What is MOTION?

MOTION means **Method for the Optimization of Traffic Signals In On-line controlled Networks**

MOTION is a new signal control method for urban road networks in central systems

MOTION®
Motivation

Traffic Situation
- High network loads
- Concurring political objectives

Deficits of existing control methods
- Functionally fixed systems
- Individual solutions

New scientific results
- Dynamic Network Models
- Automatic Incident Detection
Objectives

Provision of a flexible and modular System concept

- Extendability: functional and spatial
- Adjustable traffic engineering features
- Ability of Integration: Local control methods, Traffic system management
MOTION - Control Sequence

- Calculation / Optimization of Control Variables
- Traffic Modeling and Analysis
- Data Acquisition and Preprocessing
- Evaluation, Decision, Control
- Signalization
- Traffic Process

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MOTION - Functional sequence

Requirements of customer (e.g. control or optimization strategy)

MOTION central
- Data acquisition
- Traffic modelling
- Optimization of control variables
- Transfer of signal programs

Local control methods (e.g. PDM or VS-PLUS)
- Signal program modifications
  considering the demands of single vehicles (public transport)
The MOTION system consists of a Workstation with the network control method and Controllers with detection equipment and (optional) local control methods.
MOTION - Control Strategies

- Improvement of Capacity
- Incident and Congestion Management
- Green Waves for Main Streams
- Priority for defined Road Users
- Public Transport Priority
- Network Optimum of Delays and Stops
- Environmental Control
Detector Configurations for MOTION

Existing detectors can be used by MOTION.

MOTION prefers detector configurations k1 and l1.
Automatic Incident Detection

IF traffic volume low AND occupancy rate high, THEN incident or congestion.

IF traffic volume high, THEN imminent overload.

IF traffic volume low AND occupancy rate low, THEN no problem.
Dynamic Network Models

MS 1: 500 Veh/h
MS 2: 400 Veh/h
MS 3: 1000 Veh/h
MS 4: 1200 Veh/h

Road network

Measurements
## Optimization of Control Variables

<table>
<thead>
<tr>
<th>Control Variable</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network Cycle Time</td>
<td>necessary for coordination of traffic signals</td>
</tr>
<tr>
<td>Green Time Split</td>
<td>adapted to the traffic load of the network, prevents congestion</td>
</tr>
<tr>
<td>Phase Sequence</td>
<td>relevant for security and optimization aspects</td>
</tr>
<tr>
<td>Offset</td>
<td>important for Green Waves and minimization of delays and stops</td>
</tr>
</tbody>
</table>
Interfacing network and intersection level

**Local control**
- Signal program
  - every 10 - 15 minutes

**MOTION central**
- Traffic counts
- Occupancy values
- Incident reports (opt.)
- Cyclic flow profiles (opt.)
  - every 60 - 90 seconds

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MOTION Summary

- Enhanced Modeling of Traffic
- Hierarchical Approach with Optimization of all Control Variables
- Distributed Control on Central and Decentral Level
- Modular and Extendable System for Adaptation to Control Strategy
- Interface of Signal Control to Urban Traffic Management Systems