NETWORK LEVEL EXPERIENCE USING 3D PAVEMENT TECHNOLOGY FOR EVALUATING RUTTING, TEXTURE, AND DISTRESS

Fugro Roadware
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Automatic Road Analyzer (ARAN)

- **PAVEMENT DISTRESS**: With the ARAN's pavement imaging subsystem, planar-view digital pavement images are recorded directly to disk for 100% of the driven lane.

- **POSITIONING - GPS**: Every ARAN is equipped with a GPS and is integrated with other subsystems so that if the receiver cannot lock on enough satellites to determine its position, the ARAN DMI and the ARAN Inertial Reference System will fill in the gaps.

- **RIGHT-OF-WAY VIDEO**: The ARAN can be outfitted with as many as six HDTV cameras which captures right-of-way images allowing you to virtually view the road from the comfort and safety of your office.

- **RUTTING**: The Laser Transverse Profiler uses dual scanning lasers to accurately measure the transverse profile of the road with 1280 points over 4 meters.

- **ROUGHNESS**: The Laser SDP is a longitudinal profile measurement system that provides road profile data capture and real-time roughness index calculation using a combination of high-speed lasers and accelerometers.

- **POSITIONING - DMI**: The Distance Measuring Instrument measures ARAN change and linear distance travelled. Every ARAN is equipped with a GPS and is integrated with other subsystems so that if the receiver cannot lock on enough satellites to determine its position, the ARAN DMI and the ARAN Inertial Reference System will fill in the gaps.

- **TEXTURE**: Smart Texture utilizes high-frequency lasers to measure the mean profile depth of road surface macrotexture.
Measuring 3D Pavement Surface

• Measured pavement images recorded for complete length
• Extract profiles for rutting and texture
• Automated / manual distress detection
Pave3D Data Collection

- Straight line laser
- Camera to measure location
- Measures relative height
- Adjusted for angle
- 2 sensors combined for one signal
Pave3D Images
Measurements Options

• ARAN images can be used for:
  – Fully automated detection
  – Semi-automated detection
  – Windshield style survey

• Advantages:
  – Lots of QC means improved quality

• Disadvantages:
  – Subjective ratings
  – High level of effort
Typical Distresses Collected

- Crocodile cracking
- Longitudinal cracking
- Transverse cracking
- Edge cracking
- Potholes
- Patching
- Raveling / coarse aggregate loss
- Flushing / bleeding
- Shoving
Asphalt Images – Run 1
Asphalt Images – Run 2
Asphalt Distress Comparison
Surface Treatment – Heavily Cracked
Surface Treatment - Distresses
Unusual patterns on the highway
Street Utilities
Data Collection Experience

• Setup the equipment correctly
  – Environmental considerations
  – Mounting location materials important
  – Calibration and validation of equipment
Network Level Processing

• Processing the data
  – More processing power required
  – Can still drive faster than we can process
  – Data needs to be extracted before interpreted
Transverse Profile

- Transverse profile is measured at 4,000pts
- Down sampled and filtered to remove surface texture information
- Full profile is reduced based on combination of:
  - Detected lane markings
  - Manual measurements
  - Edge/drop-off detection
  - Default/set widths
Transverse Profile
Rutting

- With validated, transverse profile
- Point laser simulation
- Straight edge & wire
  - Vertical vs. perpendicular
  - Edge length
  - Full lane vs. half lane
- Optimal rutting path

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Calculate Ponding
Enable/Disable ponding calculation.
Rutting Examples
Rutting Examples
Macrotexture

- **Mean Profile Depth**
- Conventional:
  - High frequency (64 kHz) Selcom Laser
  - Measures longitudinally in wheelpaths
- **3D Scanning Laser:**
  - Measures height at 1mm intervals transversely
Texture Comparison

![Graph showing texture comparison between 3D scanning laser texture and single texture laser MPD. The graph displays a scatter plot with a line of best fit.](image-url)
Conclusion

• Can be used for large network
• There is an increase in processing power required
• Results are very similar to historic results
  – Increased amount of data
  – Increased accuracy
• Macrotexture may show differences
Questions

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