


Roadware's Experience: A Manufacturer's Perspective

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In The Beginning


- Low resolution imaging
 - Analog cameras
 - Tape storage and retrieval
 - VHS → S-VHS → digital tape
- Image Processing – WiseCrax
 - Digitization of road images from tape
 - Crack detection



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Technology Adoption Challenges


- Testing & Evaluation
 - Limitations vs. Capabilities.
 - What can't be done instead of what could be done – tests were designed to fail.
- Implementation & Acceptance
 - Delayed due to black box approach and failure in testing.
 - Needed the ability to validate.



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Technology Challenges


- Processor speeds
- Storage requirements / limitations
- Bandwidth
- Data capture & compression
- Resolution
- Manufacturer's specifications



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A Real Challenge

- User Expectations
 - 100% accurate
 - 100% repeatable
 - 100% of the time
- For ***their*** specific requirements



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Development Challenges

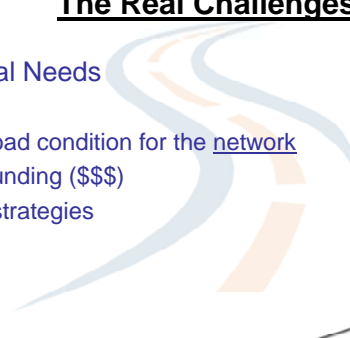
- Satisfying everyone's needs (wants)
- Maintaining maximum flexibility
- Single supportable application



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The Real Challenges

- The User's Real Needs
 - Summary of road condition for the network
 - Allocation of funding (\$\$\$)
 - Maintenance strategies

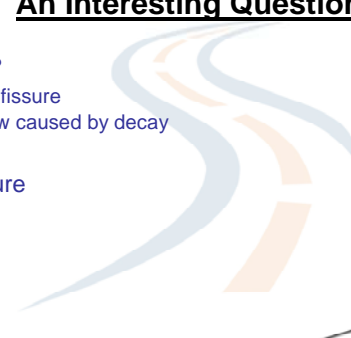


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An Interesting Question

- What is a crack?
 - a narrow break; fissure
 - weakness or flaw caused by decay
- Objective Measure
 - Length
 - Width
 - Depth
 - Straightness

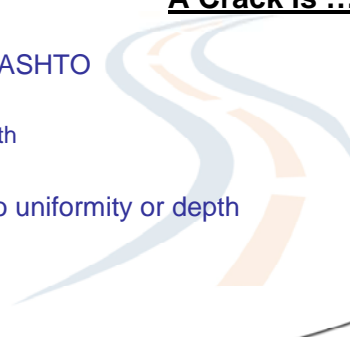


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A Crack is ...

- According to AASHTO
 - 1 mm in width
 - 25 mm in length
- No reference to uniformity or depth

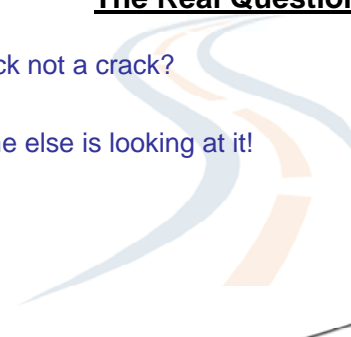


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The Real Question

- When is a crack not a crack?
- When someone else is looking at it!



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Political Challenges

- Re-inventing the wheel
 - Educational & research institutes
 - Government agencies
- Evaluation Trials
- Standards




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At The Present

- More than 17 years of development
- More than 20 installation of WiseCrax, many more pavement imaging systems
- More than 100,000 km of road processed annually – many hundreds of thousands to date



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Imaging: Data Collection

- Improved Imaging
 - Digital area scan camera: 2 mm pixel resolution
 - Auxiliary high-powered strobe lighting
 - 100% continuous lane width: approx 4 m
 - Direct to disk storage: 138 MB / km
 - Highway speeds: >100 km/h
 - Correlation to other data
 - GPS, macro-texture, profile, linear referencing
 - Used for crack detection processing

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Imaging: Data Collection

- High Resolution Imaging
 - Line scan camera: 1 mm pixel resolution
 - 100% continuous lane width: 4 m
 - Direct to disk storage: 550 MB / km
 - Highway speeds: >100 km/h
 - Precise correlation to other data
 - GPS, macro-texture, profile, linear referencing
 - Used for crack detection processing

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WiseCrax: Crack Detection

- Crack detection
- Crack classification
 - Type
 - Severity
 - Extent
- Compliant with AASHTO and SHRP rating protocols

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WiseCrax: Usage

- 0% manual intervention
- 100% manual intervention
- Everything in between
- Fixed parameter set(s)
- Automated parameter setting
- Lane width detection
- Zones within the lane – flexible classification

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Outputs

- ASCII summary for database usage
 - Detail & summary levels
- Custom (SCANNER: U.K.)
 - Individual cracks (location, length, orientation)

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Acceptance Testing

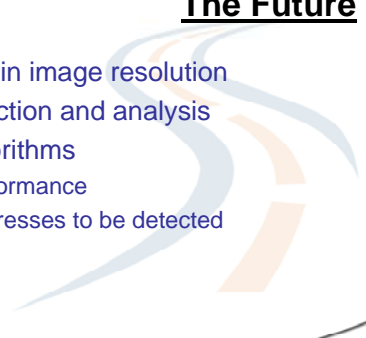
- Image resolution and synchronization
 - Is the image true (clear, precise) and where we expect it
- Ground Truth
 - Manual crack “detection” from digital images
- Iterations of algorithm testing
 - Two levels of testing – algorithmic and operational
 - Set of test data

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The Future

- Improvements in image resolution
- 2D → 3D collection and analysis
- Enhanced algorithms
 - Improved performance
 - Additional distresses to be detected

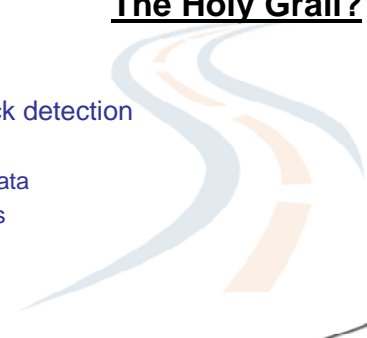


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The Holy Grail?

- Real-time crack detection
 - Lower costs
 - More timely data
 - Greater profits



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The Real Holy Grail?

- STANDARDS
 - North American?
 - European?
 - Asia?
- ONE STANDARD?



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... thank you.



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