DC8: Edge Intelligence for Model-Augmented Haptic Teleoperation in Tactile Internet

Application deadline: 28-02-2023 | Date of enrolment: 1-9-2023

Project description

Model-Augmented Haptic Teleoperation, also known as Model-mediated teleoperation (MMT) is a promising approach for Tactile Internet to address both stability and transparency in teleoperation under communication latency and packet loss. The idea of MMT is that the local device uses a local model, i.e., the *digital twin* of the remote device, to approximate the remote environment. Instead of transmitting actual haptic feedback from the remote device to the local device, the haptic feedback can be computed based on the local model without noticeable delay. However, accurate online model parameters estimation is challenging, model mismatch can, for example, cause position tracking error, resulting in dangerous slave behaviour.

This project aims to design Edge Intelligence using transfer learning and continual learning approaches to develop a new neural network-based estimation of remote environment for MMT. The key is to design and implement new machine learning methods for achieving high performance with small training data, and to design and implement continual learning methods to improve the NNs' performance based on newly collected experience. The outcome is expected to achieve model estimation acceleration for remote environment, and to increase model accuracy and minimize model mismatch, i.e., enhancing stability and transparency, under large latency.

Eligibility Conditions

- Master's degree in Computer Engineering, Electrical Engineering, Computer Science, or within a relevant area.
- The candidates are eligible if they have not resided in Denmark for more than 12 months within the past 36 months.

Required Skills

- Background on machine learning, robotics, and wireless communication system is desired.
- Strong programming skills, e.g., python programming, is desired.
- Experience in haptic technology and haptic application is a plus.
- Excellent English verbal and written skills.
- Be able to work well and communicate expert knowledge in an interdisciplinary team.

How to apply

Contact details: Alexandros Iosifidis ai@ece.au.dk and Qi Zhang qz@ece.au.dk

Please submit your application via the online application system here.

Funded by the European Union

The TOAST project is funded by the European Union's Horizon Europe research and innovation programme (HORIZON-MSCA-2022-DN-01) under the Marie Skłodowska-Curie grant agreement No. 101073465.