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MASTER'S THESIS PROPOSAL (30HP)

Next Generation Wireless Communication for Truck Mounted Cranes

Introduction

Modern truck mounted loader cranes rely heavily on wireless remote control systems to allow operators to maneuver loads safely. As crane automation and operator assistance features evolve, legacy wireless architectures face growing limitations. This Master's thesis aims to explore, evaluate, and validate next generation bidirectional radio communication protocols for mobile loader cranes. Conducted in collaboration with Olsbergs Electronics, the project combines technology research with practical field testing to establish a technical foundation for the company's next hardware generation.





Background

Olsbergs Electronics' current remote control systems rely on narrowband radio technology that is approaching the end of its lifecycle. As crane systems become more advanced, higher data rates from the crane to the controller are essential for transmitting real time sensor data and unlocking next generation features.

Transitioning to modern wireless protocols in this domain presents significant radio frequency and operational challenges. Truck mounted cranes routinely operate in harsh radio frequency environments, such as dense urban construction sites where heavy steel crane structures and buildings introduce severe signal attenuation, multipath fading and non line of sight propagation. Even under these conditions, the wireless link must guarantee low latency transmission for safety critical control commands in compliance with international functional safety standards.

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Furthermore, since the cranes are sold worldwide, a next generation wireless solution must explore frequency bands that comply with international spectrum rules without requiring region specific hardware variants.

Objectives

- Investigate, evaluate, and propose a modern bidirectional wireless communication architecture for truck mounted loader cranes. The proposed link must reliably transport low latency, safety critical control commands alongside diagnostic telemetry, maintain battery efficiency for handheld controllers, and support global deployment with a single hardware design.

- Build and test a prototype to validate the chosen wireless technology under realistic operating conditions.

Methodology

- **Literature review & Technology survey:** Analyze existing and emerging wireless technologies capable of meeting the bandwidth, latency and robustness requirements.

- **Global regulatory analysis:** Map international regulatory frameworks regarding transmit power limits, duty cycles, dynamic frequency selection and channel availability to enable global deployment using a single hardware solution.

- **System architecture & Trade Off Analysis:** Evaluate candidate architectures against key metrics.

- **Prototyping & Testing:** Build a proof of concept setup. Conduct real world field tests in challenging environments to evaluate the technology.

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The thesis work will be carried out on site at the Olsbergs Electronics office in Vallentuna