Remote Sensing and GIS-Based Characterization of Transportation Corridors

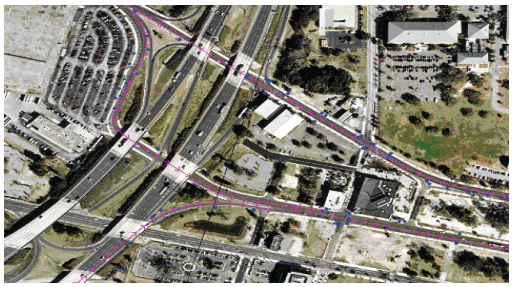
Center for Transportation Analysis (CTA) Research Areas

Aviation Safety
Air Traffic Management Analysis
Data, Statistical Analysis
Geo-Spatial Information Tools
Defense Transportation
Energy Policy Analysis
Environmental Policy Analysis
Highway Safety
Intelligent Transportation Systems
Logistics Management
Supply Chain Management
Modeling and Simulation
Transportation Operations
Planning and Systems Analysis
Transportation Security

Through the National Consortium of Remote Sensing for Transportation under the sponsorship of US DOT, Florida DOT, and Washington State DOT, advanced remote sensing and GIS methods have been developed at the Oak Ridge National Laboratory's (ORNL's) Center for Transportation Analysis (CTA) to support rapid characterization of transportation corridors associated with transportation connectivity, roadway geometry, traffic control characteristics, bridge attributes, land use patterns, etc. These methods have been implemented and evaluated in applications such as roadway inventory and environmental assessment [1][2].

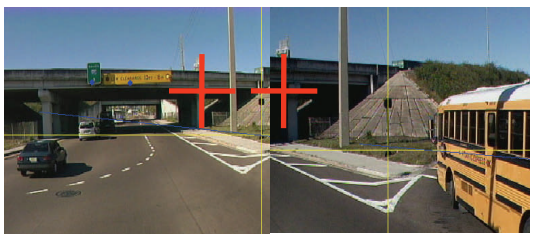
Multiplatform Data Acquisition

An integrated approach that makes combined use of data from multiplatform sensors has been adapted to provide multi-scale, multi-spectral, multi-angle, three dimensional information for road networks and transportation corridors. Roadway features and characteristics such as centerlines, through lanes, auxiliary lanes, outside shoulders, highway median, inside shoulders, intersections, and structures are identified and interpreted using overhead photographs. Additional feature attributes such as guardrail length, mile-post, or shoulder length are calculated automatically or interpolated implicitly.



Extracted roadway features overlaid on aerial imagery.

Detailed 3D roadway information on roadway features such as traffic signals and control characteristics, mile markers, and guardrails is extracted from images acquired with vehicle-based multi-camera systems.



Stereo images acquired from vehicle-based mobile mapping systems.

Illustration of images from vehicle, aircraft, and satellite-based sensors.

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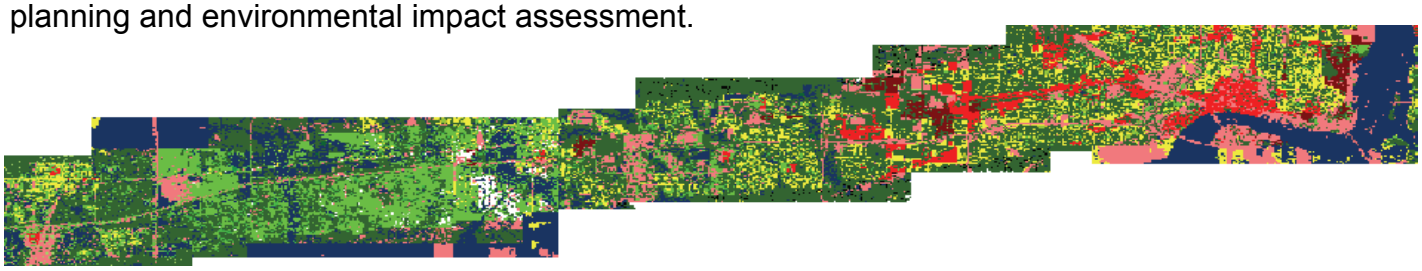
Characterization of Land Use Patterns of Transportation Corridors

Multi-spectral satellite imagery is utilized to provide data about land use patterns along transportation corridors at large geographic scales to support applications such as transportation planning and environmental impact assessment.



Roadway Characteristics Inventory

The approach, which utilizes commercial remote sensing technologies, combined with mobile mapping and GPS technologies, is particularly useful for Roadway Characteristics Inventory. The potential benefits of this approach include the elimination of redundant data collection efforts, improvements in data consistency and accuracy, a reduction in data production time and costs, improvement in the safety associated with data collection activities, and improvement in safety for the driving public. Other implied benefits include cost reduction and production improvement in maintenance activities. That is, a comprehensive and integrated procedure for data collection and maintenance will allow more coordinated access to resources for maintenance activities ranging from planning, to coordination, to field maintenance tracking.

Environment Impact Assessment

The applicability of commercial remote sensing products and spatial information technologies for environmental analysis in transportation planning has been demonstrated and assessed using the I-405 corridor in Washington State as a test case. The case study provided a valuable example on how remotely sensed data can be used productively in combination with GIS layers to generate useful maps and statistics that are directly applicable for the transportation corridor study, as required by the National Environmental Policy Act (NEPA). Remote sensing and GIS products are particularly useful for environmental disciplines where it is important to consider land cover or spatial proximity to other land uses (e.g., land use, transportation, and wetlands). Several I-405 stakeholders pointed out that Remote sensing and GIS products "may be even more useful in areas that have not been explored so heavily already" or where information quickly becomes outdated. Apparently, the use of the Remote sensing and GIS as a foundation for environmental data collection and analysis will provides an effective means to help streamline the NEPA process for transportation project.

Reference

Xiong, D., "Highway Feature and Characteristics Database Development Using Commercial Remote Sensing Technologies, Combined with Mobile Mapping, GIS, and GPS", Report Prepared for FDOT, December 2004.

Xiong, D., R. Lee, J. B. Saulsbury, E. Lanzer and A. Perez, " Remote Sensing Applications For Environmental Analysis In Transportation Planning: Application to the Washington State I-405 Corridor.

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