Designing a VISSIM-Model for a Motorway Network with systematic Calibration on the Basis of Travel Time Measurements

Master‘s Thesis of Ioannis Karakikes

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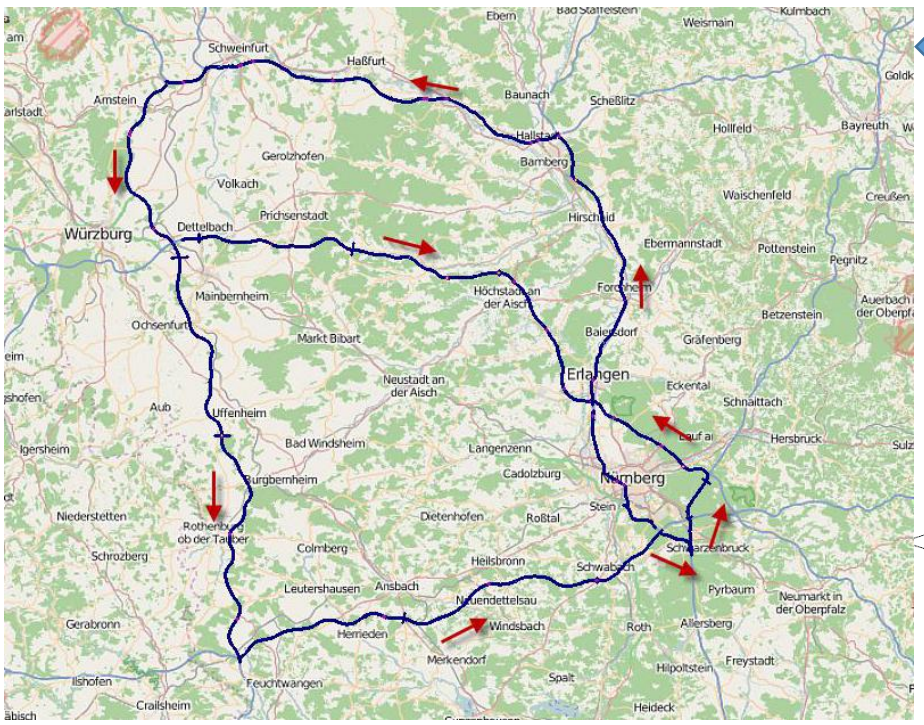
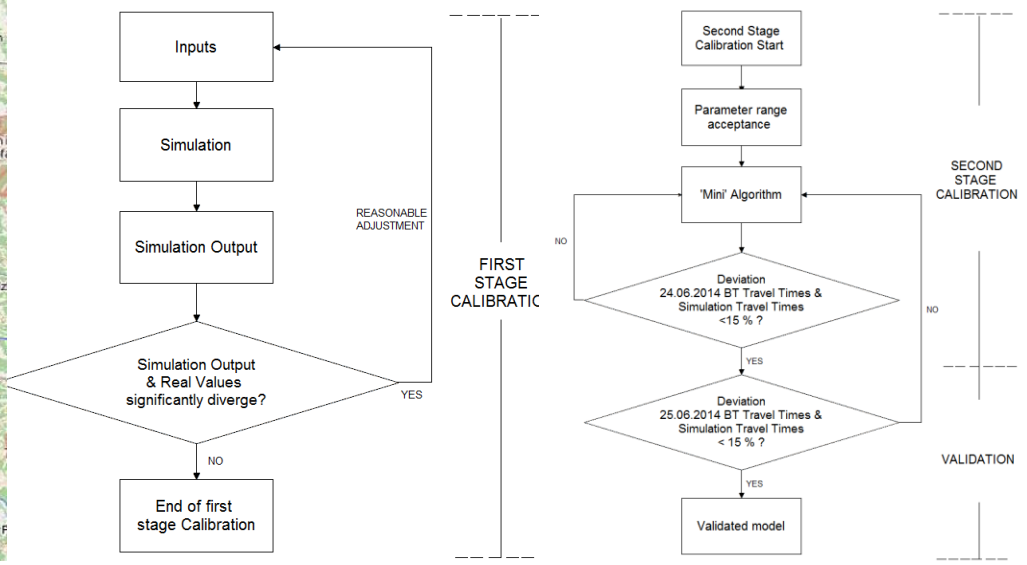
This thesis describes a systematic calibration process of a Vissim model, based on travel time measurements that were derived from limited number of BT detectors. It also provides step-by-step instructions how to process input data, how to assess compatibility of available data concerning the simulation day and eventually, how to design, calibrate and validate a highway network model. The case study that is developed, establishes an example for practitioners that are interested in designing highway networks with micro simulation tools. The three-hour microscopic traffic simulation model that will be analyzed, is located in the wider area of Bavaria in Germany and is consisted of 500 links, 113 nodes and 1820 origin-destination pairs. First, an overview of the systematic calibration approach that will be followed is presented. A description of the given datasets follows, along with their processing and ‘translation’ in Vissim’s language. Finally, model’s systematic calibration and validation based on travel time measurements from segments under free flow conditions is thoroughly explained. The delivered calibrated Vissim model acts as a test bed, which in combination with other analysis tools can be used for potential future exploitation regarding transportation related purposes.



Study Area: Federal State of Bavaria, Highways: A70, A7, A6, A73, A3, A9 Peak hours: 6:00 am – 9:00 am,

Systematic Calibration Process



Acceptance Thresholds for Travel Time deviation [Wisconsin Department of Transportation]: 15 %

Absolute Average divergence percentage from Real Travel Times on 24.06.2012 (%)														
Segment			Percent %											
			6:00 - 6:30		6:30 - 7:00		7:00 - 7:30		7:30 - 8:00		8:00 - 8:30		8:30 - 9:00	
			5400 - 7200		7200 - 9000		9000 - 10800		10800 - 12600		12600 - 14400		14400 - 16200	
	At	To	Cars	HV	Cars	HV	Cars	HV	Cars	HV	Cars	HV	Cars	HV
A70	-	-												
	-	-												
A7	93	94	1,5	6,0	1,6	7,6	1,9	2,3	2,9	5,8	0,8	6,9	5,4	2,5
	94	85	3,4	3,9	4,0	3,9	5,7	3,6	1,0	2,8	4,7	5,0	8,1	5,3
A6	83	82	4,0	5,6	8,1	7,4	6,4	1,2	10,4	2,7	13,6	1,6	14,2	0,8
	82	68	5,4	3,7	11,3	1,5	5,0	2,8	10,7	2,4	11,6	5,2	14,2	3,2
	68	86	12,5	4,3	6,2	1,7	8,1	2,7	9,8	3,9	15,7	6,3	15,5	5,5
A73	86	87												
A9	87	47												
	47	81	1,3	1,1	2,0	1,1	7,3	2,2	8,0	1,3	3,1	1,9	0,7	0,9
A3	78	89												
A73b	-	-												
A3b	92	91	2,7	3,0	4,0	4,9	2,7	3,3	6,9	4,4				
	91	90	6,4	1,4	8,8	3,2	5,9	1,3	16,7	1,0	23,3	1,7	28,4	3,3
	90	89												

Parameters	Final parameters ’ selection	Default values
Headway Time CC_1 (s)	0,9	0,9
‘Following’ Variation CC_2 (m)	3	4
Maximum deceleration trailing vehicle (m/s^2)	-3,8	-3
Safety distance reduction factor	0,5	0,6
Maximum deceleration for cooperative braking (m/s^2	-4	-3

Advantages of the systematic Calibration Process: Application on a wide sprectrum of model cases, Speed
Disadvantages: Too general, Depends on analyst’s experience