Research and Development of an 3D Stereo Imagery as a Tool for Access Permit Management

ADAM (Automated Driveway Access Management) System

Presented by Joel Hearne
Presentation Outline

- Vision
- Research Findings
- Technologies Prototyped
- Technologies Used
Automated Driveway and Access Management (ADAM) System

Vision

To develop an automated highway driveway access permitting system that includes a 3D imagery viewer and GIS interface.

Opening The Mind’s Eye To Stereo Imagery
Research Findings

GIS Technologies Researched and Developed for Access Management Purposes

- **Desktop GIS**
  - Custom Automated Land-Use Analysis
  - Integrated Systems

- **Web-Based GIS**
  - Inter-Agency Coordination
  - Mass Distribution of Spatial Data

- **Stereo GIS Data and 3D GIS**
  - Stereo GIS System
  - Digital Elevation and Landuse Models
  - 3D Visualization

- **Modeling the Right-of-Way**
  - Three GIS Basemaps
  - 3D Imagery via the Web
  - Identification of Regional “Hot-Spots” for Land-Use Change
  - Emerging Trends in GIS Data Standards and Warehouses
Paradigms for Spatially Modeling Transportation Networks

- **Linear Networks GIS**
  - Linear Referencing Along Routes
  - Roadways and Mileposts
  - Direction and Volume of Traffic Flow

- **Cadastral GIS**
  - Public Property Ownership Boundaries, Survey, Tax Assessment
  - Ubiquity of GIS Driving Trends Towards Standardization
  - Direction and Volume of Traffic Flow

- **Physical GIS**
  - Measuring 3-Dimensions from the Sky
  - Elevation Models
  - Visual-Simulations Affect High-Level Decision Making
Linear GIS – Roadways and Mileposts

- Accuracy Depends on the Quality of Referenced Roadway Route Data
- Makes Network GIS Analysis for Access Management Possible
- Means of Linking Permits with Other GIS Databases
Cadastral GIS – Land-Use and Ownership

- Requires cooperation between local, state, and federal governments
- Useful for Trip Generation and Future Land-Use Considerations
- Means of Linking Permits with Property Data
Physical GIS – 3D Modeling and Visualization

- Stereo (3D) Satellite and Aerial Photography
- Digital Elevation Models
- 3D Visualization
Automated Driveway and Access Management (ADAM) System

Web-Based Permit Application Forms

- GIS Enabled Forms
- Completes PDF Document
- Uses Stereo Imagery
Automated Form Completion

GIS interface is used to establish geo-spatial reference for permit application. GIS analysis can then be used to identify nearby features such as roadways and mileposts that can subsequently be used to fill out portions of the application form.
Automated Driveway and Access Management (ADAM) System

ADAM

vision  research  >> prototypes  applied  contact

Technologies Prototyped

Fill out application form manually
Enter form data from map

Application Form
Application Map

Fill out form from traditional HTML form interface or from GIS interface

Step 1 - Step 2 - Step 3 - Step 4 - Step 5 - Step 6 - Step 7

Information

Applicant Name:
Applicant Type:
Address:
Address 2:
City:
State:
Zip:
Phone:
Mobile:
Email:

<-- Back  Next-->
Automated Driveway and Access Management (ADAM) System

Technologies Prototyped

GIS Analysis Used for Application Completion and Validation
Application Process Complete. Let's review what we have before sending it off.

Retrieve Form

Instructions - To Applicant
- Contact the Department of Transportation to determine what plans and other documents you are required to submit with your application.
- Complete this form (some questions may not apply to you) and attach all necessary documents and submit it to the Department of Transportation.
- For help with this form contact your local Maintenance or District Office.
- Or visit our website at http://www1.myflorida.com/transportation/permits/ for the contact person and phone number in your area.
- You may also email: driveways@dot.state.fl.us
- Or call your District or local Florida Department of Transportation Office and ask for Driveway Permits.

Please print or type

APPLICANT: SUNSHINE JR STORES INC

Authorized Representative: Ochreview Engineering

Check one:
- Owner
- Lessee
- Contract to Purchase
- Authorized Representative (Note: if you are the authorized representative then a notarized letter of authorization must be attached)

Street Address: 456 Junior Store Road
Street Address (continued):
Suite 21
City, State: Atlanta, GA

Street Address: 35 Engineer St
Street Address (continued):

City, State: Fort Walton Beach, FL

Ready for submission!
Reviewer Module is an information portal for permit application forms, property databases, roadway databases, and online map interfaces.

### Roadway Access Permit Application

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<td>32541</td>
<td>(850)-839-8707</td>
<td>Commercial</td>
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Access Management GIS Solutions
Comments can be added along with digitized drawings as a communication aid.
Automated Driveway and Access Management (ADAM) System

ADAM

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Technologies Prototyped

Cadastral Maps and Reports

Access Management GIS Solutions
Internet Stereo Viewer

- Serves Large Stereo Images Over the Web
- Allows for Mass Distribution of 3D Data
- Gives the User a Highly Precise, Geo-Referenced 3D View of the Site
- Capable of highly accurate planimetric and 3D measurements
Applications for Stereo in Driveway Analysis

Driveway Grade Analysis

Visibility – Line of Site

Source: Florida’s Driveway Handbook Draft 07/02/2003 (Super Elevation and Driveway Visibility)

Source: Standard Index 546 (Sight Distance at Intersections)
3D Viewer is standalone, but can also be controlled by ADAM

The first step to accessing 3D data is downloading and installing the software application. The user then uses the “Select Image” Tool to click on the area of interest on the map.

The user clicks “Launch Palantir” puts on his or her anaglyph or shuttle glasses and views the 3D imagery.
3D Feature Extraction

- Stereo Imagery is used to extract precision GIS data such as curb-lines, parking lot boundaries, and elevation points that are useful for Access Management.
- Features extracted from Stereo Imagery have been found to be accurate to within three centimeters.
Products Derived from Stereo Imagery

- SBIR Technologies have been used to solve volumetric engineering problems for Right-of-Way land acquisition and vehicle access.

- Features such as elevation points, roadways, parking lots, building footprints, and cultural textures have been used to develop 3D visualization models for presentation to the public and land-use decision makers.
Web-GIS

- Custom GIS web-applications have been used to coordinate landuse decision making between regional planning teams

- Data sharing and inter-agency coordination has been realized via web-GIS customizations for county governments
• Thank you!

• For more information about ADAM and other Web-based products, please contact us at:
  – www.simwright.com
  – info@simwright.com
  – (850) 939-8707