



Location: ISC 3291

Date: Jan. 30th, 2025

Time: 2:00 pm

PH.D. DEFENSE

Daniel Hendrickson, PH.D. STUDENT

Structural Health Monitoring of Rail Mounted Gantry Cranes

Problem Addressed

The Port of Virginia utilizes rail-mounted Auto Stacking Cranes at their Virginia International Gateway and Norfolk International Terminal facilities. The tracks and cranes are under high load and stresses due to cargo and system weight, leading to frequent failures. Equipment failures are expensive to repair and disrupt operations.

How it Works

With current methods, the maintenance team cannot identify flaws until equipment fails. Our methodology involves ultrasonic evaluation of the rails with laser vibrometry with a combination of wavelet fingerprinting and neural networks to signal problems before a failure. Results are validated against simulation based on the Elastodynamic Finite Integration Technique. Next low-power accelerometers are installed on the cranes to collect movement data.

Impact

Machine learning anomaly detection algorithms highlight sections of the crane recordings that are potentially problems. This allows for earlier detection which decreases both the disruption of operations and need for expensive repairs.

