Young Researchers Seminar 2013

Lyon, France , June 5-7 2013

Laboratoire d'Economie des Transports
Unité Mixte de Recherche du CNRS n° 5593
Université Lumière Lyon 2 - ENTPE

DLR Deutsches Zentrum für Luft- und Raumfahrt
German Aerospace Center

Evaluation of V2I Technologies

How to Adjust Cost-Benefit-Analyses (CBA) to ITS?

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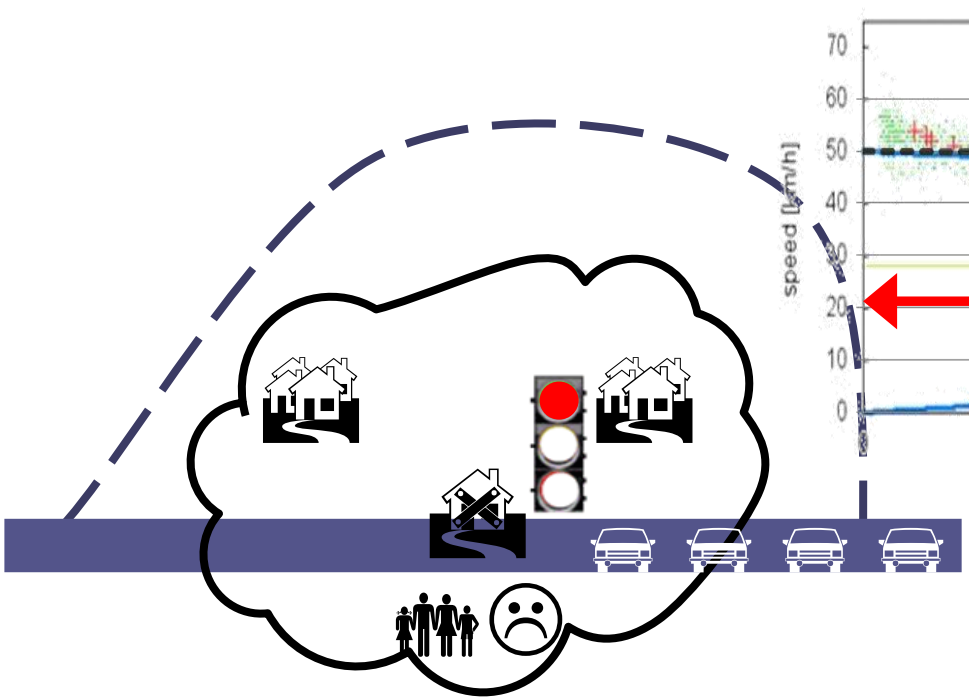
ECTRI
European Conference of Transport Research Institutes

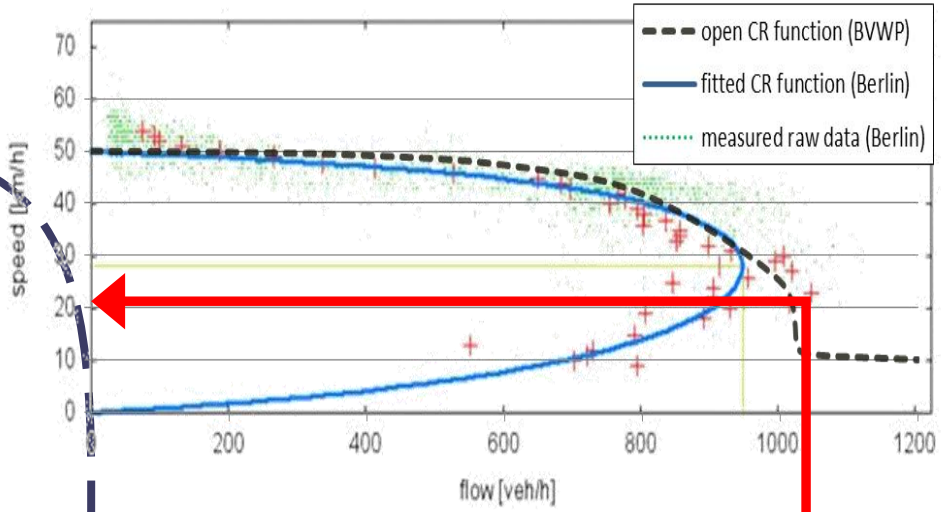
FERSI
Road Safety Research

Content

- Evaluation → Cost-Benefit-Analyses
- V2I Technologies → Cooperative ITS
- Adjustments → CBA with Microsimulation
- Results →  **?**
- Outlook → Future Research

Introduction





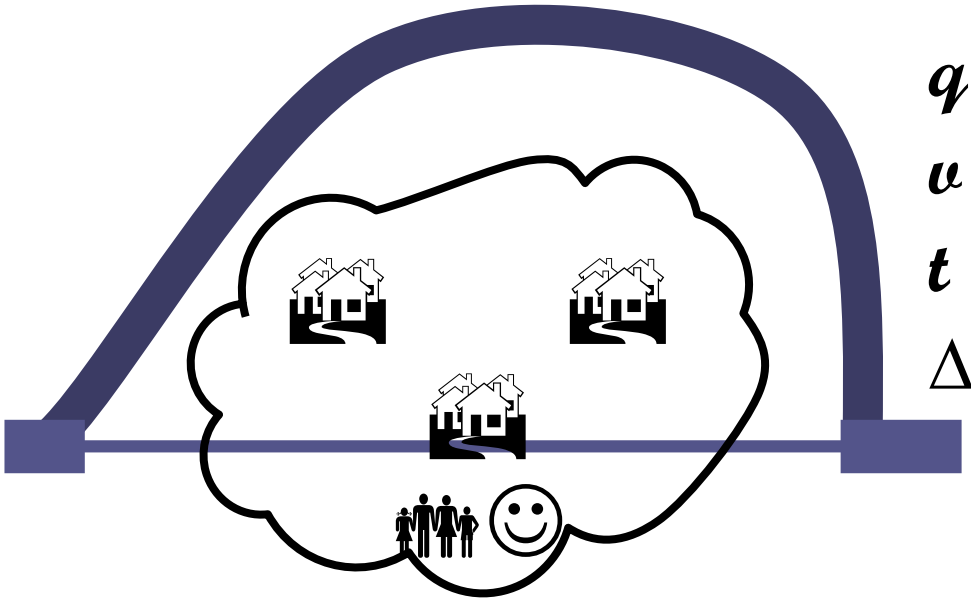
ℓ = 1 km

q = 15.000 veh/d

v = 20 km/h

t = 3 min

Introduction



ℓ = 1,7 km

q = 15.000 veh/d

v = 50 km/h

t = 2 min

Δt = 1 min

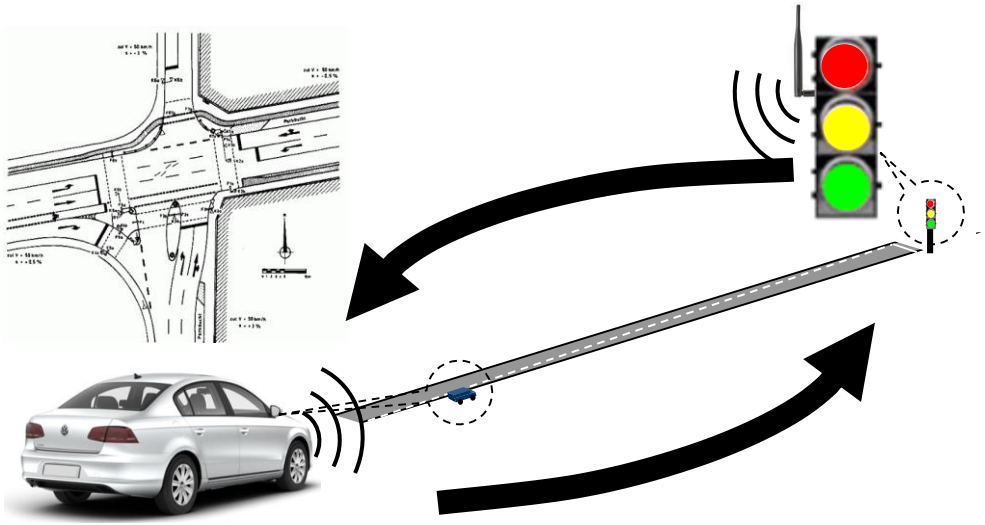
CBA in Road Projects

Global Goals	Benefit Criteria
1. Mobility	a) Vehicle Travel Time **b) Pedestrians and Bike Delay Time**
2. Resource Efficiency	c) Vehicle Operation + Maintenance ➥ *Vehicle Occupancy*



V2I Technologies in KOLINE

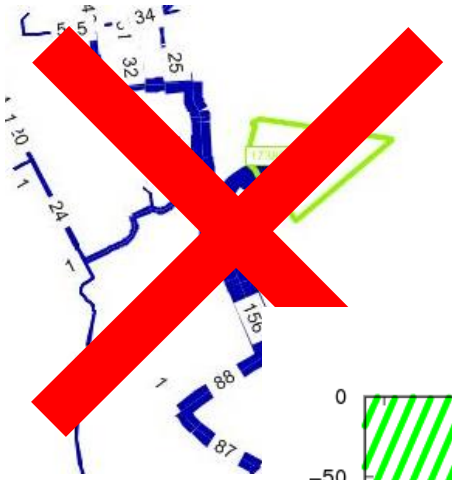
- Cooperative ITS + ADAS (ACC)

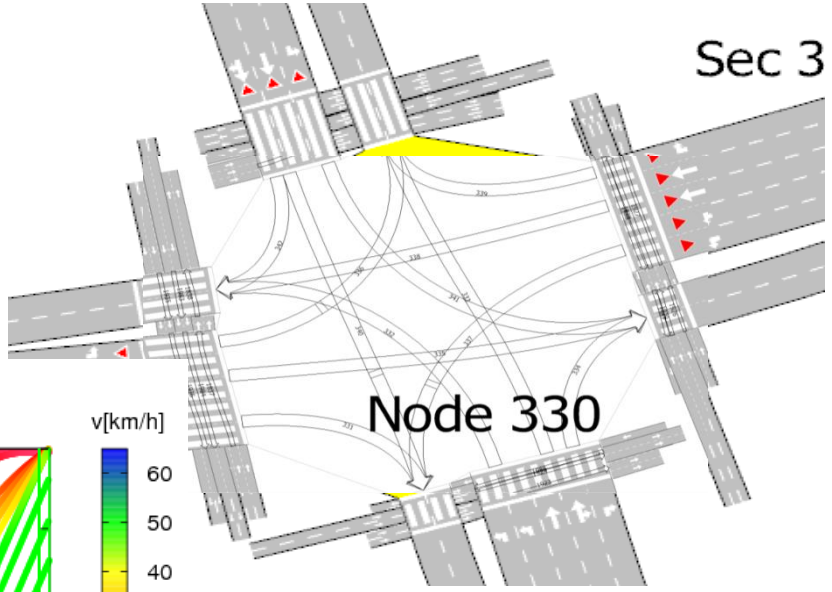


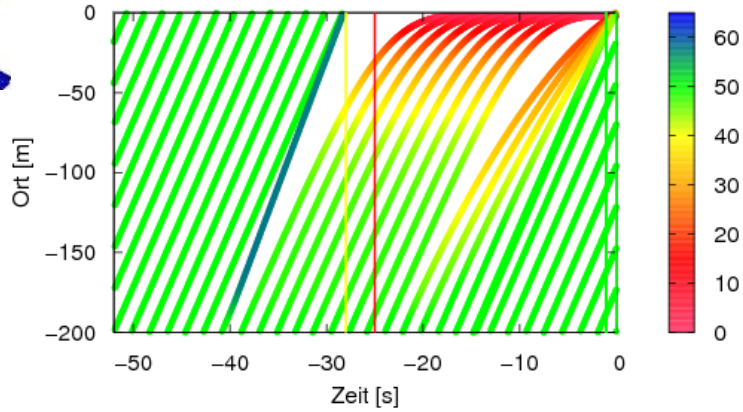


GLOSA

Adjustments: Scale of Model







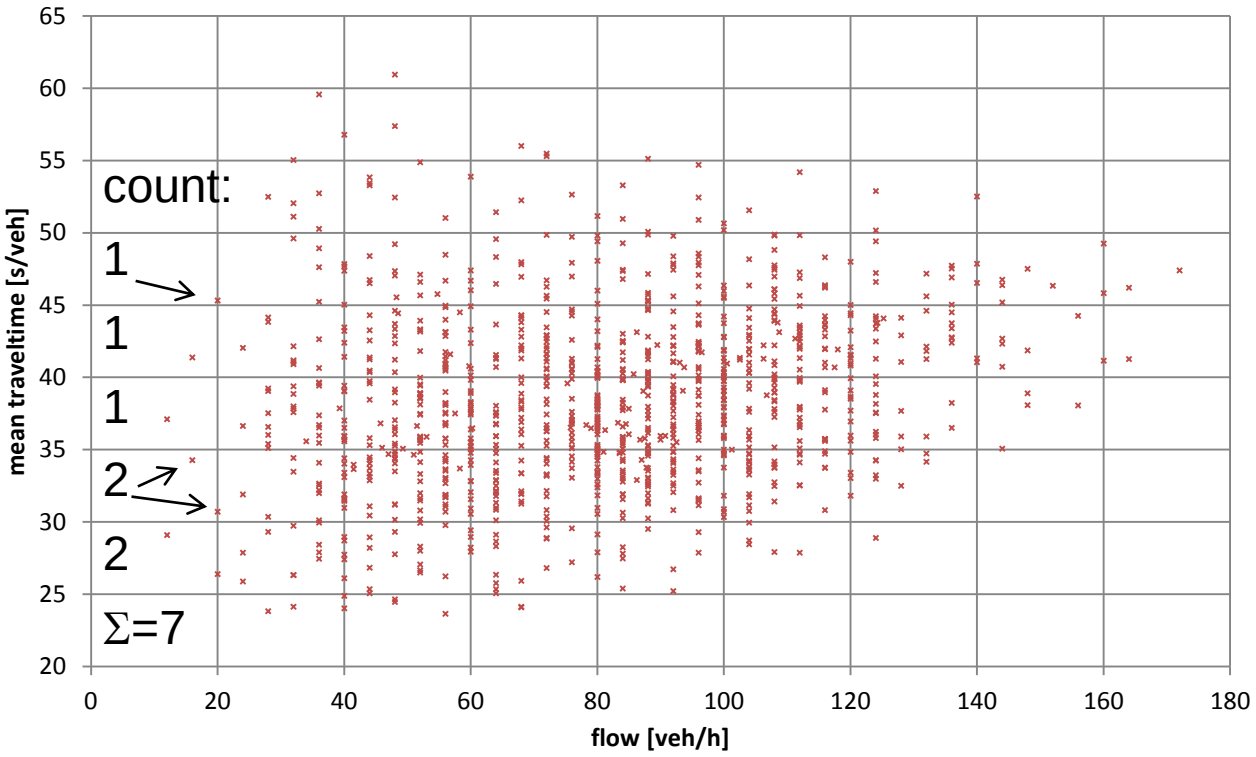
Adjustments: Cooperative ITS

Scenario	Traffic Control	C2I Rate	Tailback Estimation	Vehicle Approach Control
Base Line Test 1	Status Quo KOLINE Optimiser	0%	✗	✗
Test 2	KOLINE Optimiser	5%	detectors + vehicle data	✓
Test 3	“	15%		
Test 4	“	25%		
Test 5	“	35%		
Test 6	“			+lateral control
Test 8	“		✗	✓

Adjustments: Extrapolation

„Modelling traffic as a stochastical system [rather than as deterministic chaos] seems more plausible to me.“
(Prof. Dr. Dr. Reinhard Selten, Nobel Prize Economy 1994)

Extrapolation I: Stochastics



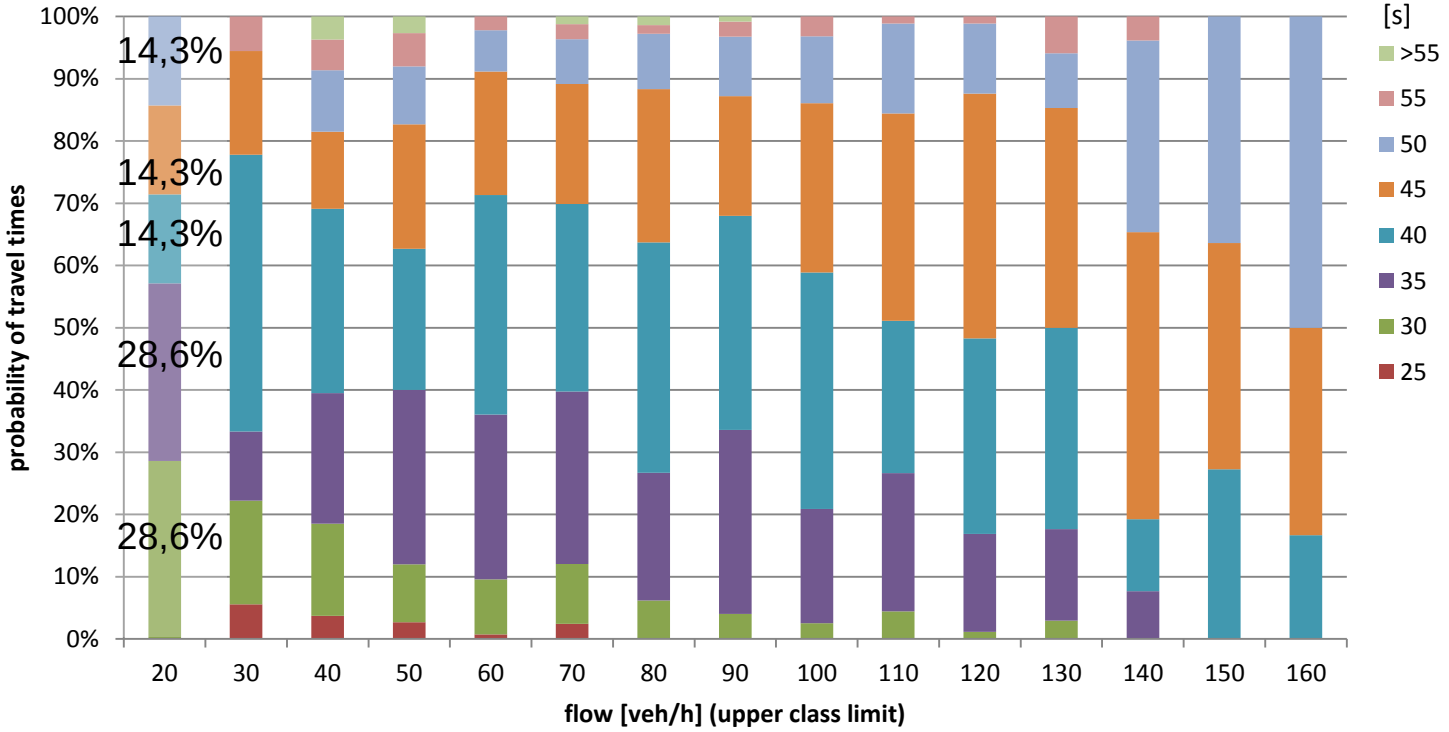
n_{sim}= 17

n =1.088

n_{classx}=14+1

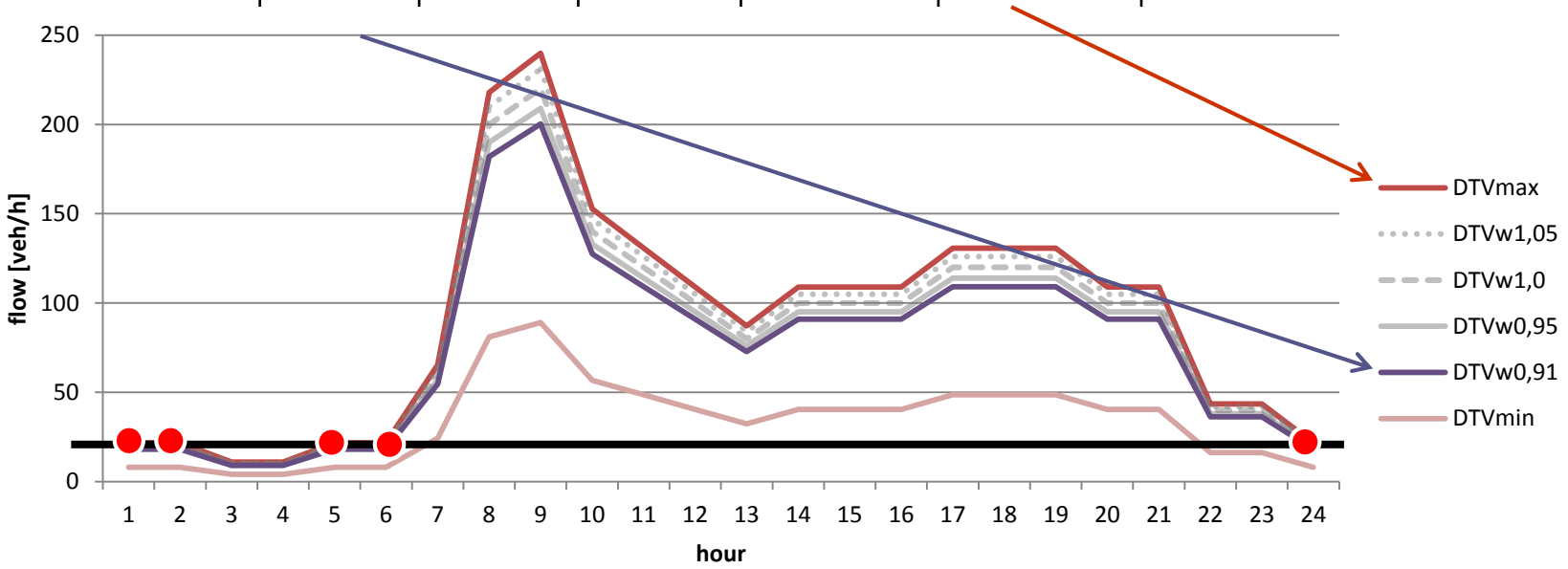
n_{classy}=7+1

Extrapolation II: Probability



Extrapolation III: Load Curves

	Workdays					Σ [d/a]
count	14	48	77	48	14	201
factor	0,91	0,95	1,0	1,05	1,09	



Extrapolation IV: Relevant Hours

Daytype	Day count	Hours @ q=20	Σ [h/a]
$Workdays_{1.0}$	77	5	385

Results I

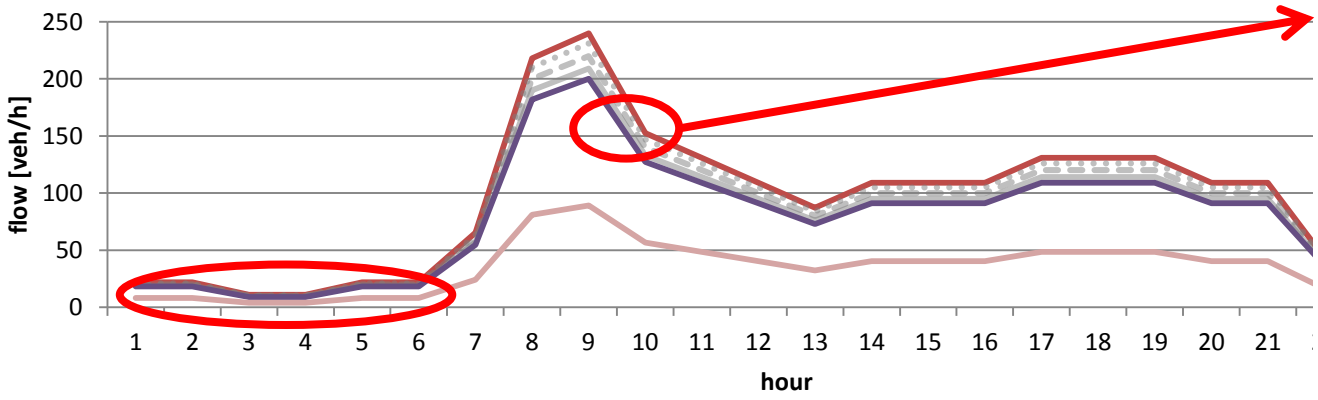
Criteria	Impact
a) Vehicle Travel Time	[26,78] %
c) Vehicle Operation incl. (g) Fuel Consumption	[17,57] %
e) Climate Gas Emission (CO_2)	[5,17] %
b) Pedestrians Delay Time	0 %
d) Pollutant Immissions (NO_x, CO, HC, PA)	0 %

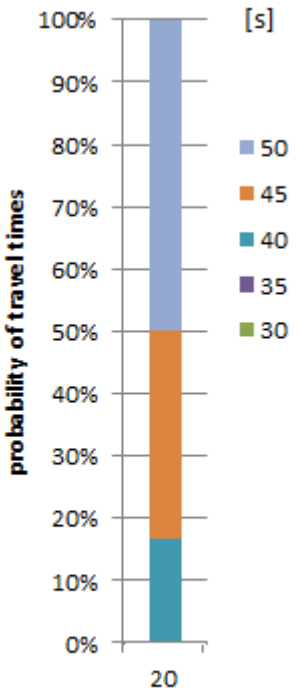
Results II

Scenario	Number of passed nodes n_N				
	1	2	3	4	5
Test1	172,0				
Test2	0,8	1,6	2,4	3,1	3,8
Test3	0,9	1,7	2,5	3,2	4,0
Test4	0,8	1,6	2,3	3,0	3,7
Test5	0,8	1,6	2,4	3,2	3,9
Test8	0,9	1,7	2,5	3,3	4,1

Outlook

- Extrapolation other criteria?
- Bayesian Network q(**t-1**)→v(t)
  - Travel time 💰 : workdays ≠ sundays
  - Different probability distribution?





Acknowledgements

The KOLINE project was granted by the German Federal Ministry of Economics and Technology (BMWi) according to a decision of the German Federal Parliament within the 3rd transport research framework “Mobility and Transport Technologies”.

Project partners:

- TU Braunschweig
  - Institute of Transportation and Urban Engineering
  - Institute of Control Engineering
- Institut für Automation und Kommunikation e.V. Magdeburg (ifak),
- Transver GmbH Munich,
- Volkswagen AG Wolfsburg (VW)