

A Distributed Traffic Aware Clustering and Predictive Algorithm for Intelligent Transportation Systems

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Recently, there has been tremendous interest in developing a “Smart” city. In this talk, we focus on one network optimization problem, that is prevalent in designing a Smart city in urban areas, traffic congestion.

We propose a traffic aware routing algorithm. There are two parts in designing the algorithm: prediction and navigation. We consider two important features: road network and vehicular network. A road network is static while a vehicular network is dynamic. We use the road network for prediction and vehicular ad hoc network for navigation. We show that traffic is not only spatially correlated but temporally correlated. That is, congestion caused by an unfortunate event on a road segment not only affects the surrounding local roads but has a domino effect on other roads not close in proximity, over a period of time.

We design a distributive, clustering algorithm to cluster the road segments that are influenced by the congested road. The clusters are then trained using long short term memory neural network model to predict traffic any time. We evaluate the proposed algorithm against other clustering algorithms during peak and non-peak hours. The vehicular ad hoc network is subdivided into zones for scalability, where each vehicle joining the network communicates within its own zone. The clusters are used by the vehicles to re-route and navigate their paths. We propose a decentralized routing algorithm using swarm intelligence techniques.

The talk will end by briefly discussing the extension of the single objective optimization problem with traffic to multi-objective optimization problem using non-dominant sorting genetic algorithm.

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