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Capstone Project Pre-Proposal

For my capstone project, I would like to propose using ESRI's parcel fabric data model, Parcel Editor toolset and available survey-grade property corner information to explore improving existing cadastral coverages and related layers. Specifically, the consulting engineering and surveying firm that I work for has been approached by the GIS Division of the City of Rapid City, South Dakota to evaluate this option. Both the client and my employer support me also using this as my project to fulfill the requirements of the MGIS program at Penn State.

Rapid City, which is home to approximately 70,000 people is the second largest city in the state. The Rapid City GIS Division has maintained a parcel coverage for over a decade. This data layer has been problematic from the beginning, largely because of its development history. Land records were originally compiled in paper format, with changes drafted by hand on large composite sheets. When computer aided drafting (CAD) platforms emerged, the paper maps were translated into a digital format and updated in Microstation. Some years later, when GIS arrived on the scene, the Microstation files were converted to ArcInfo workstation coverages. Because the original digital data that was maintained in Microstation was a representation of the parcels and not paired with any other data, it was housed in a local coordinate system. As a result, the ArcInfo workstation coverages had to be translated into stateplane coordinates. This was done using poorly rectified aerial photography, which yielded in a dataset that was representative of the City's parcels, but noticeably inaccurate in some areas of town.

Over time, developing additional layers related to the land base including street centerlines, utilities, zoning and future land use has been problematic, not to mention visually un-appealing when overlain on modern, well-rectified aerial photography. Data that is generated today using more accurate methods doesn't fit the parcel base very well, if at all in many areas. It is also difficult to maintain each layer because of their interdependence on one another. If there are changes in the land base, they often times need to also be reflected in related layers, but the related layers are all static and independent of the parcels. ESRI's parcel fabric data model sets out to address many of the shortcomings and criticisms (some of which are mentioned above) that have plagued land records managers for some time. It also takes a big step towards bridging the gap between land surveying and GIS which is extremely exciting to me - a Geographic Information Systems Professional (GISP) and Land Surveying Intern (LSI)!

There are four key components in ESRI's parcel fabric model that I am proposing to explore for my capstone project using a small test area in Rapid City:

1. workflow for converting existing parcels to ESRI's parcel fabric model
   - this is very important to the City of Rapid City because it is not financially feasible or reasonable for them to get rid of their existing coverage and start over from scratch

2. incorporating surveyed property corner data. ESRI's parcel fabric allows for the incorporation of control points so a least squares adjustment can be made on an area improving its quality

- this is also important because there is a lot of survey-grade information in the engineering design submittals made to the City that could be used to improve areas and minimize expense. Once this source has been exhausted, they can determine areas where they need to have additional survey information collected. This will help reduce the cost of improving the parcel base for the City.

3. associating layers related to the parcels to the parcel fabric

- In ESRI's parcel fabric data model, when a set of parcels is adjusted in a fabric least-squares adjustment, vectors are generated between the old and new coordinates of the parcels. The parcel fabric feature adjustment uses these vectors to adjust and realign features in associated feature classes. This addresses the City's concern about managing the layers that are impacted by parcel changes.

4. preserving recorded land record data

- One beef surveyors have long had with GIS is the perception of inaccuracy - especially when it comes to land records because most GIS systems house a representation of the cadastre for an area, not the actual recorded data. ESRI's parcel fabric addresses this by storing the recorded courses and distances, as defined on a plat by the surveyor of record. The neat feature here is that the parcel is "fit" into the space available for it in the fabric, but the surveyed information is maintained with the feature. It also has the ability to track information such as who the surveyor was, when the plat was recorded, and hold a link to the image of the plat document itself. It also maintains history so as subdividing an replatting occurs, what was there prior to the reconfiguration is maintained in a history layer.

At this point, I see my project being sort of a case study of a small area in Rapid City that would test the conversion of existing data into the parcel fabric, evaluate a least-squares adjustment of the fabric using surveyed control points, evaluate how well associated layers fair during the adjustment and test the input of a plat or two to witness how the shapes are fit into the fabric and recorded information is held.

I think this project is very relevant just from the inquiries we are starting to have at our firm from people trying to find a good solution for improving their parcel layers. There also seems to be a lot of discussion in both the surveying and GIS communities about statewide and national cadastres.

Venue for Presentation of Work

I have given some thought to how I would like to proceed with presenting my final work. I am very interested in the possibility of publishing my work in a peer-reviewed journal. One I have looked specifically at as far as submittal requirements, audience, etc. is the URISA journal.

However, I don't know if the type of project I am proposing would be appropriate for this platform.

The other option would be possibly presenting my project at the GIS in the Rockies conference to be held in Denver, Colorado, August 31 - September 1. This would get my work in front of a regional audience and be about the right time frame if I can get my work completed in the next two quarters, which is what I am really striving for.