Autonomous Intersection Management (AIM): Traffic Control and vehicle sequencing problem

**Subject:**
The traffic signal control for intersections generally falls into two basic categories: pre-timed control strategy, which is also called the fixed-time control, and the semi/fully traffic actuated control. Both strategies are based on the estimation of traffic flow rates. Since the flow rate is a continuous variable that needs a period of time to be estimated, there are always big deviations between the last computed flow rate and the actual one. This makes it difficult to exploit the potential of traffic infrastructure to the maximum level. The advances in the fields of computation and sensor technologies lead to the emergence of fully autonomous vehicles, which take complete control of vehicle operations and eliminate the driver from the control loop. This subject is related to the field of traffic control in intersections with consideration of autonomous vehicles in order to find an efficient vehicle passing sequence to maximize the traffic throughput at intersections while maintaining driver safety. It is the continuation of a previous work of Fei Yan. He proposed Branch and Bound and dynamic programming algorithms to find an optimal sequence for an isolated intersection. These algorithms are designed based on carefully analysis of the problem properties. Moreover, and since congestions in modern cities are usually caused by several adjacent intersections located in dense street networks, he extend the proposed control strategy to multi-intersection networks. He proved that an exact algorithm can not be fast enough for multiple intersections and propose then a genetic algorithm to find an optimal or near optimal vehicle passing sequence for each intersection. This algorithm requires less time with ensuring the quality of solution. The final simulations with continuous traffic flow prove the good performance of his algorithms. The candidate for this subject will continue the work already begun by Fei Yan. The objective is to further research especially in the coordination of several intersections to ensure better traffic and thus reduce congestion. Methods from combinatorial optimization will be considered. Also differences between normal vehicles and special used vehicles such as ambulances, police cars will be considered since special used vehicles should have the privileges to pass through intersection.

**Keywords:**
Transportation, Autonomous vehicle, Traffic control, Combinatorial optimization

**Expected collaborations:**