Spatially Encoded Video for Highway Operation, Event Management and Maintenance

June 2007

David Kamnitzer – IBI Group

Jérôme Ferré – SAPN
Agenda of the presentation

- Geographical context (SAPN’s network)
- Operational requirement
- Spatially encoded video – technical overview
- Key system functionality
- Benefits gained for SAPN
- Conclusions and way forward
Geographical Context

- 367 km network
- Centralised traffic management centre
- Peri-urban sections (w of Paris) AADT > 100,000
- Lower trafficked sections towards Normandy
- Popular week-end destinations
- Main route to Port of Le Havre
SAPN’s Operational Needs

- Increase knowledge of the network
  - Physical layout
  - Roadside assets

- Planning / preparation of roadworks

- Visual aid to crisis management
  - Improved communications
Technical solution

Spatially encoded video of highway

- Digital video
- GPS
- Linear referencing
- Geographic information system
System Overview

Data acquisition
- video, imagery & position

Data processing & quality control

Video browser
- Integrated video, mapping, database, GIS
RouteMapper Desktop Browser

- Video controls
- Measure & digitise
- Image clarity at high zoom
- Multiple images views
- Mapping linked to video & database
- Vehicle position
- In frame measurement

Jérôme FERRE (j.ferre@sapn.fr) & David KAMNITZER (dkamnitzer@ibigroup.com)
Measurement and export

Jump to network segment or ahead/back x metres

In-frame measurement

Business systems integration: Export to HAPMS (+ GIS, database applications)

Magnifier to improve measurement accuracy
RouteMapper Desktop Browser

- Local application, with data held either locally or centrally on network drive
- Full measurement and digitisation capabilities
- Access to video via map or database

Web based solution for company wide access

- Web based (no client side software)
- Universal access for all staff
- Common platform of imagery (ease of update)
- Low maintenance & IT costs
RouteMapper Interactive Web Browser

Route selection & navigation

Integrated mapping

Location information

Image selection & video controls
An information source:

- Explicit
- Exhaustive
- Precise
- Organised
- Unique
- Used for large variety of applications
## Benefits to the SAPN (1/3)

<table>
<thead>
<tr>
<th>Operations</th>
<th>Security</th>
</tr>
</thead>
</table>
| - Verification of roadside assets  
  - Assessing visibility of road markings, signage, emergency telephones, etc  
  - Planning of roadworks (stopping areas, lane closures) |  |
| Incident management  
(Understanding the context) | |
| - Planning tool with emergency services  
- Communication with field staff  
- Pinpointing location from visual description of area  
- Hard shoulders restrictions  
- Vehicle parking  
- Location of bridges & related infrastructure |  |
## Benefits to the SAPN (2/3)

<table>
<thead>
<tr>
<th><strong>Accuracy of design</strong></th>
<th>Improved decision making (use of video to make / justify decisions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assessment of feasibility of location of signs, radar stations, etc</td>
</tr>
<tr>
<td></td>
<td>Assessment of supporting infrastructure (set-backs, existing poles, lighting, etc)</td>
</tr>
<tr>
<td></td>
<td>Simulation of “users” perception</td>
</tr>
<tr>
<td><strong>Speed</strong></td>
<td>Facilitates consultation with colleagues / remote working</td>
</tr>
<tr>
<td></td>
<td>Decision making based on reliable information, accessible to all</td>
</tr>
<tr>
<td><strong>Quality</strong></td>
<td>Audits of the network</td>
</tr>
<tr>
<td></td>
<td>Identification of actions to pursue by the various specialties</td>
</tr>
<tr>
<td></td>
<td>Sharing knowledge with many</td>
</tr>
<tr>
<td></td>
<td>Identifying and locating equipments</td>
</tr>
<tr>
<td>Costs</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td><strong>Operation costs</strong></td>
<td></td>
</tr>
<tr>
<td>- Reducing needs for site visits</td>
<td></td>
</tr>
<tr>
<td>- Reducing safety measures during interventions</td>
<td></td>
</tr>
<tr>
<td>- One Tool for all</td>
<td></td>
</tr>
<tr>
<td><strong>Engineering costs</strong></td>
<td></td>
</tr>
<tr>
<td>- Reducing engineering time</td>
<td></td>
</tr>
<tr>
<td><strong>Maintenance costs</strong></td>
<td></td>
</tr>
<tr>
<td>- Better audit of the network</td>
<td></td>
</tr>
<tr>
<td>- Better planning of maintenance requirements based on context</td>
<td></td>
</tr>
<tr>
<td>analysis and positioning of assets</td>
<td></td>
</tr>
</tbody>
</table>
Evaluation

- Internal survey within the various user groups
  - Infrastructure
  - Road maintenance and operation
  - Marketing and communication
  - ITS projects

- 95% of respondents using system

- Numerous suggestions for improvements
  - annotations feature
  - printing of reports
  - etc

- As a result ... second version (under development)
SAPN Way forward

Second version delivered Jan 2007

- annotations feature
- route connectivity
- improved searching of video sequences
- more flexible mapping

- Sharing information with neighbouring road operators and emergency services
  - Making available online for operators of local networks, rescue teams, police, gendarmerie, etc…

- Integration with external systems / data
  - Pavement quality (GPR)
  - Noise surveys
  - Back end asset management software
Conclusion

- Significant number of uses for system
  - asset management, roadworks planning, emergency response, network studies, equipment / ITS deployment, etc
- Usage grows from initial exposure ... to “must have” tool
- Technological solution important
  - image quality
  - accuracy of positioning
  - ease of video update
  - system maintenance
- Web based solution important complement to Desktop system, facilitates universal access at modest cost