Design Visualization for Transportation Projects

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Presentation Outline

• Types of Visualization
• Benefits
• Goal Setting
• Camera Selection
• Photorealism
• Traffic Integration
• Visualization for Construction Sequence
• Resource Planning
Types of Visualization

- 2D vs. 3D

Yeager Road Roundabout, West Lafayette

US 31 North Terminus, Kokomo
Types of Visualization

- Still Image vs. Animation

Lindberg Road Bridge, West Lafayette

Complete Street Concept, Indianapolis
Benefits of Visualization

• What can visualization help?
  – Educating the drivers
  – Facilitating shareholder communications
  – Evaluating design options

• How to measure the benefits?
  – Most visualization benefits “perceived” or “anecdotal”
  – Almost impossible to associate monetary benefits with visualization
Benefits of Visualization

Ms. Mueller stated, “I was definitely not a fan of the original proposal for this bridge, but after their presentation, which included a really cool simulated drive through all aspects of this region...I told Mayor Bill Cunningham that I liked this plan.”
Goal Setting

• A critical step to justify the visualization and plan for resources
  – Specific project obstacles
  – Camera selection
  – Level of photorealism
  – Traffic operations
  – Deliverables
Camera Selection

• Fixed Camera
  – Top view
  – Ground-level view
  – Bird’s eye view

Hoosier Heartland Roundabout  State Blvd, Ft. Wayne  Indianapolis Motor Speedway
Camera Selection

- Moving Camera
  - Orbit
  - Drive through
  - Fly through/follow through

Keystone Ave & 116th St, Carmel

18th St, Logansport
Achieving Photorealism

- Infrastructure Modeling
  - Texture
  - Lighting
  - Vray/Mental ray

Market Street, Indianapolis

Indianapolis Motor Speedway
Achieving Photorealism

- Background modeling
  - 3D background modeling vs. photo compositing

All 3D Max Geometry

Photo Composite

18th Street, Logansport

Prairie Street, Elkhart
Visualization vs. Actual Photo

As Built Aerial Photo

Visualization with Photo Composite

Keystone Ave & 131st St, Carmel
Traffic Integration

• What is traffic integration?
  – Integration of traffic simulation into design visualization
  – To deliver a two-fold message for the project: it looks good and it works well!

• Challenges
  – 3D software not capable of producing interactive traffic movements
  – Traffic simulation software not capable of producing photorealism
Example: Step 1
Example: Step 2
Example: Step 2 (Cont’d)
Example: Step 3
Example: Step 3 (Cont’d)
Example: Step 4
Visualization for Construction Sequence

- Traditionally overlooked due to lack of perceived benefits
- Effective in illustrating maintenance of traffic for design refinement and public education
- Developed based on the visualization of the final products
Example: Pre-Construction
Example: Phase 1
Example: Phase 2
Example: Phase 3
Example: Phase 4
Example: Post Construction
Deliverable for Visualization

- **Web-friendly formats:**
  - jpg/png/pdf
  - Flash/h.264/wmv

- **Bring-home formats:**
  - Printout
  - DVD

- **Interactive formats:**
  - Driving simulators/mobile apps
  - Virtual Reality (VR)
Resource Planning

• Finding the most efficient visualization path for each project:
  – No one-size-fits-all solution
  – Depends on goals and available resources
  – Sometimes cheaper solutions can do just fine
    • Traffic simulation to address operational concerns
    • AutoTurn in CAD to address design vehicle swept path
## How Much Effort Does It Take?

<table>
<thead>
<tr>
<th>Visualization Format</th>
<th>Camera</th>
<th>Traffic</th>
<th>Design Modeling</th>
<th>Background Modeling</th>
<th>Photo-Realism</th>
<th>Resource</th>
<th>Typical Timeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Still Image</td>
<td>Fixed (Top View)</td>
<td>No</td>
<td>2D Elements</td>
<td>Ex. Aerial</td>
<td>Low</td>
<td>Low</td>
<td>&lt; 1 Week</td>
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<tr>
<td></td>
<td>Fixed (Bird's Eye)</td>
<td>No</td>
<td>3D Elements</td>
<td>Photo Composite</td>
<td>High</td>
<td>Medium</td>
<td>1-2 Weeks</td>
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<tr>
<td>Animation</td>
<td>Fixed (Bird's Eye)</td>
<td>Yes</td>
<td>3D Elements</td>
<td>Photo Composite</td>
<td>High</td>
<td>Medium</td>
<td>2-4 Weeks</td>
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<tr>
<td></td>
<td>Moving</td>
<td>Yes</td>
<td>3D Elements</td>
<td>3D Elements</td>
<td>High</td>
<td>High</td>
<td>1-2 Months</td>
</tr>
</tbody>
</table>

*Based on a single intersection or a service interchange*
Questions

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