

Discrete release rate impact on ramp metering performance

A. Kotsialos,¹ M. Papageorgiou,² J. Hayden,³ R. Higginson,⁴ K. McCabe,⁵ and N. Rayman⁶

¹Durham University, School of Engineering, Durham, UK

²Technical University of Crete, Dynamic Systems and Simulation Laboratory, Department of Production Engineering and Management, Chania, Greece

³ATKINS Intelligent Transport Systems, Manchester, UK

⁴ATKINS Intelligent Transport Systems, Denbighshire, UK

⁵ATKINS Transport Systems, Leeds, UK

⁶Highways Agency, Bristol, UK

Abstract:

Ramp metering, if properly applied, is a direct and efficient means to avoid or reduce the space-time extent of motorway congestion and sensibly to improve the merging conditions. Regardless of the ramp metering algorithm employed, the metering signals may be operated in various ways based on the ramp metering policy adopted. Ramp metering policies include traffic signal cycle, 2- or n -cars per green, and discrete release rates. In the latter policy, a number of discrete release rates are prespecified, each implemented with a specific cycle and green phase. This approach allows for short green phases (small platoon releases) whenever possible but also for high ramp flows when necessary. We address the problem of determining the lowest required number of release rates that will not affect ramp metering operation compared with the theoretical case of any (even decimal) release rate. Results from investigations using the ALINEA (Asservissement Linéaire d'Entrée Autoroutière) ramp metering algorithm and the METANET (Modèle d'Écoulement du Trafic Autoroutier: NETwork) macroscopic traffic simulator are reported and discussed in detail. Finally, recommendations are provided concerning the lowest required number of release rates and the discretisation scheme to be used.