DEVELOPMENT OF PMS FOR ROAD AND AIRPORT NETWORKS

Luís Picado-Santos and César Abreu
• Overview/Motivation
• General approach
• Pavement condition survey
• Aid-decision framework
• Final remarks
OVERVIEW / MOTIVATION

• Saving costs to deliver the service

• Prevent and not repair

• Support the decision through an expert, friendly and trustable system

• PMS analyzes the network from its current state and with an objective for a certain period (3, 5, 10 or more years), indicates which maintenance action on the right date should be done on a network section in order to be cost-effective in support the service to deliver to the users

• This is done using behavior models, probabilistic or deterministic, to predict the pavement state and using a decision-aid tool, indicate the better strategy considering the applicable restrictions
GENERAL APPROACH

- General structure (MODULES)

  ADMINISTRATION

  DATABASE

  QUERY

  MANAGEMENT

  EVALUATION

  REPORT

- Web-based system, developed over a geographical information system (GIS), in order to allow remote access to all information for the pavement maintenance groups in the different positions/assets of administration and to allow the representation and use of all kind of data.
• Obtain the necessary knowledge concerning the pavements behavior and its condition evolving.
• Construction and rehabilitation parameters
• Field surveys
  ➢ Surface (visual) survey
  ➢ FWD
  ➢ IRI
  ➢ Strait Edge
  ➢ Texture
  ➢ Skid resistance
  ➢ Pavement cores
AID-DECISION FRAMEWORK

• Degradation model to evaluate pavement life-cycle
  - Neuronal network tuned for each asset based on a deterministic behavior model

• Evaluate different scenarios
  - Different planning periods (3, 5, 10,…)
  - Different Grow Rates for traffic
  - Different Traffic Distribution
  - Different Quality Levels
  - Different type of solutions for preventive maintenance

• Predict intervention costs
• Automatic reports
## AID-DECISION FRAMEWORK

<table>
<thead>
<tr>
<th>Constraint</th>
<th>Type of Constraint</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning Period</td>
<td>-</td>
<td>Year</td>
</tr>
<tr>
<td>Intended Quality Objective for the section at the end of the analysis period</td>
<td>Quality</td>
<td>Year</td>
</tr>
<tr>
<td>Intended Quality Objective for the section in each year of the analysis period</td>
<td>Quality</td>
<td>Year</td>
</tr>
<tr>
<td>Penalty to restore the intended residual life in terms of cost in each section</td>
<td>Monetary</td>
<td>%</td>
</tr>
<tr>
<td>Minimum residual life (for activation of intervention priority)</td>
<td>Quality</td>
<td>Year</td>
</tr>
<tr>
<td>Update rate</td>
<td>Monetary</td>
<td>%</td>
</tr>
<tr>
<td>Minimum residual life at the end of the analysis period</td>
<td>Quality</td>
<td>Year</td>
</tr>
<tr>
<td>Maximum number of intervention days in a given year</td>
<td>Operational</td>
<td>-</td>
</tr>
<tr>
<td>Maximum number of sections with interventions in the same year</td>
<td>Operational</td>
<td>Day</td>
</tr>
</tbody>
</table>
AID-DECISION FRAMEWORK

Year 0

Year 3

Year 10

4.0
- Simulation results (example)
  - Automatic Reports
  - Summary
    - Number of interventions: 383
    - Maintenance costs: 6,500,000 €
While PMS are currently capable of providing insightful considerations for the tactical application of the preservation plan, they are not able to adequately deal with uncertainties inherent to the real-world strategic decisions.

Funding needs along with budget cuts and other economic uncertainties affect the preservation plan and, therefore, must be considered in new emerging tools.

Addressing financial risks will enable any manager to compete for funding and adapt the maintenance plan accordingly.

A successful decision support tool requires a comprehensive approach capable of incorporating inputs from across all decision levels while managing the risks that may undermine the complete preservation plan. Planning with flexibility to adjust to different situations is the key issue for the next generation of PMS.
FINAL REMARKS

Thank you for your attention

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