Spatial Analysis, Political Support, And Higher Education Funding

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Funding for public universities in the United States is highly political. State legislators must choose the level of funding from among competitive state agencies and educational institutions. They must allot funds to higher education, K–12 education, community college education, special education programs, prison systems, and a host of special projects. Furthermore, expenditures for higher education tend to comprise one of the largest categories of discretionary spending for which a state has to choose how to allocate tax dollars. In tight economic conditions, the methods for establishing an agency’s or institution’s value to the state become more complicated. How does one clearly document the contribution of a state university to each individual state legislator, especially legislators whose districts are distant from the university? How can one muster the political support of those who are significantly affected by state appropriations to universities — for example, the parents of students attending the university?

To answer these questions, the Registrar’s Office of the University of Florida, on behalf of the University President’s Office, commissioned us to execute a proof of concept study. Professor Grant Ian Thrall was asked to demonstrate how business geographic technology and analysis could benefit the university. Noelle Mecoli joined Thrall to demonstrate the concept as part of her masters thesis.

A representative project
Most colleges and universities in Florida’s state university system are commuter campuses in which students travel from their permanent address to attend classes. A state representative has a fairly accurate perception of the importance of the campus to his or her district. University of Florida, however, is a residence campus. Students, for the large part, come from other places, reside on or near campus while attending classes, and, after they complete their education, they leave the campus vicinity. The residence campus provides an opportunity for a student to become completely immersed in higher education, as well as an intermediate step toward independence from parents. However, this same remoteness comes at a price. Because the University of Florida campus is remote from most urban areas in the state — and therefore remote from most state representatives’ districts — it is easy for the representatives to overlook the importance the University of Florida is to their district.

We used GIS to document the importance of the University of Florida’s campus in Gainesville to representative districts throughout the state. We also employed GIS to evaluate student and constituent lifestyles, to illustrate that GIS allows for more than just the enumeration of counts by district.

After interviewing representatives of the Registrar’s Office, our pilot study focused on assigning a student’s data record to the correct Florida State House of Representatives district. We used the students’ declared permanent addresses to make the geographic assignment. In most instances, University of Florida students’ permanent address were their parents’ address. This allowed for the enumeration of students’ permanent addresses by representative district and led to the creation of databases for mailings that inform university constituents about legislative activities. We also completed further segmentation of the databases based on measurements of the constituents’ LSPs.

The specific task for our analysis included

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Glossary

LSP: Lifestyle segmentation profile
POS: Point of sale
SQL: Structured query language

Business geographic analysis can convey to legislators the importance of a university and help garner political support for adequate funding.
Obtaining the appropriate database of student records

Processing the database through software that assigns LSPs and geographic coordinates

Acquiring the appropriate database of legislative district boundaries

Performing a polygon overlay to assign legislative district codes to each student record

Counting the number of students’ permanent addresses in each legislative district.

Coordinating lifestyles

The Registrar’s Office provided us with the University of Florida student database. It is a private database and is not available to the general public. The database contained student enrollment records for fall 2002 and comprised a variety of data fields, including permanent address.

We chose ESRI BIS Coder (formerly CACI/Coder Plus) from ESRI BIS (www.esribis.com) to assign ZIP+4 Codes and geographic coordinates to the student records based on permanent address. ESRI BIS Coder assigns LSP codes and geographic locational coordinates to individual data records at a ZIP+4 Code, five digit ZIP Code, or census tract geographic scale. In this proof of concept study, we correlated geographic coordinates with the data records using the product’s more accurate “street address matching procedure.” We did not use the feature that assigns geographic coordinates based on “best matching” street address, ZIP+4, and ZIP Code.

We choose the more accurate geocoding method because the Registrar’s Office was concerned about addresses being assigned to the wrong legislative district.

For obvious reasons, we dropped from the database student records with permanent addresses outside Florida. Also, we removed students’ permanent addresses that were not assigned latitude and longitude coordinates, such as those with post office boxes. Thus, from a total of 46,923 records in the original student database, 42,567 students listed an address in Florida as their permanent address. An additional 6,373 records (or 15 percent) were deleted because they did not geocode to street address. We then mapped the remaining 36,194 permanent addresses using ESRI’s ArcGIS 8.2.

We additionally assigned LSPs to all the students permanent address records using ESRI BIS Coder. LSPs provide a composite measurement that summarizes population characteristics by location. The basic principle that underlies the creation and use of an LSP is Tobler’s first law of geography: all things are related, but near things are more related than distant things. Thus, people with similar demographic and consumption characteristics, generally reside in close vicinity to one another. And, as Michael Weiss writes in The Clustering Of America, “political surveys confirm that people living in the same cluster make similar choices.”

By assigning LSPs to students’ permanent addresses, the University of Florida could use SQL operations to select student records by LSP for specific mailings. In this way, the university might garner more support for higher education by sending letters with a message targeted to specific geodemographic characteristics.

Joining districts

With the geographic coordinates and LSPs assigned to the student address, the next step of our analysis was obtaining the new State of Florida Legislative District boundaries House Plan H406H020, which was approved in July 2002. The Legislature of the State of Florida provided the boundary file for the 120 House districts, which was in ESRI’s shapefile format and decimal degrees in North American Datum 1983. The Florida Department of State, Division of Elections also provided us with contact information for each state legislator, updated to include the winning candidate in the 2002 general election.

The boundary file included district numbers as attributes, and the legislator contact information database included the legislator’s name, title, district number, and legislative office address. The common district number allowed us to join the contact information to district polygons. Figure 1 shows a map of the districts after we imported the boundary files into our ArcGIS.

Next, to combine the student address and legislative district data, we used the spatial-join operation in ArcGIS to assign the appropriate legislative district and contact information to each student record. Figure 2 maps students’ permanent addresses on the legislative district polygon layer.

The spatial-join also combined attributes of objects from the legislative district

FIGURE 1 Florida has 120 Legislative House Districts. This map shows the boundaries of each district, which were updated in July 2002.
addresses provide market insight much like a retailer’s POS data. The trade-area information can be used by university administration to either increase penetration within the established market or to increase the geographic range of its recruitment efforts.

Nonetheless, because some students list their temporary Gainesville residences as their permanent address, the area in Figure 3 may not reflect the true 80 percent trade area of University of Florida. To continue with the analogy of the retailer, multibranch retailers might obtain their POS address data by purchasing those addresses from credit card companies. Customers that pay with cash, however, would not be included in that database. Hence, the retailers’ trade area would likewise also be biased in an unknown direction — either too large or too small.

To increase the accuracy of the university’s 80 percent trade area, students whose permanent addresses are within Gainesville might be assigned geographic coordinates based on the coordinates of the high school from which they graduated.
Business geographic techniques can also be used to calculate the trade area for the University of Florida in a manner similar to depicting market area for a retail establishment.

A proven tool
Although the University of Florida Registrar’s Office has not at this time applied the methods and procedures demonstrated in this work, our study proved that GIS can be a valuable tool for demonstrating to state legislators the importance of a university in serving the educational needs of students in their districts.

State legislators can use the information from Table 1 when they evaluate the importance of University of Florida to their legislative district in terms of serving that district’s needs for higher education. In addition, the university can use the LSP information we populated into the student database to document to state representatives a more detailed measure of the importance of the university to their legislative district. The LSP data also enables the university to send letters with a message targeted to specific geodemographic characteristics, helping it more effectively garner political support for higher education and the sustained funding it requires to serve its mission.

References