

# Real Time Distance Education: Experiment of Geoinformatics Course over Asia

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# Real time distance education...

- By technologies, real time distance education fill the instructional gap between teacher and student(s) at physical distance.
- Real time distance education system as we are experimenting provides face-to-face interaction environment as live classroom. The method and technologies used are appropriate to the instructional tasks; there is student-to-teacher and student-to student interaction and feedback system at real time. No matter how far you are.

# Existing distance education and upgrading

- Internet based distance education as e-learning
- The system is comparatively cheaper, easy to learn, earning high degree from home, etc.
- Although, this system presents interactive interface, it lacks live interface between professor and students as classroom.

In this regards , JAXA, Japan is conducting several pilot experiments over Asia to be utilized on future gigabit rates Internet satellites as part of **i-Space Project**.

# Importance of distance education by Satellite

Easily implemented even where the ground communication infrastructures are not sufficient

Distance education for under-populated area where lecturers are deficient

Effect of “on-site training” in combination with lecture learning and *e*-learning (Web Based Training)

- Due to (simulative) ”on-site training” by web technology, the ratio of “remaining in one’s memory” increases from 5% to 70%.
- Enhancing Subject Material
  - Attractive presentations (audio, video and live data)
  - Enabling visualization of concepts (simulation and modeling)
- Self-assessment measures (online examinations and quizzes)

# General overview of i-Space system

**i-Space Pilot Experiment**  
**“Asia e-learning Pilot Experiment**  
**by Multi-point Distant Learning**  
**Network System”**

Precursor for WINDS application experiment

Commercial Satellite: Super Bird-C on 144E

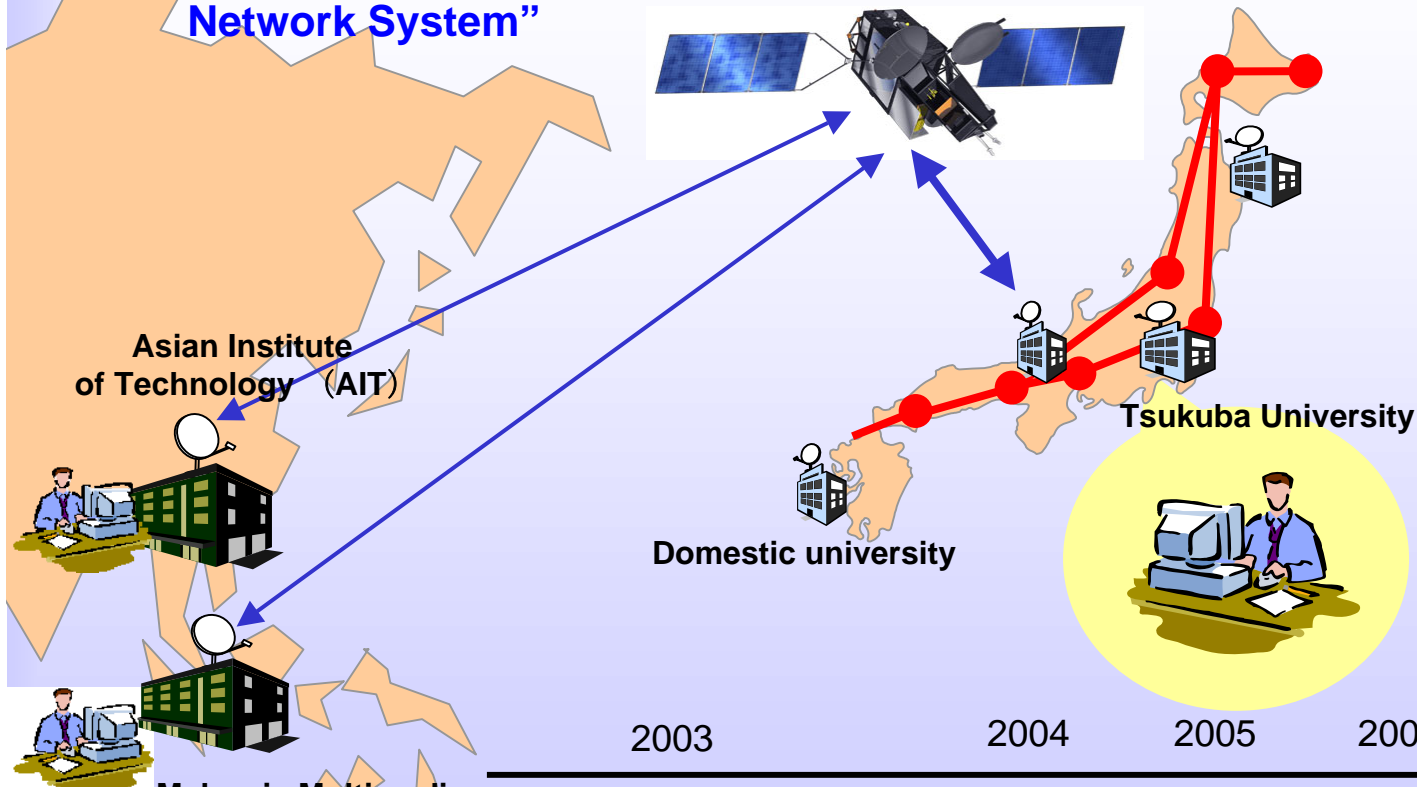


Image of lecture and teaching screen

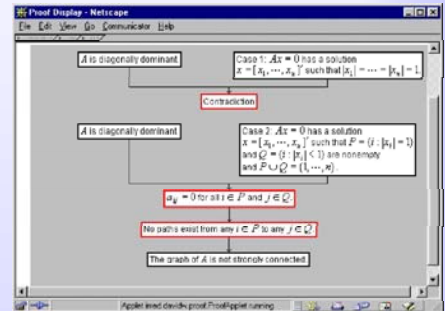
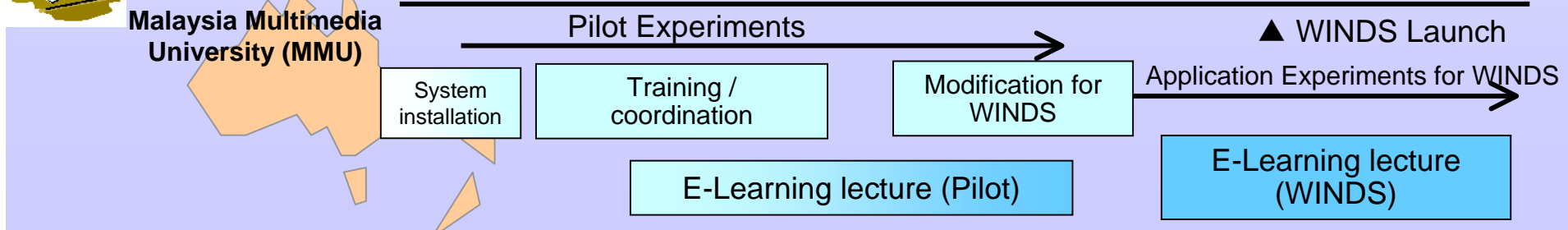


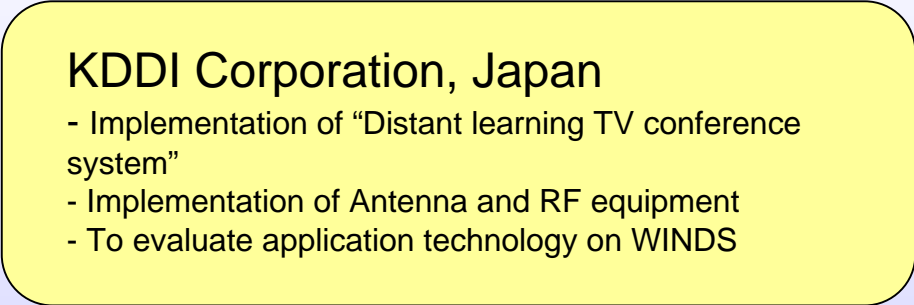
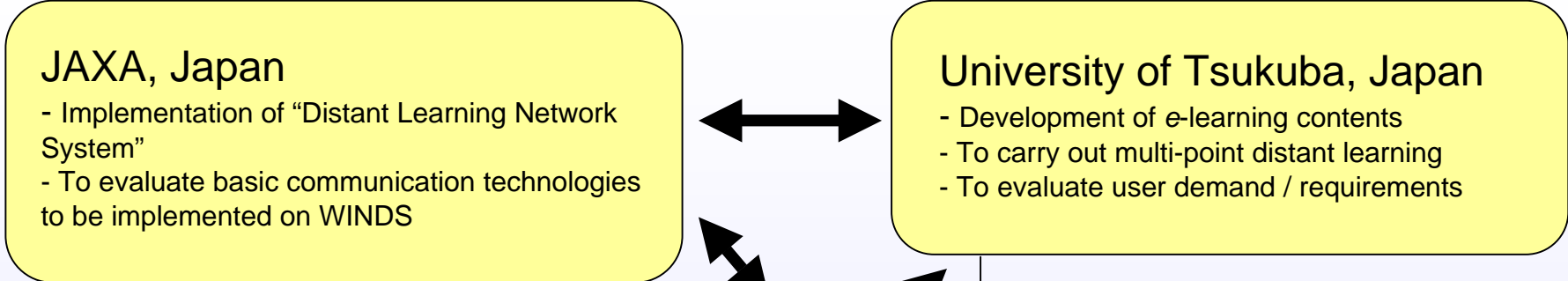
Image of e-Learning teaching-materials



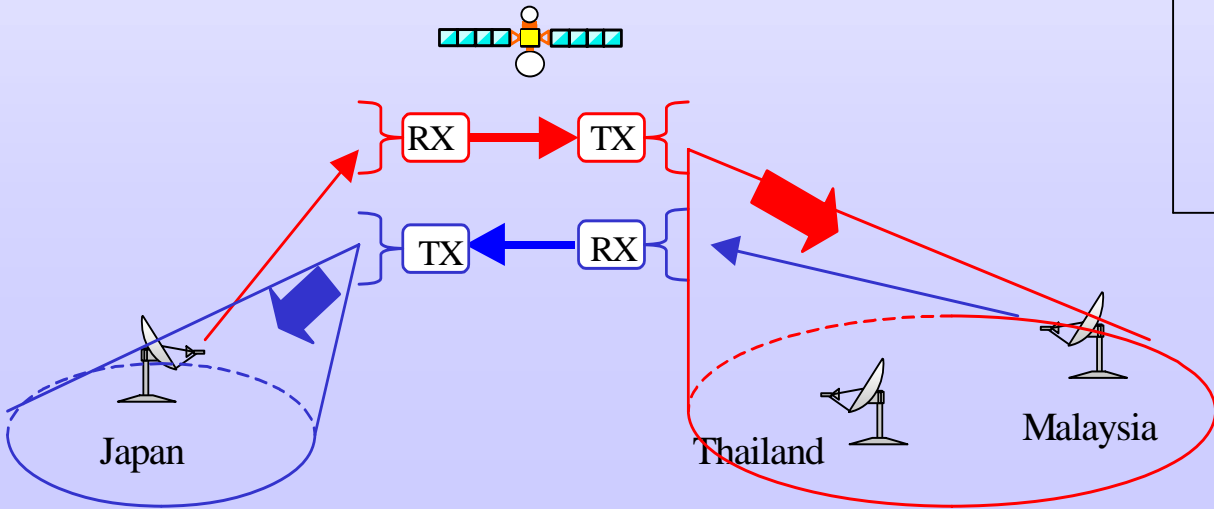
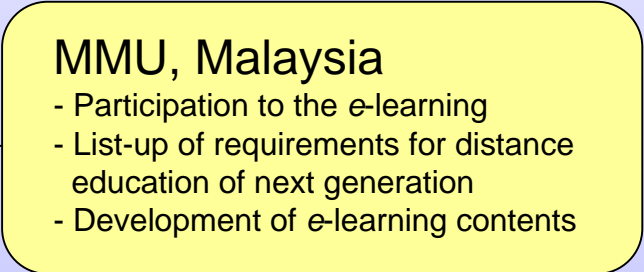
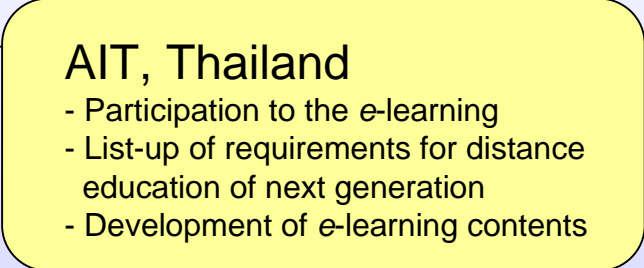
# Application areas of satellite-based distance learning

- On-demand “real time” gigabit-rate data distribution using future satellite like WINDS as well as optic-internet could help enhancing advanced knowledge to academic sites and urban/remote area in South East Asia.
- The number of *e*-learning course material designers and IT engineers would be increased through the joint-development of real time *e*-learning contents between the universities in Asian regions.
- Real time satellite-based distance education system would be applicable for
  - Educational promotion activities of RS/GIS/aerospace technology to enlarge users from different fields
  - Mobile distant education system useful for sustainable educational development in GMS countries
- Disaster/epidemics monitor and mitigation support system or Mobile hospital system using the same topology communication network but with VSAT or USAT and slight modification of application software.

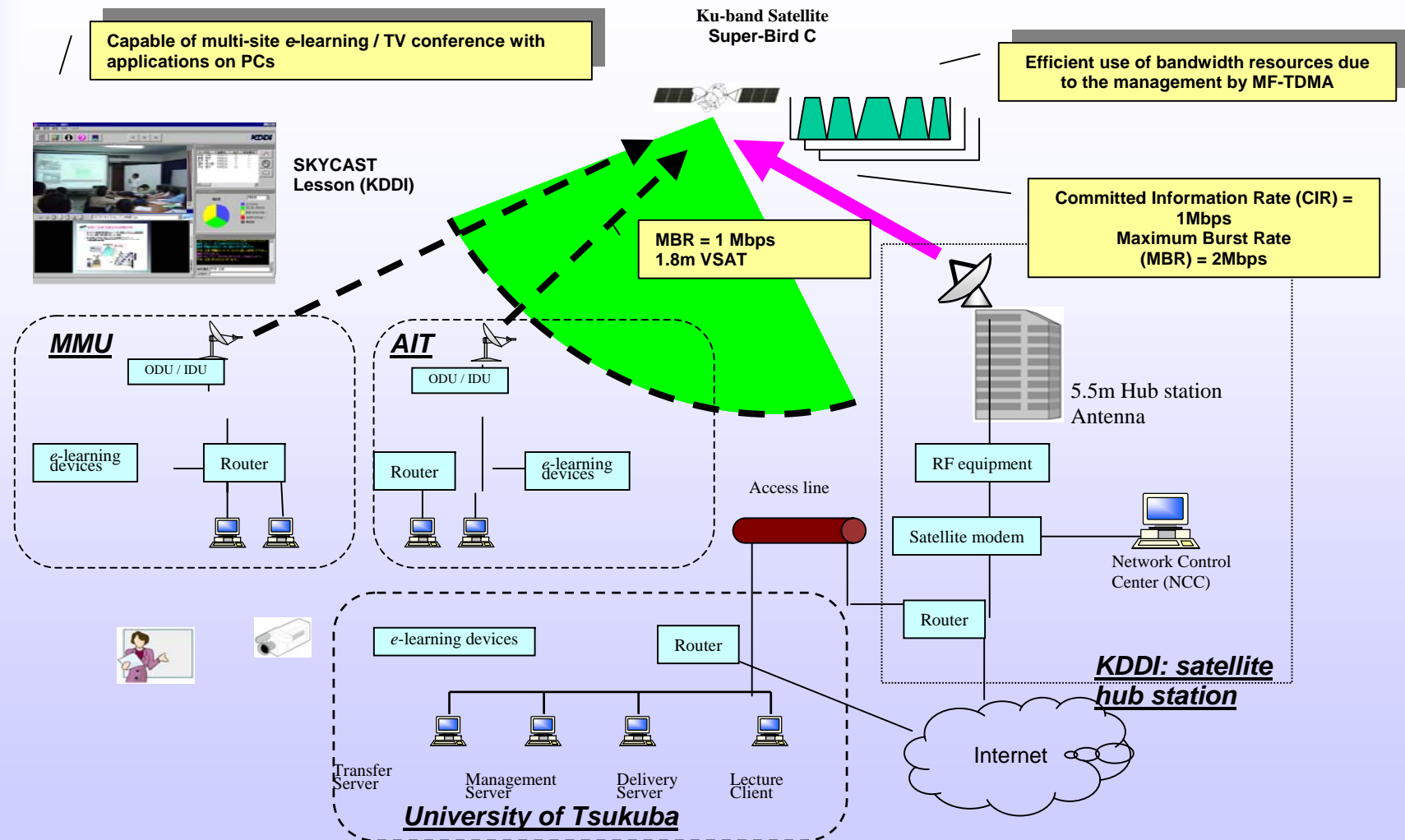
# Real time distance education experiment players



## Co-operation



# Configuration of the experiment system





# Second experiment real time distant learning

## Lectures Schedule

<b>Lecture Day 1: 16:00-18:00pm (JST), January 12<sup>th</sup>, 2005</b>	
Fractal Transform and its Application to Imaging I	University of Tsukuba
<b>Lecture Day 2: 16:00-18:00pm (JST), January 19<sup>th</sup>, 2005</b>	
Fractal Transform and its Application to Imaging II	University of Tsukuba
<b>Lecture Day 3: 16:00-18:00pm (JST), February 2<sup>nd</sup>, 2005</b>	
Special Topics in GIS-I	Asian Institute of Technology
<b>Lecture Day 4: 16:00-18:00pm (JST), February 9<sup>th</sup>, 2005</b>	
Special Topics in GIS-II	Asian Institute of Technology
<b>Lecture Day 5: 16:00-18:00pm (JST), February 16<sup>th</sup>, 2005</b>	
Special Topics in GIS-III	Asian Institute of Technology
Special Topics in Multimedia I	Multimedia University
<b>Lecture Day 6: 16:00-18:00pm (JST), February 23<sup>th</sup>, 2005</b>	
Special Topics in Multimedia II	Multimedia University
<b>Lecture Day 7: 15:00-18:00pm (JST), March 7<sup>th</sup>, 2005</b>	
Open Lecture by Guest Lecturers (Tsunami)	Asian Institute of Technology

## Geoinformatics education through real-time distance education via satellite

- Versatile nature of geoinformation science and its adaptability with other sciences “always high demand”
- Geospatial expertise is recognized as being, key to all aspects of development and capacity building towards developing sustainable nations and regions.
- Therefore, it is now desirable to forward such science door-to-door and individual-to-individual at cost effective manner.

## Geoinformatics education through distance...

- Realizing the importance of geoinformatics education over Asia, the RSGIS/AIT is investigating the suitability of geoinformatics education system for Gigabit-rates Internet satellite.
- First and second experiments were successfully completed during the 2003-2005 with the aim of viability of geoinformatics education in e-Learning system over Asia and adaptability of WINDS satellite.

# Distance education: geoinformatics course material design

- Instructional design and e-learning web-based course material R&D are suitable for
  - Engineering education in graduate school level (RS/GIS FoS)
  - Training course for senior engineers

 *Aerospace technology awareness program using RS/GIS*

  - Engineering education in university level
  - Engineering, science and applied mathematics education in high-school level
- RS/GIS FoS, AIT
  - Proto-type PowerPoint or web-based course material design on
    - GIS / Remote Sensing / GPS
    - Aeronautics / Space Technology / Small satellite Design
    - Statistics / Numerical Analysis for GIS, *etc.*
  - Language is English.
  - For RS/GIS education and training, image and animation video data are very helpful for understanding the principle and methodology.

# Classroom during the Experiment



# Distance education experiment platform: SKYCAST Sample image

MPEG4 Image of Lecturer

Skycast Lesson - teacher1@デモコース1 [2画面モード: 議長]

会議 設定 ヘルプ

1画面モード [F11] 2画面モード [F12] 集計モード

KDDI

議長映像 - teacher1 (MUTE)

ブラウザ

about:blank

http://www.kdd.com/grad/h2/edu/ch.html

参加者映像 - 生徒2

チャット

参加者リスト

官署名	部署名	出席	状態	却下
生徒2	student2	○	QCIF	
生徒1	student1	×	--	全却下
生徒3	student3	×	--	リフレッシュ

相手選択 送信文

**Education material**

For a HTML or Power-point teaching materials that is designed beforehand, page turn by lecturer or automatic transfer to the link Web-site is possible.

MPEG4 Image of Student

Text-based Chat

Participation Status Management

## Experiment results and discussion: operational aspect

- The power-point presentation files including animation video and satellite images were sent to the server in Univ. of Tsukuba prior to the lectures, due to the system configuration reasons.
- During each lecture, as a consequence, the lecturer had to ask Univ. of Tsukuba side via microphone in order to scroll next page, thus sometimes lectures didn't proceed timely. This should be resolved some way by the time of WINDS application.
- Flexible bandwidth control of live data transmission from multi-point had functioned well as expected.

# Experiment results and discussion: data and quality

- **Image/Movie Data Transmission**
  1. There was no problem with transmitting/receiving high resolution satellite image data.
  2. Real time transmission of simulated landscape data was first failed due to the link capacity.
  3. Thus, to transmit video or movie data in the system, distribute required data to each client server prior to the lecture.
- **Quality of Communication Link**
  1. Echo and howling were sometimes observed due to the alignment of microphone and speaker.
  2. Communication delay. Some systematic counter measures are desired for those satellites in proper link problems.
  3. Unfortunately there was no rainfall and thunderstorms during the experiment, so we were unable to check the effect in quality due to bad weather.



## Experiment results and discussion: platform SKYCAST

- SKYCAST developed for two-way lecture point, hence the system configuration will have to be improved in case of lectures with multi participation points.
  1. Simultaneous display of multi client points
  2. Scroll-manageability of presentation file from multi point
  3. User-oriented flexible setting of display configuration
  4. Integration of white board
- A design of proto-type *e-learning* Web-based lecture materials for *RS/GIS, GPS and Introduction to Aerospace* has been prepared in RS/GIS Field of Study of AIT.
  1. Some part of them had been tested during the experiment
  2. It is realised that **more interactive aspect** should be adopted in order to utilise the media effectively.

**Samples of course material used in real  
time distance education experiment**

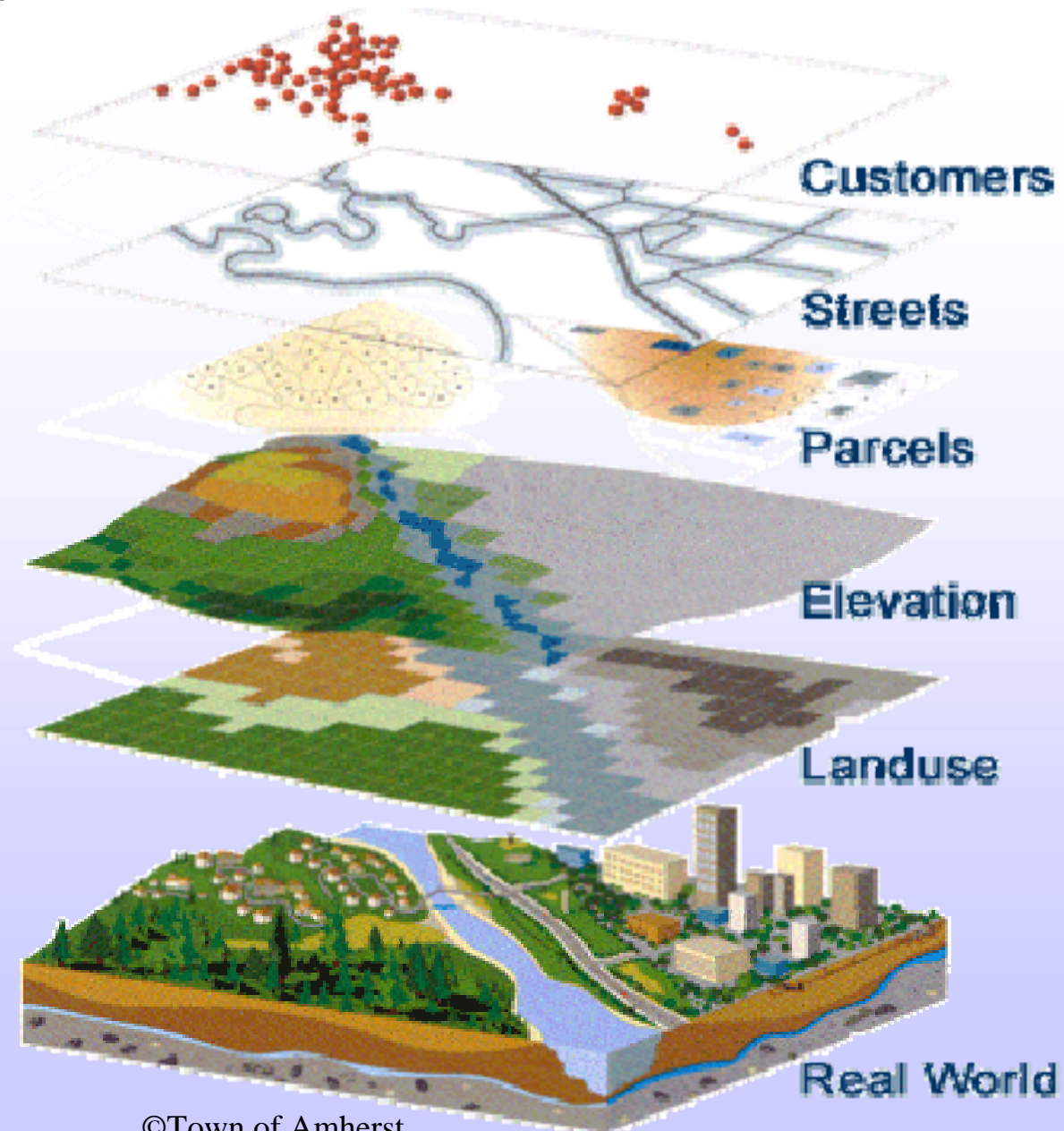
# Text

## Special topics in GIS - I

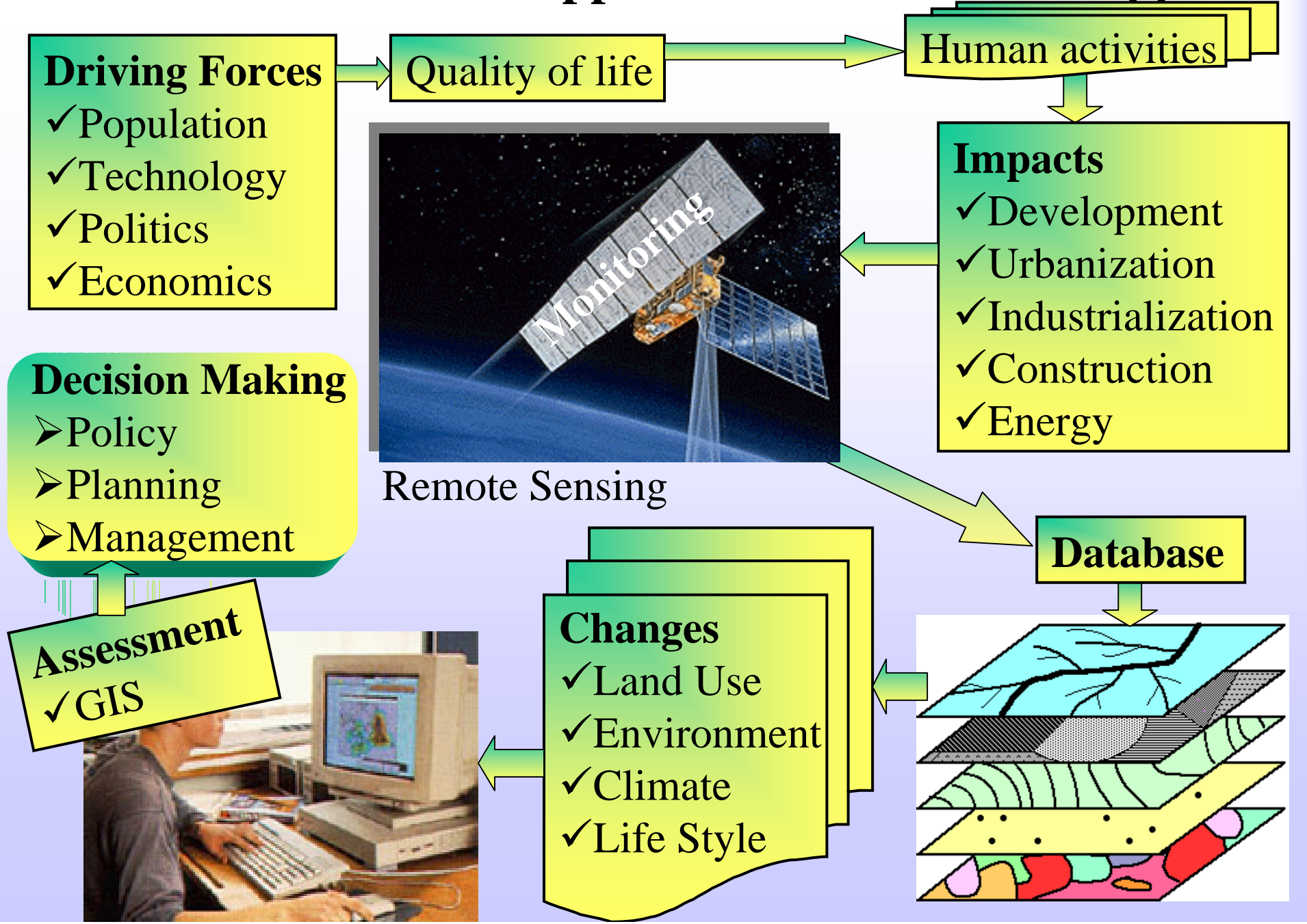
### GIS is

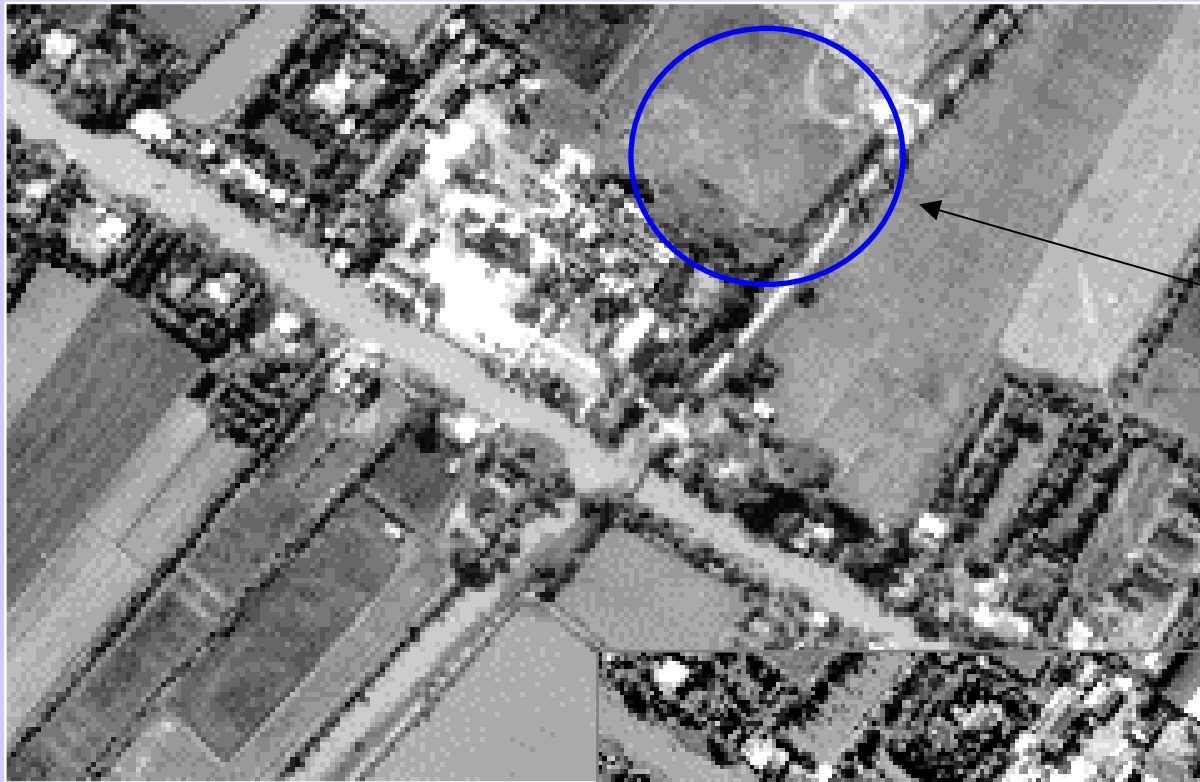
- a powerful set of tools for collecting, storing, retrieving at will, transforming and displaying spatial data from the real world (Burrough, 1986)
- a database system in which most of the data are spatially indexed, and upon which a set of procedures operated in order to answer queries about spatial entities in the database (Smith et al. 1987)
- a decision support system involving the integration of spatially referenced data in a problem solving environment (Cowen, 1988)

# Model



# Interactive model: GIS Application for Decision Support

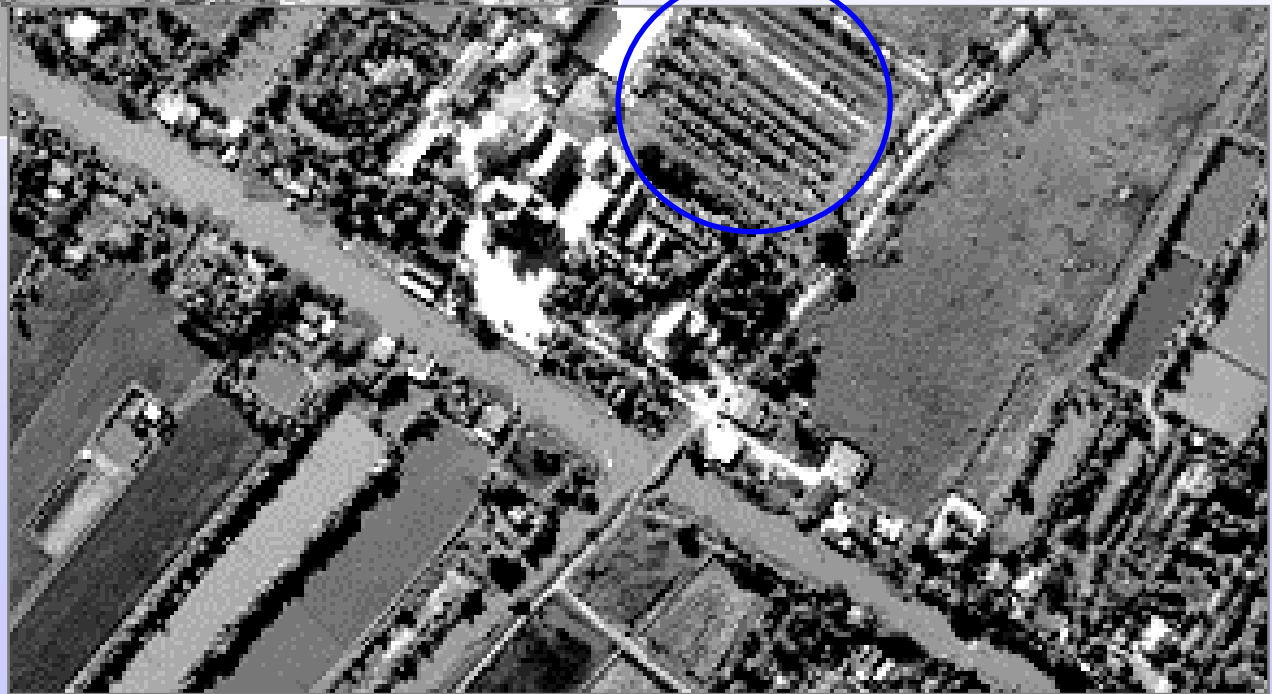




## Satellite images

Monitoring land use/cover change using satellite images

*1990*



*2000*

# Simulative Landscape model: Different targets

- Environmental impact



Example of Simulated Photos: Land cover change before and after, impact on environment

# Landscape Visualisation of Scenarios simulative movie



Example of Simulated Movie Video: For urban landscaping



# Summary & Concluding remarks

- Multi-point/multi-media real time distant learning second experiment among three countries as a precursor to WINDS system simulated by existing Ku-band satellite was successfully conducted.
- Each of the participating universities had broadcasted the lecture-classes in real-time and communicate simultaneously with each other via live video voice and text-chat.
- The suitability of geoinformatics course materials had been experimented by delivering the live lectures to the three participated universities at real time.
- A design of proto-type *e*-learning Web-based lecture materials for geoinformatics and aerospace is being prepared in the AIT/RS&GIS FoS. Some part of them had been tested during the experiment and realised more interactive aspect should be considered.
- As a result many valuable information, experiences and lessons have been learned during the second experiments, which would further guide to improve the geoinformatics distance education materials and the future system.