High Performance Machine Vision System for Monitoring Railcar Health

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A. Completion of Mechanical Inspection Study

- Many Mechanical Components were isolated using algorithms on side view:
  - Robust Wheel Identification
  - Brake Shoe Area Identified
  - Spring Pitch Measurement
  - Bearing End Cap Bolts Localization
- Algorithm successfully identified missing Bearing End Cap Bolts
Results:
Robust Wheel Identification

Wheel on left obscured by step and various shadows
Artificial block placed to cover large portion of wheel
However, algorithm identifies wheel correctly
Results:
Brake Shoe/Head Location

Improved localization of previously identified brake area
Area now contains only brake shoe and head
Results:
Robust Bolt Identification

Correct Identification of bolts and their orientation
- Blue block artificially added
- Natural artifact on bolt
- Bolt boundaries almost nonexistent
- However, algorithm identifies bolts correctly
Results:
Main Components Identified

Components identified in various car types
Missing Bolt Detection

bearing end cap bolt inspection failure:
only 2 of 3 bolts found

Image from Gary Nelson - Norfolk Southern Car Shop in Decatur
Other Results: Technology Digest Completed

- Technical Digest Publication
  - TD-04-008 Published June 2004
  - “A Machine Vision System for Monitoring Railcar Health: Preliminary Results” by John M. Hart, Narendra Ahuja, Chris Barkan, and Dave Davis
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Image Sources - Norfolk Southern Car Shop in Decatur, Illinois
- CNIC Yard, Champaign, Illinois
Images taken by John M. Hart unless otherwise noted