Research and Training Activities in the Field of GIS at AIT

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Abstract

Asian Institute of Technology is a graduate school located in Bangkok and established in 1959. The Institute has been supported by donors from various countries, international agencies and the private sector. Students at AIT originate from whole of the Asian region creating a rich international environment, which is one of the most unique characteristics of AIT.

At AIT, activities related to remote sensing, GIS, GPS, etc., referred to as geo-informatics, are implemented based on 3 components, namely STAR program, ACRoRS and GAC, which cover Education, Research and Training, respectively. STAR (Space Technology Application and Research) program offers master and doctoral degree courses which are the basic function of AIT as an academic body. ACRoRS, Asian Center for Research on Remote Sensing is carrying out research for advanced technologies, and feeding back the results to the region through STAR and GAC. GAC, GIS Application Center, has been organizing training courses to fulfill the demand for short-term education in the region. These 3 components are closely related sharing resources to increase the effectiveness of the respective activities.

In the STAR program, we are offering GIS courses not only within the program but to institutes to fulfill the demand from all application fields. Since the introduction of GIS has progressed so much in various fields, STAR program started to play a role as GIS technology provider for a variety of application fields for developing close links among them.

ACRoRS has been using GIS databases or developing GIS databases in various projects. For example, GIS database around Mt. Mayon in the Philippines has been developed in the form of a comprehensive Disaster Prevention Plan as part of a JICA project. Bangkok Ayuttaya satellite map was developed and published using GIS technology combined with remote sensing, in which digitized road network was corrected using high resolution satellite data. GIS is playing a very important role in the research activities of ACRoRS.

GAC has been organizing training courses related to GIS and remote sensing since 1995. Courses sponsored by NASDA are held 5 times a year. Three out of 5 courses are organized by GAC by inviting participants from various countries of Asia. Other two courses are organized outside of Thailand through collaboration with the host countries to gather a large number of local participants. GAC has been developing its course materials using the output of the research projects of ACRoRS. Data in the materials were developed in the course of real research projects. This program is highly appreciated by the participants as it gives them the opportunity of being exposed to real project work. Recently materials for the watershed management course have been published as CD-ROM.

Introduction

Asian Institute of Technology is a graduate school located in Bangkok and established in 1959. The institute is supported by a large number of donors from various countries, international agencies and the private sector. Students at AIT originate from whole of the Asian region forming a rich international environment, which is one of the most unique characteristics of AIT.

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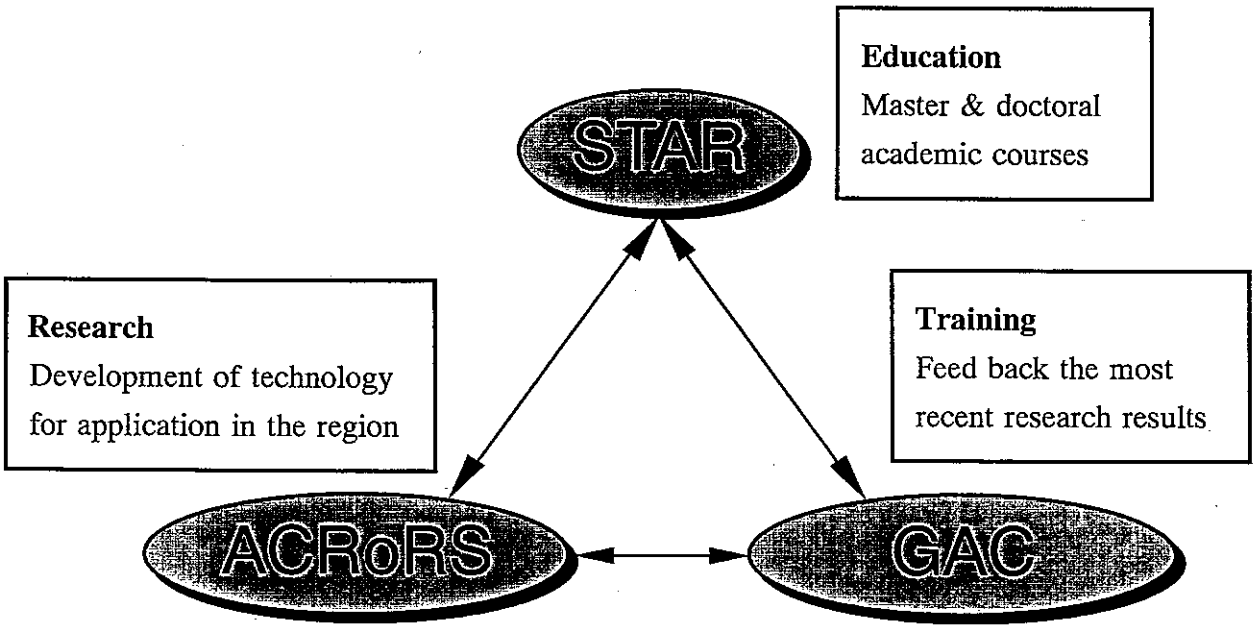

Fig.1 Three components for the promotion of geo-informatics technology
STAR: Space Technology Application and Research Program
ACRoRS: Asian Center for Research on Remote Sensing
GAC: GIS Application Center

At AIT, activities related to remote sensing, GIS, GPS, etc., referred to as geo-informatics technology, are implemented based on 3 components (Fig.1), namely STAR program, ACRoRS and GAC, which cover Education, Research and Training, respectively. STAR (Space Technology Application and Research) program offers master and doctoral degree courses which are the basic function of AIT as an academic body. ACRoRS, Asian Center for Research on Remote Sensing is carrying out research for advanced technologies and for the development of applied technology, and feeding back the results to the region through STAR and GAC. GAC, GIS Application Center, has been organizing training courses to fulfill the demand for short-term education in the region. These 3 components are closely related sharing resources to increase the effectiveness of the respective activities.

Education

Faculty of STAR program consists of 2 JICA experts (including the author), 1 JST expert, 1 member of the French Government (secondment), 1 ESA member (secondment) and 2 members directly hired. Also there are many associated faculty members who are providing a wide range of expertise to the program. Master course (20 months) consists of 5 terms (4 months/term). Students attend courses in the first 3 terms. At the end of the 3rd term, students present a thesis proposal. Once it is approved by the thesis committee, students carry out research for the thesis using the last two terms. Curriculum covers fundamental to advanced GIS and remote sensing techniques, including theory, operation of software, computer programing, etc. Students can enjoy fully equipped remote sensing and GIS computer facilities. The topics for the thesis range from local to global issues, algorithm development to application development using the major field of the students as a base.

Recognizing the very broad applicability of GIS and remote sensing, STAR Program is offering GIS courses not only to the students participating in its program but also to those of AIT. The course is designated as Institute-wide GIS Course. Recently, an Institute-wide GIS Laboratory has been established through a Japanese Equipment Grant to AIT to support the Institute-wide activities on GIS and remote sensing. Institute-wide GIS

course is playing a major role in the promotion of GIS and remote sensing technology in the field of environment, civil engineering, agriculture, marketing throughout AIT.

Research

ACRoRS, Asian Center for Research on Remote Sensing, is the research component. The center was established in 1997. The center is also functioning as a research center of AARS (Asian Association on Remote Sensing) to gather more cooperation from the region. ACRoRS is carrying out research (Table 1), providing satellite data, receiving visiting researchers, providing consultation services and feedback of its experience to the regions through training courses. ACRoRS receivies NOAA AVHRR data and supplies data outside using Internet. All the data received at ACRoRS are being transferred to the University of Tokyo within 30 minutes after the reception, providing the region with near real time remote sensing data.

Table 1 Research projects carried out at ACRoRS/AIT

Project Name	Status	Sponsors / Cooperating Organizations	Outline
NOAA AVHRR Reception and Distribution	Cont'd	Univ. of Tokyo, Iwate Univ., NACSIS, NIES, NIAES, etc.	Reception and Archiving of NOAA AVHRR day and night, Implementation of High Accuracy Geometric Correction (PANDA) and Atmospheric Correction (6S) System, Data Distribution over Internet for Near Real-time Monitoring
World File Web	Cont'd	Joint Research Center	Operation of a node of World File Web, The broadcasting will start in July 1999
Sea Surface Temperature Broadcasting	Cont'd	NOAA, RESTEC, DOF, SEAFDEC, NRCT	Project has just started, Broadcast Sea Surface Temperature using NOAA AVHRR
Remote Sensing and GIS Analysis for Database Generation and Detection of Changes in the Study on Comprehensive Disaster Prevention Around Mayon Volcano in the Republic of the Philippines	Completed	JICA	Analysis of volcano activity such as lava flow, pyroclastic flow and mudflow using remote sensing, Estimation of possible sediment yield for designing river structure, development of GIS database to be utilized by social planners
Japanese Satellite Data Promotion Project	Cont'd	NASDA	Project for Promotion of Japanese Satellite Data
Updating of Map Information in Bangkok Ayuttaya Area Using Japanese Satellite Data and GIS	Completed	NASDA	Publication of a 1:100,000 Map using satellite data and GIS data
Differential GPS Station Setup	Completed	NASDA, RESTEC	Setup of Kinematic DGPS Station using Mobile Phone, Accuracy Assessment for Level Survey
Assessment of Debris Flow Risks along Sindhuli Highway in Nepal	Cont'd	Nippon Koei, Co., Ltd.	Development of algorithm to assess debris flow risk for road network
Bangkok Heat Island Phenomena Study	Cont'd	Keio University	Running of automatic weather station, Analysis of data using remote sensing data
Application of Remote Sensing for Road (Asian Highway) Planning	Completed	Japan Highway Association	Assessment of the capability of remote sensing data for obtaining road information especially for Asian Highway Project
RICESAT	Cont'd	AARS	Secretariat of RICESAT Development
Forest Monitoring in Southeast Asia using Multi-Sensor Multi-Resolution Satellite Data	Cont'd	ESA	ENVISAT Pilot Project, Analysis of the AATSR, MODIS and NOAA AVHRR to study forest conditions
Monitoring of Dry Riverbed Uplift Using SAR Interferometry	Cont'd	ESA	ENVISAT Pilot Project, Estimation of dry riverbed uplift using differential ASAR interferometry

Table 2 Training courses at GAC/AIT (1998 July - 1999 August)

No	Date	Duration	Course Name	Sponsor	Venue	No. of Participants	Course Description
1	13-24 July 1998	2 Weeks	Remote Sensing and GIS for Watershed Management	NASDA/ RESTEC	AIT	15	Refer to No. 7
2	27 July-7 Aug. 1998	2 Weeks	Basic GIS training	FAO/GTZ/ UNOPS/ UNDP	AIT	5	Two-week basic GIS training in arc/info environment includes GIS basic theory, setting up environment, preparation of maps for digitizing, error handling. Theory lecture notes descriptions are also provided together with extensive hands-on training.
3	19-23 Sep. 1998	5 Days	Application of Japanese Satellite Data Data Fusion and GIS Integration	NASDA/ RESTEC	Bandung, Indonesia	26	To provide information on RS/GIS and the activities of NASDA/RESTEC towards the development of this technology, as well as demonstrate the application of Japanese satellite data in the development planning of the Asia Pacific region.
4	31 Aug.-11 Sep. 1998	2 Weeks	SAR Data Potential and Application	NASDA/ RESTEC	AIT	16	Designed to disseminate the SAR technology and its potential for prospective users. About 40% of the time is assigned to introduce the technology, different sensors, data handling, physical nature of the radar-earth interactions, geometry and correction methods and interferometry
5	26-30 Oct.1998	5 Days	Mapping From Space	NASDA/ RESTEC	Ho Chi Minh City Vietnam	23	Training on digital photogrammetry. Theory and hands-on training are carried out.
6	30 Nov.-11 Dec.1998	2 Weeks	Advanced GIS for Flood and Disaster Mitigation	NASDA/ RESTEC	AIT	15	To provide practical knowledge on spatial data input, data management, data analysis and data output concerning hazard identification and as far as possible mitigation measures. Handling on digital terrain model, Linear Combination Model, Triangular Irregular Network (TIN) module were used for deriving different scenarios in the identification of possible disasters.
7	17-28 May 1999	2 Weeks	GIS & RS for Watershed Management	NASDA/ RESTEC	AIT	15	Designed to GIS users who are looking for special applications on Watershed Management. The course covers the concept of watershed, GIS & remote sensing Watershed management, image enhancement and classification plus Hands-on Training on Arc/Info based Unix environment. Participants are given the Opportunity to work through a practical case study on their own, and they will have the opportunity to practice the integration of GIS and different sensor data. (Landsat, SAR, OPS, etc.). The course includes real-time differential GPS survey.
8	6-9 July 1999	4 Days	GIS for Planning and Management in Public and Private Enterprises		AIT	5	Designed to encompass many business and utility service organizations for higher productivity and profitability by introducing the concept of GIS and spatial analysis. The emphasis is placed on introducing the concept of GIS in business database generation, management, information retrieval, and analysis for business planning, management and development. The course covers conceptual aspects as well as provides demonstration exercises developed on GIS packages. Several case studies of GIS application in business planning, and management are discussed.
9	21-25 June 1999	5 Days	Mapping from Space	NASDA/ RESTEC	Sri Lanka	19	Designed to promote knowledge of remote sensing, specifically high resolution sensors with a larger number of potential users and decision-makers in a cost- effective manner. This training also introduces the pro and cons of high resolution satellite data and their potential for detailed mapping.
10	20-24 July 1999	5 Days	RS & GIS for Flood Mitigation	NASDA/ RESTEC	Bangladesh	21	To demonstrate the usefulness of remote sensing and GIS for flood disaster mitigation. The use of optical data, SAR data combined with GIS database was demonstrated.
11	16-27 Aug 1999	2 Weeks	SAR Data & Their Potential and Applications	NASDA/ RESTEC	AIT	15	Designed to disseminate the SAR technology and its potential to the prospective users by introducing the technology, different sensors, data handling, physical nature of the radar-earth interactions, geometry and correction methods and interferometry. Participants were given the opportunity to handle SAR data on their own starting from data reading, correction filtering, texture analysis to interpretation. Use of SAR data in the field of hydrology, marine, coastal processes, land cover, snow & ice, DEM generation is addressed, and hands-on training is provided.

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Training

GAC, GIS Application Center, has been organizing training courses related to GIS and remote sensing since 1995 (Tables 2 & 3). GAC can design its training courses in a very flexible way based on the request from participants and donors. The training courses at the Center aim at providing advanced level courses targeting the integration of remote sensing and GIS such as overlaying, implementation of models, etc.

Table 3 Number of participants in training courses at GAC/AIT (1995 to August 1999)

Countries	Number of Participants					
	1995	1996	1997	1998	1999	Total
Bangladesh	1	1	4	6	24	36
Brunei					1	1
Cambodia		1		1		2
Fiji		1	1	1		3
India	3	2		2	2	9
Indonesia			4	30	5	39
Laos		2	4			6
Myanmar				3		3
Malaysia		2	2			4
Mongolia			2	2	2	6
Nepal	3	3	35	5	2	48
Pakistan			4	1	3	8
Philippines	2		22	5	1	30
Bhutan				2		2
PRC				1	1	2
Sri Lanka	1	2	2	7	23	35
Thailand	7	4	6	4	7	28
Vietnam	2	2	4	30	4	42
Total	19	20	90	100	75	304

Courses sponsored by the National Space Development Agency of Japan (NASDA) are held 5 times a year. Three out of 5 courses are organized at AIT campus by inviting participants from various countries of Asia. Two courses are organized outside of Thailand through collaboration with the host countries to gather a large number of local participants. GAC has been developing its course materials using the output of the research projects of ACRoRS. Data in the materials were developed in the course of real research projects. This program is highly appreciated by the participants as it gives them the opportunity of being exposed to real project work. Recently materials for the watershed management course have been published as CD-ROM. Due to the expansion of GIS applications to the marketing field, course materials for marketing have been developed.

Facilities

For the activities of these three components, the latest UNIX and PCs, networking system and software are available. Internet connection is well established especially between AIT and Japan, supported by NACSIS 2Mbps line and 1.5Mbps AIII link. The Internet link enables to disseminate information, exchange data and near real time environmental monitoring. The Internet link is one of the major infrastructures to promote geo-informatics technology in the region.

Acknowledgement

I would like to express my special appreciation to all the support given by generous donors.