

GIS-Based Roadway Video-logging using a Firewire Camera Combined with Satellite Differentially Corrected GPS

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Background

- Clemson Transportation Systems group received funding last spring to build a research van

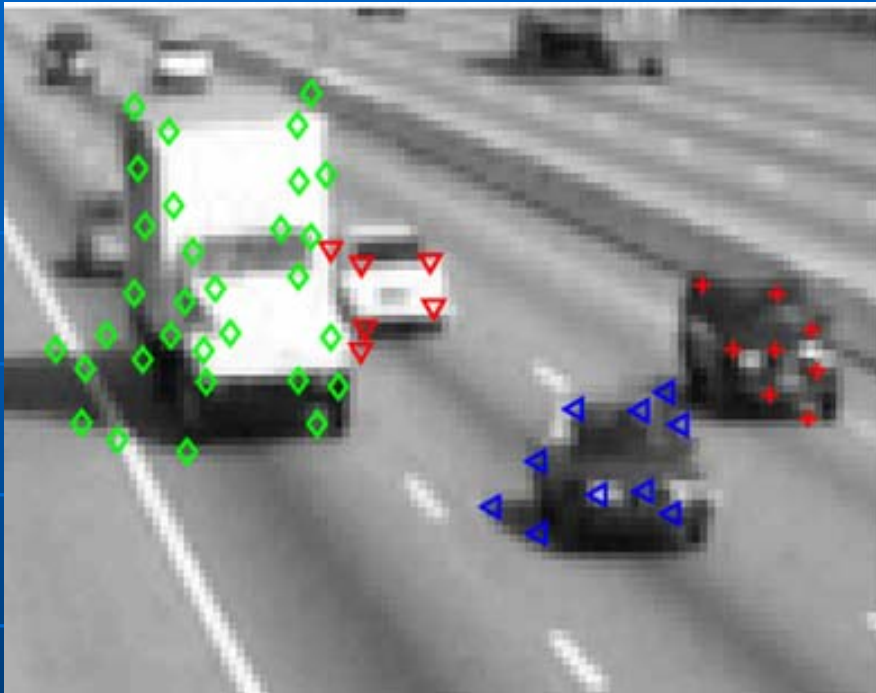


AutoScope MVP



- Super system
- Some problems with perspective and occlusions at 30'

Automated feature tracking



- Counts individual lanes accurately
- Collects speed and other traffic parameters
- Implementing vehicle classification

Background (con't)

- One of the capabilities was dynamic datalogging with submeter geocoding capability
- Easily expandable
- Videologging a must

Commercial Based Video Logging Systems

- Expensive!
- Proprietary
- Some are based on older computer technology

Conceptual Design

- Video-logging
 - Digital
 - High-speed storage directly to hard drive
 - Twin camera setup (front and rear)
 - Time stamp
 - Variable frames per second
 - Annotation capability

Conceptual Design

- GPS
 - Time stamp
 - Real-time high-accuracy (sub-meter)
 - Extensive coverage
 - Sub-second update rate
 - NMEA

Software Integration

- VERY simple GIS interface using generic feature classes (points)
 - Logs GPS data
 - Activates viewer software
- Video logging software to run independently but simultaneously with GPS collection
- RDMS Key field options
 - Point ID
 - Difficult to synchronize
 - Time...

Time is the Key

- Synchronizing is automated
- Most loggers can generate time
- GPS is time based and precise
- To ensure time is synchronized precisely
 - Let GPS provide time
 - Update computer clock based on web

Camera Options

- Variety of Vendors
- Firewire or USB 2.0
- Interchangeable lenses
- Frame rates up to 30 frames per second 640 x 480 resolution
- Higher resolution will reduce frame rate: Firewire: 1024 x 768, 15-30 frames. USB 2.0 comparable

More on Frame Rate

- Data must be stored at the rate that pictures are taken.
- Even more difficult if using two cameras
- At 30 frames per second traveling at 60 MPH – roughly 1 picture every 3'

Camera Chosen

- Firewire Camera
 - Very fast storage—even with two cameras
- Non-proprietary software library
- Initial cameras purchased were 640 x 480 due to limited budget
- Basic lens (at least initially)

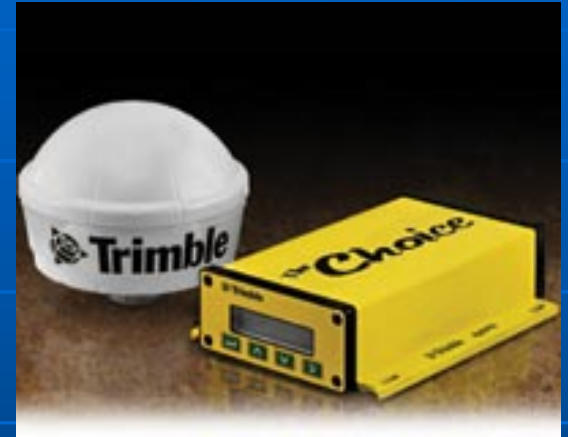


GPS Options

- Variety of Vendors
- Accuracy
 - Beacon (e.g. Coast Guard)
 - Somewhat sporadic coverage
 - CORS is not real time
 - Omnistar
 - Nationwide coverage
 - Submeter
 - WAAS
 - Nationwide coverage
 - Free
 - 1 to 3 meter accuracy

GPS Chosen

- Trimble AG 132
 - Course/Acquisition
 - OMNISTAR/WAAS compatible
 - Not carrier phase
- OMNISTAR
 - Annual cost depends on service chosen
 - No post-processing required
 - No set-up time for a real-time base station



Carrier Phase Benefits

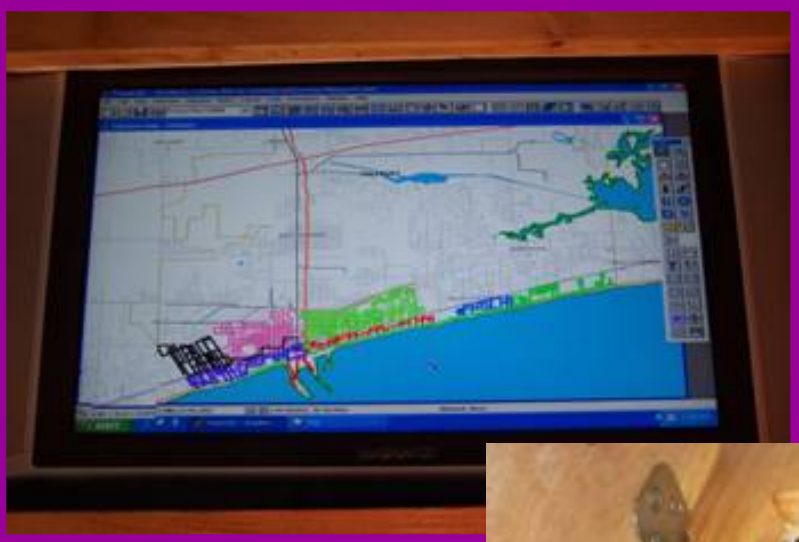
■ Accuracy

- With OMNISTAR XP <20 CM Kinematic
- With OMNISTAR HP <10 CM Kinematic

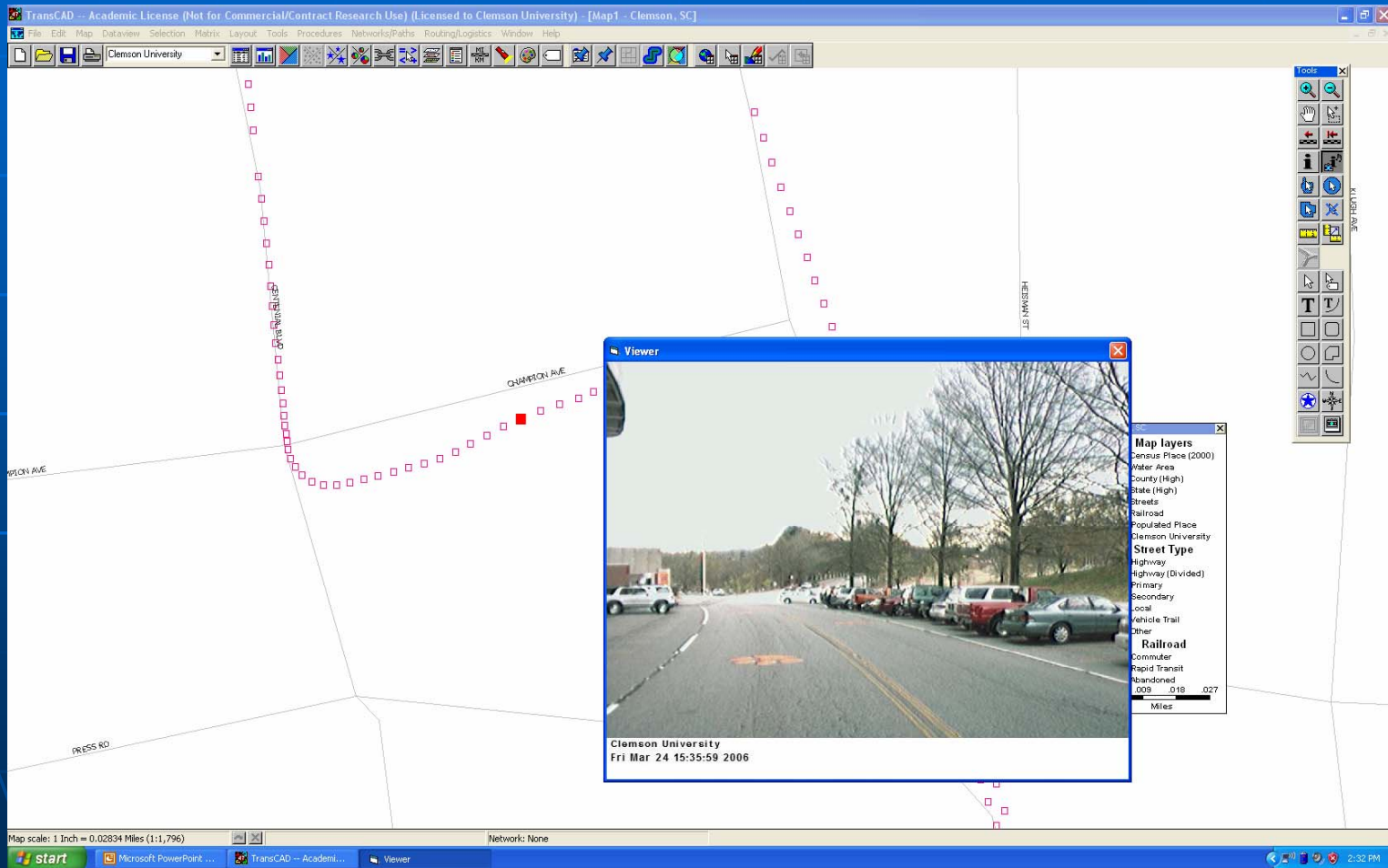
■ Drawbacks

- Longer initialization
- Loss of lock in urban terrain or traveling under bridges takes longer to reacquire

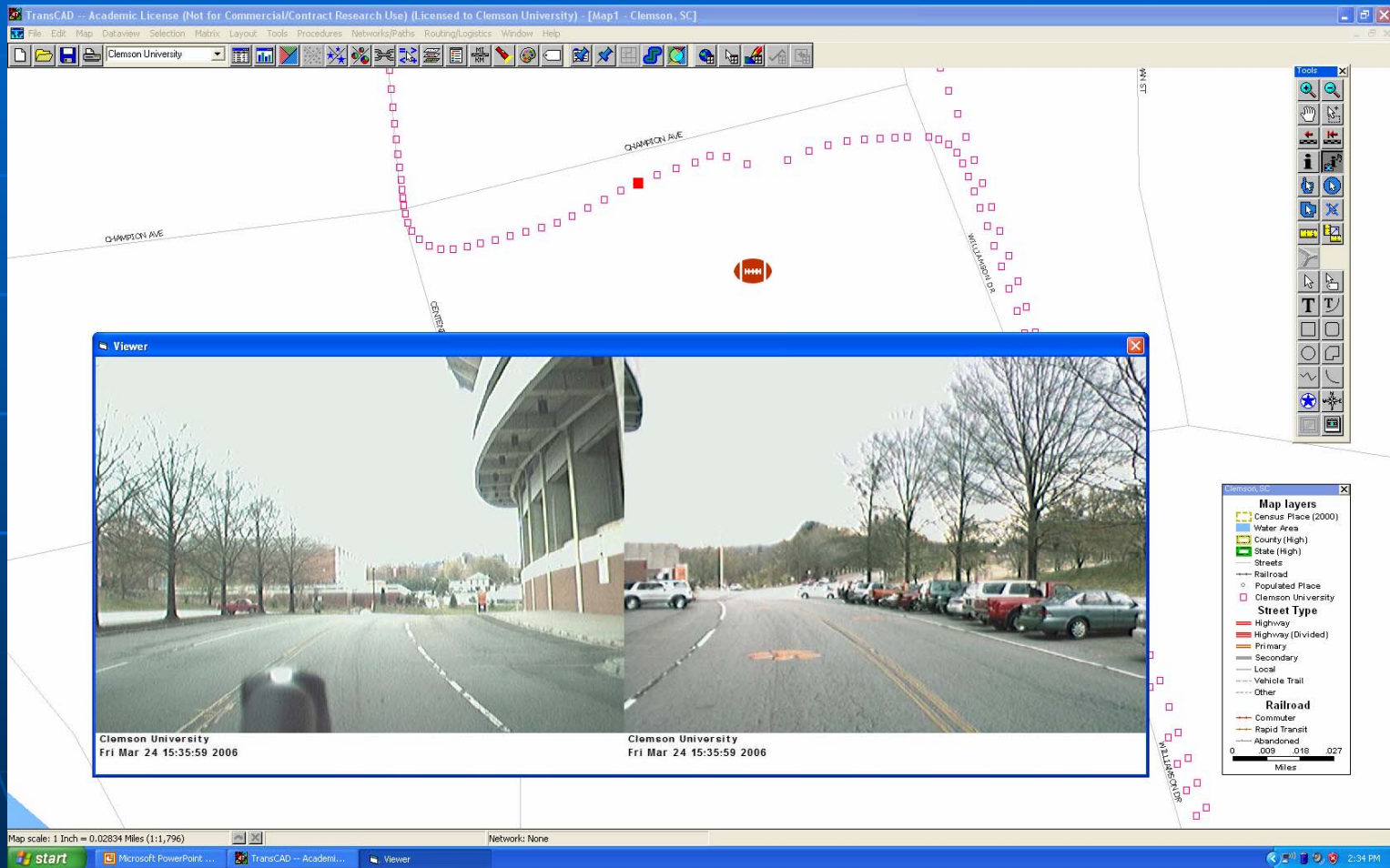
Hurricane Katrina Relief



Rear Camera



Both Front and Back Cameras



Urban Terrain and Bridges

- We have not had significant continuity problems in South Carolina
- A DMI can be incorporated to supplement point data.
- Interpolation is also possible

Conclusions

- Low cost video-logging alternative
- Flexible integration of other attribute data is possible
- Time is the key to linking the data to GPS points
- Can work with just about any Vector GIS

Thank you!

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GO TIGERS!