Title:
A Vision of Intelligent Train Control

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Abstract:

The progressive adoption of artificial intelligence and advanced communication technologies within railway control and automation has brought up a huge potential in terms of optimisation, learning and adaptation, due to the so-called "self-x" capabilities; however, it has also raised several dependability concerns due to the lack of measurable trust that is needed for certification purposes. In this paper, we provide a vision of future train control that builds upon existing automatic train operation, protection, and supervision paradigms. We will define the basic concepts for autonomous driving in digital railways, and summarise its feasibility in terms of challenges and opportunities, including explainability, autonomic computing, and digital twins. Due to the clear architectural distinction, automatic train protection can act as a safety envelope for intelligent operation to optimise energy, comfort, and capacity, while intelligent protection based on signal recognition and obstacle detection can improve safety through advanced driving assistance.