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Resource Allocation in Vehicular Fog Computing

Title of the dissertation	Task Allocation and Resource Scheduling in Vehicular Fog Computing
Contents of the dissertation	Future vehicles will become smarter and more connected. With the merging and sharing of data generated by onboard sensors, next-generation vehicular applications (e.g., cooperative lane change) are emerging that create a significant demand for sufficient computing resources to conduct time-critical and data-intensive tasks. Owing to the space, weight, and cost constraints, the computing capacity of most vehicles may not be high enough to handle such tasks. On the other hand, offloading these tasks to the cloud is not applicable, due to the considerable transmission delay. A new computing paradigm known as vehicular fog computing (VFC) has been proposed that pushes computing and communication resources to the edge of the network. Its key idea is to offload computational tasks from the client vehicles to fog nodes located for example at cellular base stations or buses with extra computing power. In this dissertation, the focus is on designing task allocation and resource scheduling algorithms via various mathematical models to enable high-quality and low-latency VFC-based services for vehicular applications. The feasibility and challenges of applying VFC for real-time analytics of a crowdsourced dash camera video is investigated. Furthermore, a framework for latency and quality optimized task allocation in VFC is presented and a task-offloading framework for visual-based assisted driving is proposed. Finally, the design of a QoI and latency aware task allocation scheme for vehicle-based visual crowdsourcing is presented, which takes into account vehicle mobility and the spatiotemporal variation in the workload of vehicular fog nodes. Analytical studies were conducted in order to answer the research questions and evaluate the effectiveness of the designed algorithms, using real-world application profiles and traffic data as input.
Field of the dissertation	Computer Science, Networking
Doctoral candidate	Chao Zhu, M.Sc.(Tech.)
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Custos	Professor Antti Ylä-Jääski, Aalto University School of Science, Department of Computer Science
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