

REMOTE SENSING AND DIGITAL IMAGE PROCESSING TEACHING WITH VIRTUS

A. L. B. Candeias

UFPE, CTG -Cartographic Engineering Department, Av. Acad. Hélio Ramos, s/n – Cidade Universitária, 50740-530 Recife, PE - analucia@npd.ufpe.br

Commission VI, Working Group VI/4

KEY WORDS: Remote Sensing, Education, Learning, Teaching, Training, Internet, Multimedia, System

ABSTRACT:

The learning environment makes appropriate use of a variety of media. Various learning styles are best engaged by using a variety of media to achieve learning outcomes. Selection of media may also depend on nature of content, learning goals, access to technology, and the local learning environment. This present paper proposes a teaching methodology of Remote Sensing and Image Processing, based on INTERNET technology and VIRTUS-UFPE project. Basic themes and applications can be used in engineering courses and others areas that need Remote Sensing resources. A material developed here provides a motivation in Remote Sensing and Image Processing teaching. In Classroom or in homework activities, this material is very efficient to stimulate the students to learning this discipline.

1. INTRODUCTION

1.1 Web-Based Learning

Web-based learning designs must consider the nature of content, specific context, desired learning outcomes and characteristics of the learner. Learner-centered strategies include modular, stand-alone units that are compatible with short bursts of learning. Learning modules may also be open, flexible and self-directing.

The learner is actively engaged. Active, hands-on, concrete experiences are highly effective. Learning by doing, analogy and assimilation are increasingly important pedagogical forms. Where possible, learning outcomes should relate to real-life experiences through simulation and application.

The learning environment makes appropriate use of a variety of media. Various learning styles are best engaged by using a variety of media to achieve learning outcomes. Selection of media may also depend on nature of content, learning goals, access to technology, and the local learning environment.

Learning environments must include problem-based as well as knowledge-based learning. Problem-based learning involves higher order thinking skills such as analysis, synthesis, and evaluation while knowledge-based learning involves recall, comprehension and application.

Learning experiences should support interaction and the development of communities of interest. Learning is social and sensitive to context. Learning experiences based on interaction and collaboration support learning communities while building a support network to enhance learning outcomes.

Multiple interactions, group collaboration and cooperative learning may provide increased levels of interaction and simulation.

More details about web-based learning can be found in: Almeida, 1998; Bryan, 1996; Dodge, 1995; Ferreira, 1994; Gilder, 1996; Kay, 1991; Lasen, 1988; Lasmar, 1995; Levy,

1996; Kearsley, 1998; Kroner, 1998; Kubela, 1998; Marker, 1989.

Some interesting URL in Portuguese that uses INTERNET in education are listed as following.

- **Bernie Dodge**
Webquest: uma técnica para aprendizagem na rede internet
(<http://www.divertire.com.br/artigos/dodge1.htm>)
- **Edith Ackermann**
Ferramentas para um aprendizado construtivo: repensando a interação
(<http://www.divertire.com.br/artigos/eackermann1.htm>)
- **Jorge Fróes**
Educação e tecnologia: o desafio do nosso tempo
(<http://www.divertire.com.br/artigos/froes1.htm>)
- **José Armando Valente**
Informática na educação: instrucionismo x construcionismo
(<http://www.divertire.com.br/artigos/valente2.htm>)
- **José Manuel Moran**
Mudar a forma de ensinar e de aprender com tecnologias
(<http://www.divertire.com.br/artigos/jmoran1.htm>)
- **Sonia Zaitune**
Atividade lúdica, prazer e aprendizado
(<http://www.divertire.com.br/artigos/szaitune1.htm>)
- **LÉVY, Pierre.** A Emergência do cyberspace e as mudanças culturais. [on-line]. Artigo capturado em 11/01/2001
(<http://www.portoweb.com.br/PierreLevy/aemergen.html>)
- **Notas Sobre a Geografia do Ciberespaço - Cláudio Cardoso**
(<http://www.facom.ufba.br/pretextos/claudio3.html>)

1.2 Remote Sensing And Digital Image Teaching With VIRTUS-UFPE

Remote Sensing and Image Processing (Lillesand e Kiefer, 1994; Novo, 1992; Schowengerdt, 1983) have their content in dynamic way with new sensors, new methodologies and applications among others.

Some authors like Sausen et al. (2001), Silva and Demattê (2001), Kirmann (1997), Santos (1998), Santos (1999), Florenzano and Santos (2001) developed resources in pedagogical teaching of these areas.

To teach disciplines like Remote Sensing and Image Processing, spatial, spectral and radiometric resolution of digital images are very important in a lot of applications and need to be cleared presented. On other hand, the interaction of these images with specific software need to be cleared presented too. A resource on-line can help in this case, specially when a result need be developed by the students or need to be presented in classroom. INTERNET resources are a good way to help in areas to obtain these kinds of resolution, software approach among others.

This present paper proposes a teaching methodology of Remote Sensing and Digital Image Processing based on INTERNET technology and a software developed at UFPE (Federal University of Pernambuco) Brazil) called VIRTUS (<http://www.virtus.ufpe.br/>). Although this paper presents results dedicated to Cartographic Engineering and Geography courses, basic themes and applications can be used in others engineering courses and others areas that need Remote Sensing resources. In this paper, we analyze those features of WWW that are most interesting for educational purposes and show possible sophisticated pedagogical uses of the web. This paper shows a material to provide a motivation to Remote Sensing and Digital Image Processing teaching.

In Classroom or in homework activities, this material is very efficient to stimulate the students to learning these disciplines. The idea behind this approach is to offer a learning environment which implements didactic advantages of conventional classroom group work.

It would be possible to transform this approach in a distance teaching with some modifications. Via Internet, students are enabled to work more specifically transfer some results, put new sites in the web library, etc. in VIRTUS platform (Fig 1).

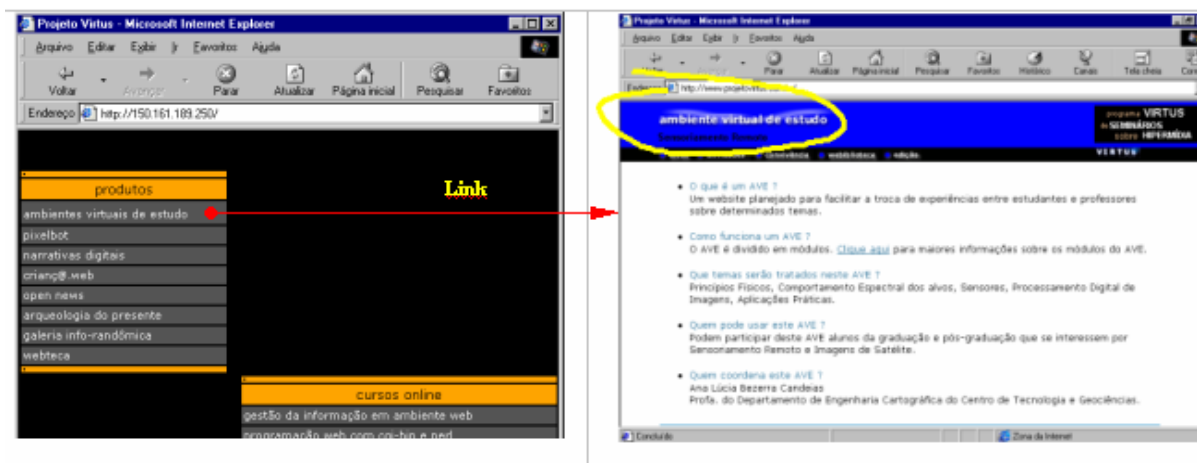


Figure 1 – Virtus Project (<http://www.projetovirtus.com.br/>).

The comprehensive teaching material provided in the general lessons gives a general introduction into remote sensing and digital image processing. The classroom provides various tools to support collaborative learning, e.g. tools for generation and structuring idea, sharing documents, etc. Some instructive approach of VIRTUS system can be seen in <http://www.c5.cl/ieinvestiga/actas/ribie98/132M.html> and a very interesting paper about this approach can be seen at http://www.igd.fhg.de/archive/1995_www95/papers/89/paper.html.

An AVE - "Ambiente Virtual de Estudo" in Portuguese, is a Virtual Place of Study, developed in platform Virtus - UFPE. Figure 2 and 3 show the AVE developed to Remote Sensing. This AVE can be accessed by using the URL: (<http://www.projetovirtus.com.br/>) selecting first line of product and after, the key word (author or key word of discipline) ex: candeias or sensoriamento remoto.

2. METHODOLOGY

Classroom activities are based on Spring software - INPE - Brazil (<http://www.dpi.inpe.br/spring/>) that is previously installed in each classroom PC and at student's homes and VIRTUS system. The methodology is divided in some steps that are described as following:

1. First, It was defined an AVE on VIRTUS system that was called "Sensoriamento Remoto - Remote Sensing" the same name of the discipline.
2. After, It was defined which contribution that AVE would give in the discipline. In our case, AVE helped in presential theory and practical classroom and homework activities.
3. Then, a PowerPoint text was showed to the students at each practical classroom that contains the objectives of that day. This PowerPoint text is accessed to help in obtain images, new information about the context and exercises

that are made with Software SPRING from INPE - Brazil (<http://www.dpi.inpe.br/spring>).

4. After this, results of each practical class were put on the VIRTUS platform.

5. Other kinds of activities like chat, web-library, activities of next classroom, advice among other things was made into VIRTUS system.

6. Image and other kinds of documents were repository into VIRTUS platform, like exercise lists, special documentation among others.

3. RESULTS

Below, in Figure 2 and 3 are presented the AVE developed to Remote Sensing and Image Processing discipline. This AVE can be accessed by using the URL: (<http://www.projetovirtus.com.br/>) with a key word (author or keywords of discipline) ex: candeias or sensoriamento remoto.

In Figure 3 there are links to some information, activities, companionship, web-library and edition edition.

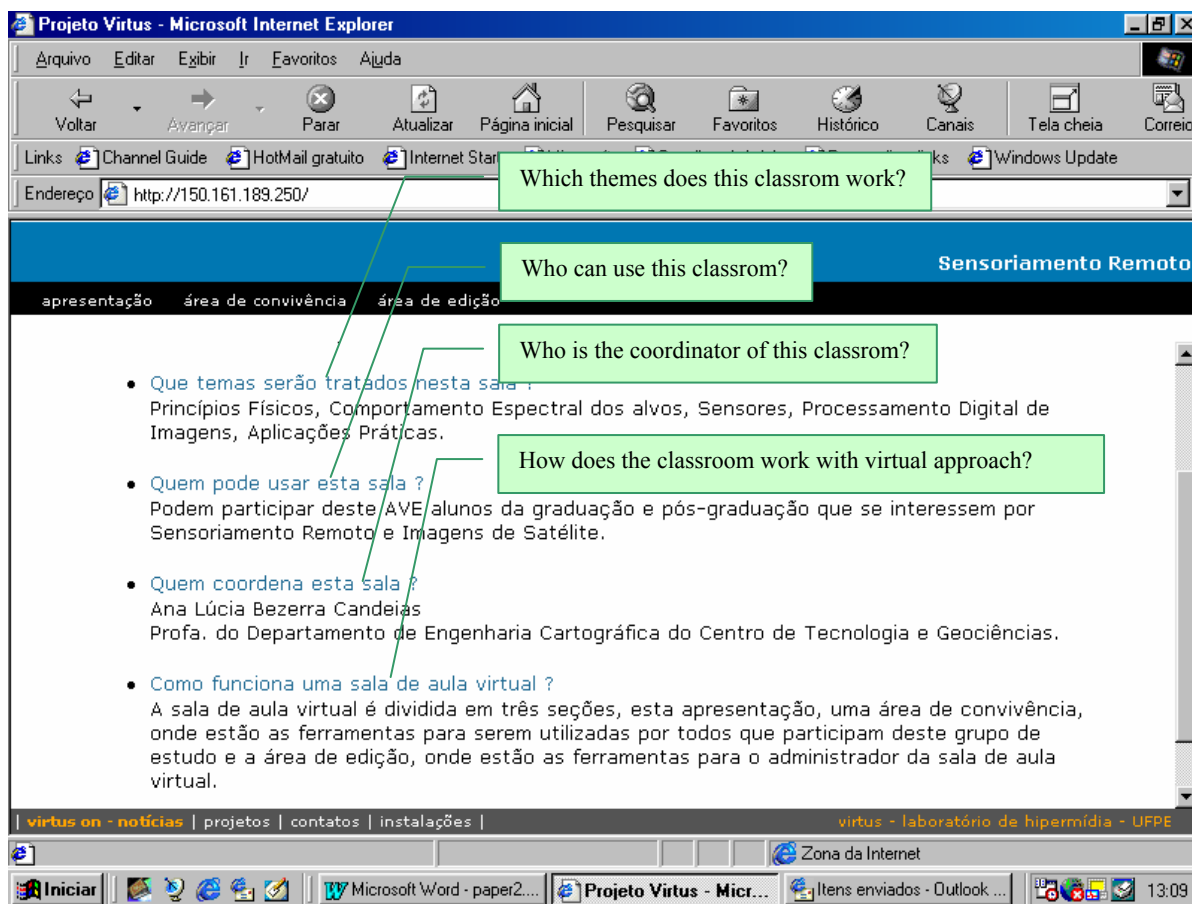


Figure 2 - AVE developed in Portuguese.

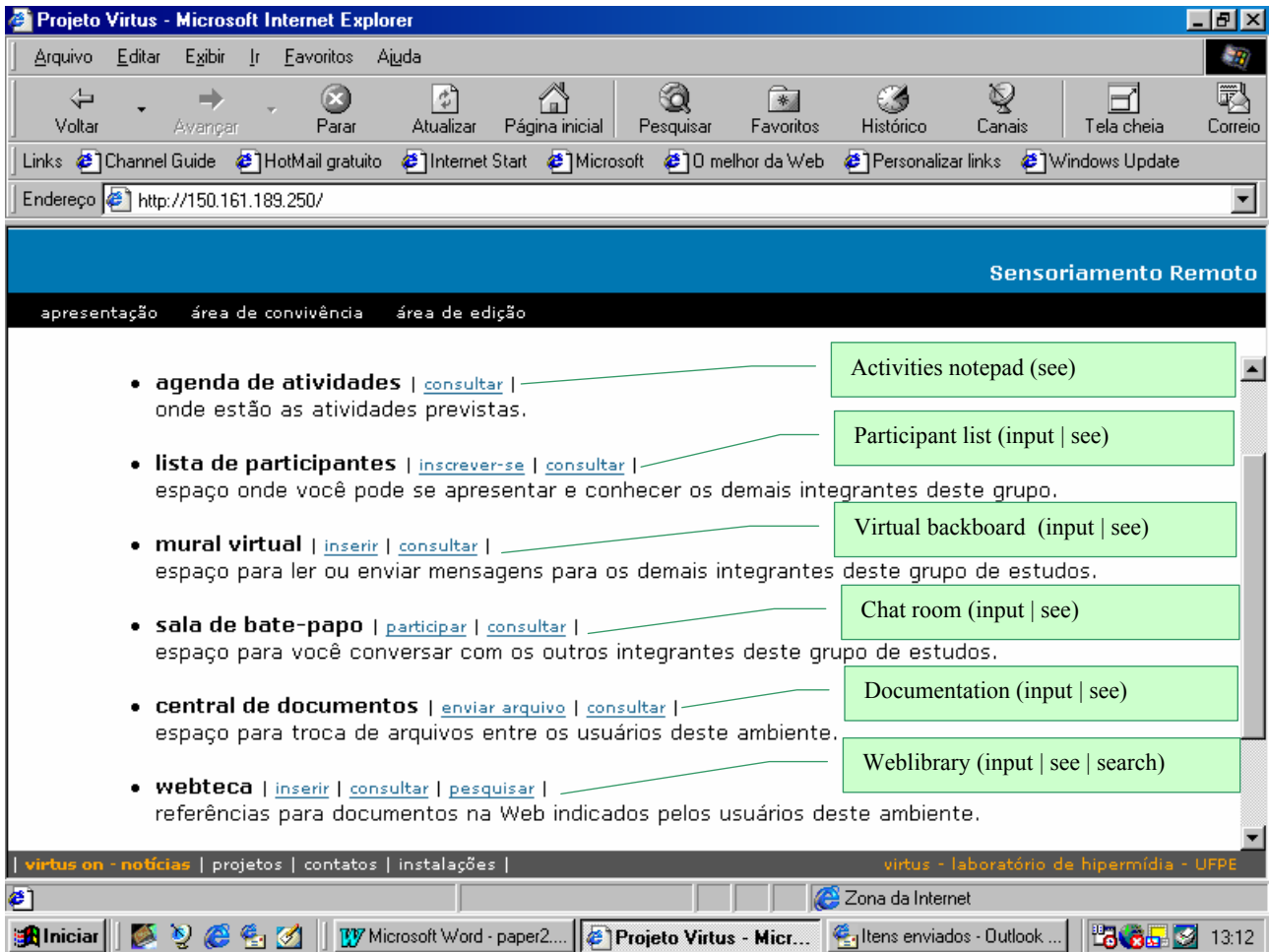


Figure 3 - AVE Companionship area in Portuguese.

4. CONCLUSION

In Remote Sensing like in Digital Image Processing area a book or some annotations about these topics stay old in a few time, because of the quickly advances of these areas. INTERNET resources can help in a special way to maintain these topics actualized.

Paper and transparencies are not good to show some digital processing over an image. Results processed directly via web would be a nice kind of solution. Some transformation over them can be made on-line, with specific software. This methodology make easy the teaching and learning in this area. On the other hand, diskettes and CD-ROM can be let away because transfer can be made directly by INTERNET resources. Information activities of disciplines would be easy with VIRTUS system developed at UFPE.

Pedagogical resource of multimedia tools (VIRTUS system) is efficient in Remote Sensing and Image Processing classroom. With these resource is possible to stimulate the students to use new resources of technology and prepare them in INTERNET tools. Principal impact of to teacher Remote Sensing and Image Processing is to make possible to distribute on-line in INTERNET or INTRANET dynamic information about these areas and it is a good resource to manipulate image, data, documents among others.

5. REFERENCES

- Florenzano, T. G.; Santos, V. M. dos. O Uso do Sensoriamento Remoto na Educação Ambiental. *X Simpósio Brasileiro de Sensoriamento Remoto*. Foz do Iguaçu, Paraná, Abril, 2001. Workshop. CD-ROM.
- Kirmann A Teacher's Introduction to Remote Sensing. *Journal of Geography*, 96, 3 May/June, 1997, 171-176.
- Lillesand, T. M.; Kiefer, R. W. *Remote Sensing and Image Interpretation*. New York, John Wiley, 3. ed., 1994, 750p.
- Novo, E. M. L. *Sensoriamento Remoto: Princípios e Aplicações*. São Paulo, Edgard Blucher, 1992, 308p.
- Santos, V. M. N. dos. *O Uso Escolar das Imagens de Satélites: Socialização da Ciência e Tecnologia Espacial*. In: Pentead, H. D. Org., São Paulo, Cortez, 1998 .
- Santos V. M. N. dos. *Escola, Cidadania e Novas Tecnologias: Investigação sobre Experiências de Ensino com Uso do Sensoriamento Remoto*. São Paulo, 1999. Dissertação de Mestrado. FEUSP.
- Sausen T.; Ruddorff, B. T.; Ávila, J.; Simi Filho, R.; Almeida, W. R. C.; Rose, V. G. C.; Godoi Filho, J. G. Projeto EducaSeRe III – A Carta Imagem de São José dos Campos. *X Simpósio*

Brasileiro de Sensoriamento Remoto. Foz do Iguaçu, Paraná, Abril, 2001. Workshop. CD-ROM.

Schowengerdt, R. A. *Techniques for Image Processing and Classification in Remote Sensing*. New York, NY, Academic, 1983.

Silva; Demattê Técnicas Pedagógicas mais Eficientes e Agradáveis em Relação às Técnicas Expositivas para o Ensino e Aprendizagem d Sensoriamento Remoto. *X Simpósio Brasileiro de Sensoriamento Remoto*. Foz do Iguaçu, Paraná, Abril, 2001. Workshop. CD-ROM.

6. REFERENCES RECOMMENDED

Almeida, Fernando J. de *Educação e Informática*. Os computadores na escola. São Paulo: Cortez Editora, 1988.

Bryan, Newton A. P. *Desafios educacionais da presente mutação tecnológica e organizacional para a formação de professores do ensino tecnológico*. *Formação do Educador* (org. BICUDO e JÚNIOR). UNESP, volume 3, 1996.

Cortelazzo, Iolanda B. C. *Utilização pedagógica das redes eletrônicas*. *Formação do Educador*. volume 3, 1996.
Dodge, Bernis WebQuests: a technique for Internet-based learning. *The Distance Educator*. San Diego, vol 1, n.2, p.10-13, Summer 1995.

Ferreira, Sueli *Introdução às Redes Eletrônicas de Comunicação*. *Ciências da Informação*. Brasília, 23(2):258-263, maio/agosto, 1994.

Gilder, George *Vida após a televisão; vencendo na revolução digital*. Rio de Janeiro, Ediouro, 1996.

Gallo, Sílvio. *A filosofia e a formação do educador: os desafios da modernidade*. *Formação do Educador*. UNESP, volume 2, 1996.

Hoineff, Nelson. – *A nova televisão; desmassificação e o impasse das grandes redes*. Rio de Janeiro. Delume Dumará, 1996.

Kay, A. *Computers, networks and education*. Scientific American. September 1991, 100-108.

Larsen, S. *New technologies in education*. In Lovis, T. e Tagg, E. D. (Ed.), *Computers in education: Proceedings of the IFIP TC3*, Amsterdam, Elsevier Science Publisher, 1988.

Lasmar, Tereza Jorge. *Usos educacionais da Internet: A contribuição das redes eletrônicas para o desenvolvimento de programas educacionais*. Brasília, Faculdade de Educação, 1995.

Lévy, Pierre. *O que é virtual?* Editora 34, São Paulo, 1996.
Bludnicki, Mary. Supporting Virtual Learning for Adult Students. *Technological Horizons in Education*. 25(11), June, 1998, 73-75.

Kearsley, Greg. *Distance Education Goes Mainstream*. *Technological Horizons in Education*. 5(10), May, 1998, 22-26.

Kroder, Stanley; Suess, Jayne e Sachs, David. *Lessons in Launching Web-Based Graduate Courses*. *Technological Horizons in Education*. 25(10), May, 1998, 66-69.

Kubala, Tom. *Addressing Students Needs: Teching on the Internet*. *Technological Horizons in Education*. 25(8), March, 1998, 71-74.

Marker, Gerald e Ehman, Lee. *Linking Teachers to the World of Technology*. *Educational Technology*, March, 1989, 26-30.

Schlumpf, Jake. *Linking Tradition With Technology*. *Technological Horizons in Education*. 25(11), June, 1998, 16A.

Vizer, Eduardo. *Medios y Sistema Educativo*. In *Atracción Mediática: el fin de siglo en la educación y la cultura*. Mercedes Cafiero, Roberto Marafioti e Nadia Tagliabue. Buenos Aires: Biblos, 1997, 159-160.

Willis, Barry. *Distance Education: Obstacles and Opportunities*. *Educational Tecnology*. May-June, 1994, 34-36.

Wolcott, Linda L. *The Distance Teacher as Reflective Pratictioner*. *Educational Technology*. January-February, 1995, 39-43.

Zamudio, Javier Arévalo. *Una Experiencia Puntual de Educación a Distancia: multimedia UPN, educación para los medios*. In *Atracción Mediática: el fin de siglo en la educación y la cultura*. Mercedes Cafiero, Roberto Marafioti e Nadia Tagliabue. Buenos Aires: Biblos, 1997, 141-143.

Perry, W. *The State of Distance-Learning Worldwide*. International Center for Distance Learning of the United Nations University, 1984.