Bachelor Thesis

Investigating the Influence of Line-of-Sight Communication on Platooning Performance

Cooperative Adaptive Cruise Control (CACC), commonly referred to as *Platooning*, is a Intelligent Transport Systems (ITS) that has been studied in detail as it can deliver improvements to many traffic characteristics.

Guaranteeing safe operation of platoons is a complex issue which involves many research fields. In particular, communication between platoon members is critical. While most existing work in this domain has put an emphasis on using solely Radio Frequency (RF)-based solutions such as IEEE 802.11p., recently heterogeneous communication has been studied to provide the strict reliability assurances required for a safety relevant system such as Platooning.

To this end, line-of-sight technologies such as Visible Light Communication (VLC) or radar-based communication are candidates to complement the large propagation area which is characteristic for RF communication. As the communication with such methods is limited to directly visible vehicles, they need to rely on multi-hop communication, in particular within a platoon.

It has been shown that Platooning using exclusively line-of-sight communication can function reliably [1]. Due to the multi-hop nature of the communication method, adverse effects like increased packet loss and delays could be observed. A detailed analysis of these effects was, however, not conducted.

Therefore, in the scope of this thesis we want to investigate the influence of line-of-sight communication on platooning. In particular, we would like questions like the following to be addressed:

- What parameters influence the networks performance?
- Can a limit of the maximum platoon size that can be safely supported be derived from these parameters?.
- In what way does the CACC controller choice influence platooning performance?

Requirements

The candidate is expected to have basic understanding of networking, in particular in the vehicular context. Knowledge about network simulation, as well as relevant tools for data analysis (e.g. R or python) and project management (git & SVN) are a plus.

[1] M. Schettler, A. Memedi, and F. Dressler, “Deeply Integrating Visible Light and Radio Communication for Ultra-High Reliable Platooning,” in *15th IEEE/IFIP Conference on Wireless On demand Network Systems and Services (WONS 2019)*, Wengen, Switzerland: IEEE, Jan. 2019, pp. 36–43.

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