Urbanloop control:

from individual pods to network

PhD topic – Université de Lorraine (France)

Advisors

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Location

The PhD will take place at Université de Lorraine, CRAN, UMR CNRS 7039 : 2 avenue de la forêt de Haye, 54516 Vandœuvre-lès-Nancy, France

Duration

3 years starting preferably in the fall of 2024

Funding

2100 €/month (gross)

Keywords

Control, modeling, autonomous vehicle, Urbanloop, networked system

Context

The company Urbanloop SAS develops an on-demand individual rail transport system that allows the user to move from one point to another without waiting, transfers, or even intermediate stops. It consists of numerous pods (see figure below) circulating autonomously on interconnected loops.

While the work has just begun for the implementation of a first 2.2 km loop allowing the circulation of 10 pods for the Paris 2024 Olympic Games, Urbanloop is facing new challenges for a city-wide installation. This scaling requires improving the performance of individual pod control and addressing issues related to a large number of pods on the circulation loops. The French national ANR COMMITS research project aims to meet these challenges.

Objectives

In this context, the objectives of this PhD thesis in control engineering are as listed next.

- Individual pods: The goal is to design a control law for an individual pod (i.e., assuming it is the only one on the circulation network) to meet the specifications provided by Urbanloop in terms of speed regulation and safety.
- Pods network: The second step involves implementing the pods on the circulation network and considering the constraints involved: avoiding collisions, managing intersections, (dis-)insertion. Cooperative strategies based on inter-pod communications will be studied, drawing inspiration from existing work on the control of autonomous vehicles, such as e.g., [1,2,3,4,5].
- Experimental validations: The selected control laws will initially be validated through numerical simulations and, if possible, implemented experimentally on the Tomblaine circuit in the suburbs of Nancy.

This thesis will be funded by the ANR COMMITS project involving CRAN (Nancy), LORIA (Nancy), CNAM (Paris), and, of course, Urbanloop.

Job profile

We are looking for a candidate holding either a master's degree, an engineering school diploma, or any equivalent degree in control engineering, applied mathematics, or mechanical engineering (with a strong background in control engineering in the latter case). Expertise in Matlab is desired.

Please contact Jérémie Kreiss (jeremie.kreiss@univ-lorraine.fr) and Romain Postoyan (romain.postoyan@univ-lorraine.fr) for more information.

References

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