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

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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...
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
Drive Around Campus
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!