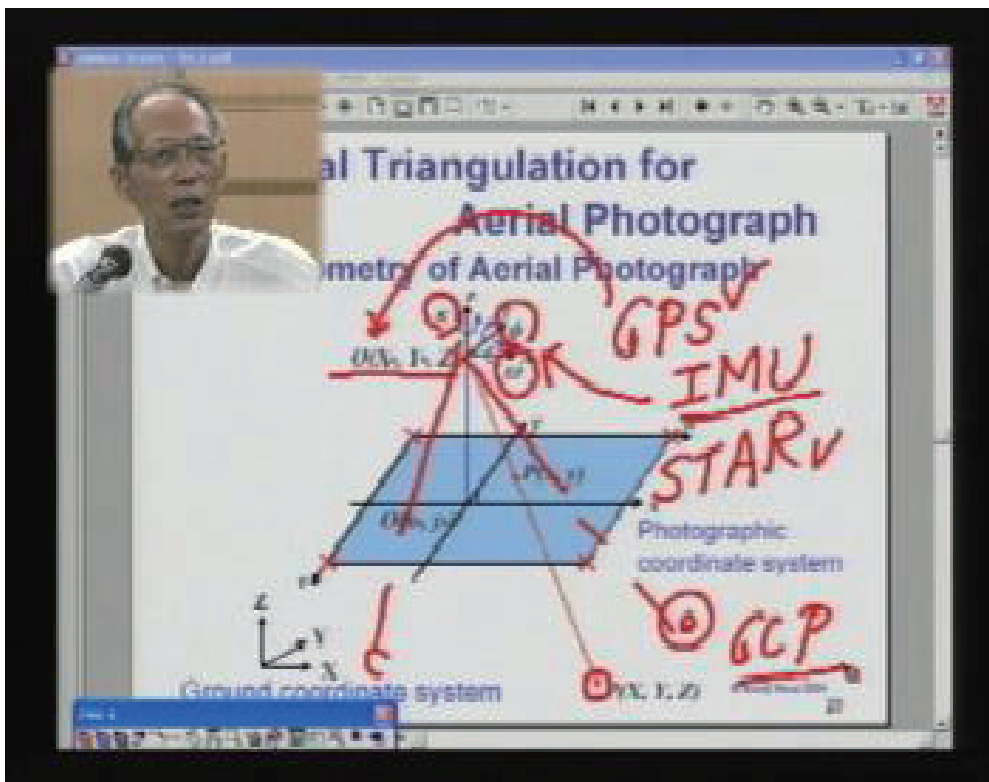


Figure 2 Answering for a question using touch panel

The lecturer of the above courses was Prof. Shunji Murai, who answered more than 400 questions for RS and 300 questions for GIS in total.

ADVANTAGES OF JICA NET DISTANCE EDUCATION

According to the questionnaires answered by participants, the following advantages are recognized.

- 1) It will be possible for beginners to study RS and GIS systematically.
 - 2) Many participants from different organizations and different countries can share knowledge and experience through the distance education. Particularly TV conference was appreciated by participants for the interactive communication between the lecturer and participants in cooperation of facilitator. Figure 1 shows a big TV screen which showed class rooms of four countries.
 - 3) The record of Q&A session in written form was evaluated very useful to understand many parts and items which are not mentioned in the lectures and the text.
 - 4) The examination with the submission of certificate for successful completion had become incentive to concentrate into the lecture and Q&A session.
 - 5) Those participants can repeat self-learning with given CDs at any time and anywhere.
- 6) E-mail service for extra Q&A session after ordinary session was sometimes useful for those participants to make special questions to the lecturer.
 - 7) IT technology such as touch panel can be applied as shown in Figure 2.

CONCLUSIONS

- 1) JICA NET Distance Education contributed to developing countries in terms of capacity building of remote sensing scientists, technicians, engineers and/or managers who are engaged in governmental projects and university lecture and research.
- 2) JICA NET Distance Education proved successful with respect to the cost effectiveness as compared with the conventional "face to face education". The number of trainees in the distance education will reach about 200 for three courses in a year, while the conventional training just 10 to 15. Until now since 2004, more than 400 trainees have completed the Distance Education with less than 20 times expenses..
- 3) The interactive TV conference for Q&A session is highly appreciated to supplement the mechanical feeling of "video show type" lecture.