

# Heuristics for Car-Traffic Congestion Reduction Based on Optimal Control\*

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The reduction of urban traffic congestion is becoming a crucial issue in the nowadays welfare. When there is a technology capable of coordinate traffic lights with green times calculated through sophisticated mathematical algorithms a moderate reduction of travel times (or congestion) can be experienced as it is stated by the references [1, 2] for the TUC strategy.

Using concepts of traffic engineering we describe a well known dynamic linear model of traffic flow in a urban traffic network that is controlled using the traffic-light times. This simplified model allows to obtain a Riccati feedback matrix and compute traffic-light times that will improve the congestion levels. Nevertheless, the introduction of phase constraints in the LQ problem makes the Riccati solution non necessarily optimal. In order to comply with those constraint a projection step is taken at each time. Even if not theoretically proved, this solution behaves enoughly well in practice.

We present some numerical experiments made with the model on an academic example and we validated them with a microscopic simulator that we have created based on Car Following theory and discrete event models.

## References

- [1] V. Dinopoulou, C. Diakaki, and M. Papageorgiou. Applications of the urban traffic control strategy TUC. *European Journal of Operational Research*, 175(3):1652–1665, December 2006.
- [2] C. Diakaki, M. Papageorgiou, and K. Aboudolas. A multivariable regulator approach to traffic-responsive network-wide signal control. *Control Engineering Practice*, 10:183–195, 2002.

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