

Title:

A Vision of Intelligent Train Control

Authors:

Francesco Flammini^{1,2}, Lorenzo De Donato³, Alessandro Fantechi⁴, Valeria Vittorini³

¹ School of Innovation, Design and Engineering, Mälardalen University, Eskilstuna, Sweden

² Department of Computer Science and Media Technology, Linnaeus University, Växjö, Sweden

³ Department of Electrical Engineering and Information Technology, University of Naples Federico II, Naples, Italy

⁴ Department of Information Engineering, University of Florence, Florence, Italy

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.

Fundings and Disclaimer:

This research has received funding from the Shift2Rail Joint Undertaking (JU) under grant agreement No 881782 RAILS (Roadmaps for Artificial Intelligence (A.I.) integration in the rail Sector). The JU receives support from the European Union’s Horizon 2020 research and innovation programme and the Shift2Rail JU members other than the Union.

The information and views set out in this document are those of the author(s) and do not necessarily reflect the official opinion of Shift2Rail Joint Undertaking. The JU does not guarantee the accuracy of the data included in this document. Neither the JU nor any person acting on the JU’s behalf may be held responsible for the use which may be made of the information contained therein.

Publication Notes:

This Conference Paper is available at:

https://link.springer.com/chapter/10.1007/978-3-031-05814-1_14