Master Thesis Topic: The impact of modular electric vehicles on urban traffic:

Background: The continuous growth of travel demand challenges urban mobility as congestion increases. The advancement of technology proposes new forms of shared mobility, such as, modular electric vehicles. It is an advanced smart transportation system based on swarms of modular electric vehicles. Each module can join and detach with other modules on standard city roads. When joined, they create an open, bus-like area among modules, allowing passengers to stand and walk from one module to another. Modularity allows en-route-transfer, that optimizes system capacity, cuts cost and traffic, increase ubiquity and comfort for the passengers. However, urban mobility is a complex system; the benefits of any new mobility approach cannot be guaranteed unless corresponding challenges are analysed. This thesis targets to develop and analyse modular vehicle's mobility in simulation environment. The aim is to identify different traffic scenarios and analyse the impact of modular vehicle's movement, coupling and decoupling on the regular traffic.

Methodology:

1. Literature survey.
2. Use readily available Munich transport network to develop modular vehicle's movement, coupling and decoupling feature in the simulation environment.
3. Identify different traffic situations and simulate modular vehicles to identify the impacts on the regular traffic.

Research outcome:

A detailed analysis of the impact of modular vehicles on the traffic. Identification of the rules in which scenarios modular vehicle's movement, coupling and decoupling is advisable and in which scenarios it's not advisable.

Expected skillset:

1. Experience in simulation tool (SUMO) and coding
2. Good analytical skill

References:

1. NEXT IS NOW, https://www.next-future-mobility.com/
2. Hannoun, G. J., Men´endez, M., 2022. Modular vehicle technology for emergency medical services. Transportation Research Part C: Emerging Technologies 140, 103694
3. Lu, Q., Tettamanti, T., Hörcher, D., & Varga, I. (2020). The impact of autonomous vehicles on urban traffic network capacity: an experimental analysis by microscopic traffic simulation. Transportation Letters, 12(8), 540-549.

Starting date: In May 2023 or later

How to apply: Interested applicants should contact Santa Maiti (santa.maiti@tum.de) and Qinglong Lu(qinglong.lu@tum.de) by sending an email including a short explanation (max. 100 words) of why you are interested in this thesis topic and your starting date.