Review of control strategies used in modern railway vehicles

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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.
   - Secondary suspension control concept: Improves the ride quality.
   - Primary suspension control concept: Stability at high speeds.
   - Adhesion control concept: Maximizes the use of poor running conditions.

2. Active lateral suspension control
   - Skyhook damping control concept: [1]
   - Bogie configuration for a high speed train

3. Active primary suspension control
   - Adhesion force control based on field oriented vector control concept: [4]

4. Wheel slip control
   - Preliminary control concept: [1]
   - Precedence control concept: [1]
   - Skyhook damping control concept: [1]
   - Active stability and steering control of wheelset concept: [2]
   - Integrated control scheme concept: [3]
   - Wheel configuration for a high speed train

REFERENCES