University of Huddersfield Repository

Ngigi, R. W., Pislaru, Crinela, Ball, Andrew and Gu, Fengshou

Review of control strategies used in modern railway vehicles

Original Citation


This version is available at http://eprints.hud.ac.uk/id/eprint/13496/

The University Repository is a digital collection of the research output of the University, available on Open Access. Copyright and Moral Rights for the items on this site are retained by the individual author and/or other copyright owners. Users may access full items free of charge; copies of full text items generally can be reproduced, displayed or performed and given to third parties in any format or medium for personal research or study, educational or not-for-profit purposes without prior permission or charge, provided:

- The authors, title and full bibliographic details is credited in any copy;
- A hyperlink and/or URL is included for the original metadata page; and
- The content is not changed in any way.

For more information, including our policy and submission procedure, please contact the Repository Team at: E.mailbox@hud.ac.uk.

http://eprints.hud.ac.uk/
ABSTRACT

Control systems are being developed in the railway industry to maintain good steering, stability and comfort. Although, these systems are in operational, there are prospects of fully implementing mechatronic principles through an integrated control system. This poster is intended to provide various aspects of control system technology that are incorporated in modern railway vehicles and to give illustrative examples of where particular control objectives have been met. Its main contribution is to identify opportunities for further research in this field.

INTRODUCTION

The use of railway vehicles worldwide has increased and thus, more and more trains are being produced. This trend is unlikely to change anytime soon. Therefore, there is a need to develop trains that provide safe and comfortable transportation, and at the same time have minimal impact on the environment. The challenge is to develop vehicles that can satisfy these conflicting requirements. One of the steps in achieving this is the use of mechatronic subsystems that employ sensors, actuators and control systems. There are several control strategies which have been developed to automate various operations within the railway vehicle. Only the ones that are well established will be reviewed.

CONTROL STRATEGIES

1. Tilt control
   - Enables trains to curve at higher speeds.
   - Maximizes the use of poor running conditions.
   - Improves curving abilities and stability at high speeds.

2. Active lateral suspension control
   - Integrates lateral stability and tracking.
   - Skyhook damping control.

3. Active primary suspension control
   - Active stability and steering control of wheelset.
   - Adhesion force control based on field oriented vector control.

4. Wheel slip control
   - Precedence control.

Tilt control concept:
- Tilt technology on a pendolino train (Source: Virgin website)

Tilting technology on a pendolino train (Source: Virgin website)

Skyhook damping control [1]

Active stability and steering control of wheelset [2]

Adhesion force control based on field oriented vector control [4]

REFERENCE


