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Review of control strategies used in modern railway vehicles

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**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 the ride quality.

2. **Active lateral suspension control**
   - Stabilizes at high speeds.
   - Improves curving abilities and stability at high speeds.

3. **Active primary suspension control**
   - Adhesion force control based on field oriented vector control.

4. **Wheel slip control**
   - Skyhook damping control.
   - Precedence control.

**CONTROL SCHEMES USED IN RAILWAY VEHICLES**

1. **Tilt control**
   - Based on pendolino train (Source: Virgin website)

2. **Active lateral suspension control**
   - Skyhook damping control
   - Precedence control

3. **Active primary suspension control**
   - Actuator control
   - Combined control

4. **Wheel slip control**
   - Adhesion force control based on field oriented vector control

**REFERENCES**


