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# Two Perspectives on GIS/LIS Education in the United States

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# Two Perspectives of GIS/LIS Education in the United States

**Gary Jeffress and Thomas Meyer**

**ABSTRACT:** Education in Geographic information science (GIS/LIS) happens in the United States both within surveying-related academic programs and in other academic programs that use spatially oriented data and information. This article presents an overview of two such programs. The first is a four-year Bachelor of Science degree program in Geographic Information Science at Texas A&M University-Corpus Christi. The second is a concentration with a four-year Bachelor of Science degree program in Natural Resources at the University of Connecticut (UConn). Geographic information science is the primary focus of the Texas A&M program, whereas GIS/LIS is an emphasis of the UConn program. Both approaches are presented for comparison.

## Introduction

**G**eographic information science (GIS/LIS) is playing a prominent role in surveying and mapping education in the United States. Universities are now offering four-year Bachelor of Science degrees in this field both to compliment traditional surveying education and as an end in itself. Geographic information science is also being offered as a supporting discipline in the context of another degree, the need for sophistication in spatial sciences having been recognized outside the surveying and mapping communities. This article examines two programs that exemplify each approach.

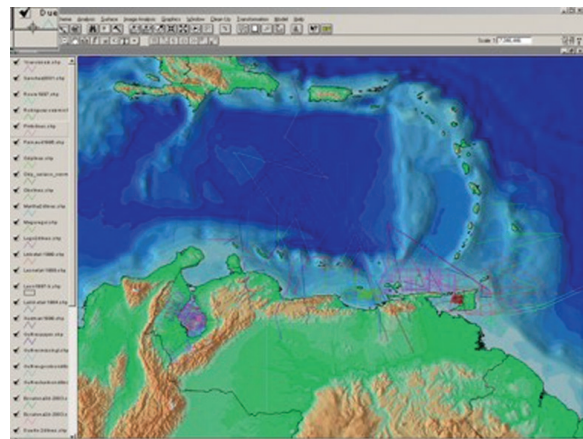
## A Four-Year Bachelor of Science Degree Focused on GIS/LIS

Texas A&M University-Corpus Christi has a four-year Bachelor of Science degree program in Geographic Information Science (GISC). This program has two emphases:

- Geomatics, where students are prepared for careers in the Land Surveying Profession, with a focus on managing cadastral data and information for land administration; and
- Geographic Information Science, where students are prepared for careers in GIS, with a

focus on building GIS from a comprehensive knowledge of computer science and spatial data collection technologies.

The GISC program at Texas A&M furnishes future professional surveyors with a fundamental knowledge of GIS and future GIS professionals with a fundamental knowledge of surveying and precise positioning. Presently, after ten years' experience of producing graduates from the program, 67 percent of the graduates elect to pursue careers in surveying and 33 percent of graduates pursue careers in GIS. The imbalance is probably due to the shortage of professional surveyors, and hence higher salaries, and a realization that surveying offers an interesting professional career with the option of working outdoors.



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An interesting trend in the United States is the shrinking of the surveying profession. In Texas for example, the number of licensed professional land surveyors has declined from about 4000 in 1990 to 2539 in 2006. The median age of the 2539 licensed surveyors is 55 years, 20 percent being 65 years or older. Another



Texas A&M-Corpus Christi. [Source: <http://gisc.tamucc.edu>]

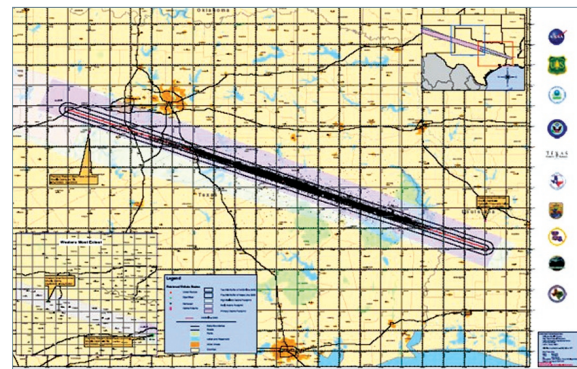
interesting statistic is that of the total, 266 are aged 70 years or older, while only 205 are under the age of 40. This decline highlights the sharp increase in productivity in the surveying industry brought about by increases in the use of technology and the automation of geospatial measurement. While technology has enabled the surveying profession to keep up with the demand for surveying services, we seem to have reached a point where demand is out-pacing supply and the competition for qualified surveyors is intensifying.



Coastal research at Texas A&M. [Source: [www.sci.tamucc.edu/ccs](http://www.sci.tamucc.edu/ccs)]

Graduates with the GIS emphasis also find they are in high demand, but for a slightly different reason. It seems the GISC program graduates have a distinct advantage due to their foundation courses in computer science, mathematics, and geospatial data collection technologies. These graduates also have the advantage of extensive use of ESRI software during many of their GIS courses taken in each year of the program. Their ability to write software and their understanding of operating systems, databases, and networking is very much sought after by employers.

This notwithstanding, the concern remains to attract bright young students into GIS/LIS education and the geospatial professional workforce. Higher salaries in response to the strong demand for GIS/LIS graduates are helping to attract new students. Still, educational programs have to commit precious resources to recruiting to maintain healthy student populations within their programs. Assistance from the geospatial professions is slowly forthcoming with offers of scholarships, internships, and good salaries upon completion of studies. This assistance does help in fending off pressure from univer-



Columbia space shuttle debris path, April 2003. [Source: <http://cbi.tamucc.edu>]

sity administrators to consolidate or close small enrollment programs.

By far the best way industry can assist academic programs is to fund endowed chairs. Endowed professorships virtually guarantee the long-term sustainability of an academic program. Two such chairs have been established in the United States. The first, the Conrad Blucher Chair in Surveying, was established at Texas A&M University-Corpus Christi in 1995 by a privately funded endowment. The second, an endowed chair in Geomatics at Oregon Institute of Technology, was established by the U.S. Bureau of Land Management in 2006. These endowed



Grass studies. [Source: <http://gis.tamucc.edu>]



commitments to GIS/LIS education highlight the concerns that the industry has in maintaining the flow of educated employees. With the ageing of the existing workforce these efforts are becoming critical.



University of Connecticut. [Source: <http://www.cant.uconn.edu/>].

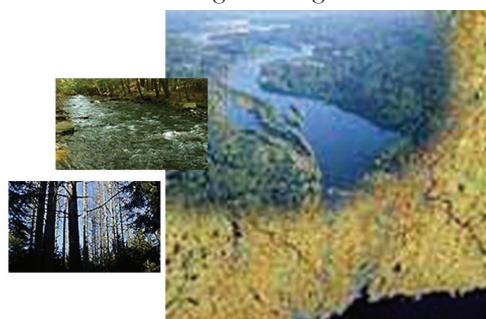
## A Four-Year Bachelor of Science Degree Focused on Natural Resources Management

Geomatics education in the United States also takes place in academic units not devoted entirely to surveying and mapping. The Department of Natural Resources Management and Engineering (NRME) at the University of Connecticut offers a concentration in geomatics similar to a minor, but this concentration is offered within a student's major department instead of in a different department. All NRME students are required to complete the courses in a concentration in order to graduate. The NRME concentration disciplines are atmospheric resources, fisheries management, forestry/forest ecology, water resources, wildlife management, and geomatics.

To graduate with the geomatics concentration, students are required to complete the following courses: Introduction to Geomatics, Geodesy, Advanced Remote Sensing, and Natural Resource Applications to Geographic Information Systems. Geomatics students must also pass six additional courses from various possibilities, including plane surveying, geographic information system theory, physical geography, differential and integral calculus, digital computer programming, wetlands biology and conservation, watershed hydrology, dendrology, water quality management, natural resources

modeling, environmental meteorology, and forest management. These courses span four departments in three colleges, giving NRME students a broad exposure to geomatics theory and its applications.

University of Connecticut's NRME currently has around 80 undergraduate and 30 graduate students. The geomatics concentration is new and, therefore, no one has graduated with this concentration. However, geomatics courses are not new in NRME, and three students have graduated to go on to be employed as surveyors, in addition to several dozen who work either entirely or partially in the GIS community. The Natural Resources Management and Engineering GIS students are often hired by government agencies, planning entities, and environmental engineering firms.



As a land grant university, the University of Connecticut has a mission to provide education to the general public. Thus its NRME faculty work closely with extension educators to present adult education offerings to the general public and continuing education courses to professional surveyors. These offerings include weeklong GIS courses, GPS instruction both for the recreational user and for mapping professionals, and various geodesy courses. These courses typically draw from 10 to 30 attendees



GIS applications. [Source: <http://erg.usgs.gov/>].

and are offered regularly throughout the year. The University of Connecticut's NRME also has university research centers supporting its geomatics outreach efforts, including the Center for Land Use Education and Research and Non-point Education for Municipal Officials. Both of these centers focus on (primarily satellite-based) remotely sensed image analyses to help Connecticut municipal officials understand how their decisions might impact of the urbanization of Connecticut's rural areas and plan accordingly.

## Conclusion

This paper presents two examples of academic programs that highlight GIS/LIS education—one having a traditional surveying and mapping approach, the other with an approach that puts GIS/LIS within the Natural Resources

Management context. There are many more examples of academic programs in the United States that also highlight GIS/LIS education with approaches tied to many academic endeavors, which use GIS/LIS technologies to manage geospatial data and information.

The graduates that emerge from all of these GIS/LIS-enabled programs have the ability to communicate with geospatial tools. These tools are being integrated into all sectors of human endeavor and are being increasingly shared on the Internet. Geospatial data sets and the professionals who create them are witnessing an ever increasing exposure to the public who are in turn demanding increased volumes, more sophistication, and interactivity with geospatial data. It is no wonder that many disciplines are integrating GIS/LIS into their academic programs.

