Postgraduate Seminar Series

Venue: Graduate Seminar Room
Date & Time: June 8, 2024 at 3:00 PM

Speaker Information

Md. Ismail (Std No. 0422052046) is a full-time M.Sc. student in the department of CSE, BUET. He completed his undergraduate studies from CSE, RUET in 2021. His research interests lie in Optimization, Simulation, and Operation research. He is currently doing his postgraduate thesis under the supervision of Dr. Muhammad Ali Nayeem. He will be speaking about his ongoing research in this talk.

An Agent-Based Simulation Framework for Online Optimization of the On-Demand Transit Operation

On-demand transit (ODT) has emerged as an alternative approach, offering a middle ground between private vehicles and public buses by introducing dynamic features that adapt to travelers' travel demands on the fly. The core challenge of the ODT operation lies in the online optimization of vehicle assignments to newly generated travel requests and the real-time adjustment of vehicles' routes with no or incomplete information. Previous research has addressed this through three primary formulations: (a) vehicle routing problems, (b) integer programming, and (c) network design problems. Various algorithms have been employed to address these complexities. Widely adopted methodologies in this realm include heuristic-based approaches, Branch & Bound techniques, matching models, and Lagrangian decomposition, Heuristic-based algorithms encompass techniques such as simulated annealing, simulated annealing combined with genetic algorithms, and hybrid genetic algorithms. However, our investigation reveals that existing studies predominantly concentrate on fixed bus stations, resulting in static routes and requests, as well as relatively small-scale networks. Yet, such static approaches may not fully harness the dynamic potential of ODT to efficiently adapt to varying travelers' demands. To fill this gap, we focus on conducting a comprehensive study of vehicle assignment of on-demand transit (ODT) operations. We formulate the real-time trip assignment and route adjustment problem for the ODT operation, exploiting two classical models: a) TSP, and b) VRP. We propose two heuristic-based algorithms, TSP-SA and VRP-HGS along with a baseline model. For the evolution of our model, we experimented with a real-world dataset incorporating around ten thousand requests from 2749 riders in Halifax Regional Municipality (HRM), Canada. To measure the performance of our approaches against the baseline, we used several key performance indicators such as percentage of completed trips, average traveler waiting time, average traveler delay to reach the destination, average vehicle empty trip time, and percentage of VKT reduction.