Faculty of Sciences

GEO1343   Remote sensing

[30h+30h exercises] 5 credits

Teacher(s):   Eric Lambin
Language: French
Level: First cycle

Aims

Knowledge : The students will acquire a good knowledge of the different applications of remote sensing, and a capacity to decide which sensors and which image processing and interpretation methods are most appropriate for a given application. Skills : The students will gain understanding of the bases of remote sensing and will be able to process and interpret satellite data on a given region, using a image processing software on PC. Emphasis is put on optical remote sensing for terrestrial ecosystem applications.

Main themes

Prerequisites : Notions of statistics, general physics course.
The course has three components:
1: The presentation during lectures of the theoretical and methodological bases of remote sensing;
2: The application of image processing and interpretation methods to Landsat data on a region of Belgium, using image processing software on PC;
3: The exploration of a large range of remote sensing applications and of the methods used in each application, on the basis of CD-ROMs demonstrating case studies.
Physical bases of remote sensing:
- Definitions: radiant energy, radiant flux, radiant flux density, radiance;
- Interactions between energy and the surface of the earth: laws of Stefan-Boltzmann and Wien.
- Spectral reflectance curves ;
- Atmospheric effects;
- Physical interactions with thermal infra-red energy.
The sensors used in remote sensing:
- Landsat MSS and TM, SPOT;
- AVHRR, Vegetation, MODIS;
- the new high spatial resolution sensors.
Image processing:
- Corrections for non-systematic and systematic geometric distortions
- Radiometric corrections
- Extraction of statistics from images
- Contrast enhancement
- Spatial filtering
- Supervised classification
- Unsupervised classification
- Classification errors estimation
- Change detection methods
- Multispectral transformations: Tasseled cap transformation; principal components analysis;
- Notions of microwave remote sensing.
Practical work:
Processing of a Landsat TM image of Belgium:
1st session Introduction to image processing software
2nd session Color composites and contrast enhancement
3rd session Design of a scientific project
4th and 5th sessions Geometric correction
6th session Unsupervised classification
7th session Supervised classification
8th session Accuracy assessment of classification

Other information (prerequisite, evaluation (assessment methods), course materials recommended readings, ...)

Support: Wilmet J. 1996. Télédétection aérospatiale: méthodes et applications. SIDES, Fontenay-sous-Bois, ISBN 2 86861 097 8.
Other recommended book: Richards J. 1986. remote Sensing Digital Image Analysis, Springer-Verlag, 2ème édition.
Human ressources: 1 professor and 1 assistant.
Continuous evaluation based on:
- Two tests during the trimester: (i) physical basis of teledetection and (ii) image processing technique (10% of final result for each test, so 20% for both);
- two practical work reports for each processing step (30% of final result for the overall of reports);
- a work on teledetection applications: answer to several questions, based on CD-ROMs (20% of final result).
Final evaluation: based on written examination (30% of final result).

Other credits in programs

ARCH13BA	Troisième année de bachelier en sciences de l'ingénieur, orientation ingénieur civil architecte	(5 credits)	
GEOG13BA	Troisième année de bachelier en sciences géographiques	(5 credits)	Mandatory