Automated Pavement Crack Detection

RoadCrack

Contact: David Pratt
Roads & Traffic Authority of NSW
Australia
David_Pratt@rta.nsw.gov.au

Overview

- Importance of cracking in road pavements
- Background to RoadCrack development
- Capabilities & features
- Method of data capture
- Data reporting & presentation
- Future directions & developments

Cracking In Road Pavements

- Australian pavements majority have thin surfacings
- RTA – 40,000 Lane-kms
  - Spray-seal - 70%
  - A/c - 24%
  - Concrete - 6%
- Water entering into cracks weakens the pavement
- Early detection is cost effective (< 1mm preferred)

RoadCrack Technology

- Concept – in early 90s
- 1992 – RTA engaged CSIRO
- 1997 – 1 channel prototype
- 1999 – 2 channel 25% sampling
- 2001 – 4 channel 100% sampling

RoadCrack Current System

- Vehicle platform & power generation
- Image acquisition
  (4 x line scan “cameras” – each 600mm width)
- Illumination (reflectors & quartz iodine lights)
- Real time image processing & analysis
  (600mm x 500mm frame compiled & analysed)
- User interface & data reporting

RoadCrack Technology Components
RoadCrack Performance

- Highway Speed Operation
- All Types of Sealed Pavements
- 2.4 m Survey Width
- Continuous Survey
- Classifies Crack Types
- Determines Crack Width (1mm detection threshold)

RoadCrack Equipment

- VOLVO truck
- Shaft encoder (distance measurement)
- 3 phase 240V generator
- Uninterruptible power supply (UPS)
- 4 image sensors ('cameras')
- 13 computers
- Graphical user interface (GUI)

Vehicle Features

- VOLVO truck
- Shaft encoder (distance measurement)
- 3 phase 240V generator
- Uninterruptible power supply (UPS)
- 4 image sensors ('cameras')
- 13 computers
- Graphical user interface (GUI)

Capabilities

- Continuous scanning - 800 frames for 100m
- Real time processing – allows monitoring by operator
- Classify cracks - predominant type
- Extent (count of frames)
- Severity (average width)
- Detection threshold - width down to 1mm
- Images not stored - can capture sample images
- Network or investigatory testing
- Data capture - night or day

Data Quality

- Location reference (RoadLoc & GPS)
- Distance calibration (Regularly checked)
- Image quality (Sample images retained)
- Repeatability trials (Before & after each job)
- Consistent annual survey plan (of most trafficked lane)
Network Survey Data Summary At 100 M

<table>
<thead>
<tr>
<th>Road Location Reference</th>
<th>Percentage Area and Width of Crack by Type</th>
<th>Comments</th>
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<tbody>
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<td></td>
<td>Percentage</td>
<td>Longitudinal</td>
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<tr>
<td></td>
<td>% of Area</td>
<td>% of Width</td>
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<td>0.0</td>
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</tbody>
</table>

Crack Report For Site Investigation

Crack Extent/Severity Analysis

Annual Performance Reporting

Pavement Durability on Sealed Country State Roads (including National Highways)
Summary

Benefits from Automation
- Objective, repeatable (measured vs estimated)
- Reduced cost & improved safety

Performance to suit needs
- Width detection threshold (1mm)
- Survey frequency & network sampling

Standards & Documents
- Defined data specifications & test method
- Validation & repeatability procedures
- Reporting (type, severity, extent – definitions & limits)

RoadScan - The Next Phase -

Systems Combined on One Survey Vehicle

- Cracking – RoadCrack
- Profile – Roughness & Rutting (Scanning Laser)
- Strength – Deflection (at high speed) (Laser)
- Geometry – Terrain Model

Summary

- World Class Performance
- Data Contributes to Asset Management (used in project selection)
- Routine operation since 1997 > 250,000 kms
- Spare Capacity - surveys for other States
- Commercial Opportunities (International Patent)
- Potential Integration of Technologies on same vehicle (Profilometer, High Speed Deflection?)