

## Real-time Estimation of the Critical Occupancy for Maximum Motorway Throughput

Elias Kosmatopoulos<sup>1</sup>, Markos Papageorgiou<sup>1</sup>, Diamantis Manolis<sup>1</sup>, Jill Hayden<sup>2</sup>, Roger Higginson<sup>2</sup>, Keith McCabe<sup>3</sup>, Nanu Rayman<sup>4</sup>

<sup>1</sup> Dynamic Systems and Simulation Laboratory, Technical University of Crete, 73110 Chania, Greece

<sup>2</sup> ATKINS Transport Systems, The Axis, 10 Holiday Street, Birmingham B1 1TF, UK

<sup>3</sup> ATKINS Transport Systems, The Old Brewery, High Court, The Calls, Leeds LS2 7ES, UK

<sup>4</sup> Highways Agency, Temple Quay House, 2 The Square, Bristol B51 6HA, UK

---

### Abstract

The local ramp metering strategy ALINEA aims at stabilizing the downstream motorway occupancy near the critical occupancy so as to achieve maximum motorway throughput. Two previously proposed real-time estimation schemes for the critical occupancy are fine-tuned, modified and evaluated in this paper by use of extensive traffic data from eight locations of the U.K. M6 motorway. The evaluation results indicate satisfactory estimation accuracy, rapid tracking behaviour and high robustness with respect to measurement noise, detector failures and different kinds of traffic conditions. The reported investigations open the way to the field implementation of the adaptive AD-ALINEA ramp metering strategy that incorporates the real-time estimation of the critical occupancy.