



-ECTRI – FEHRL – FERSI

-Young Researchers Seminar 2015

## Traffic Safety Evaluations for Emergency Vehicles

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Wissen für Morgen

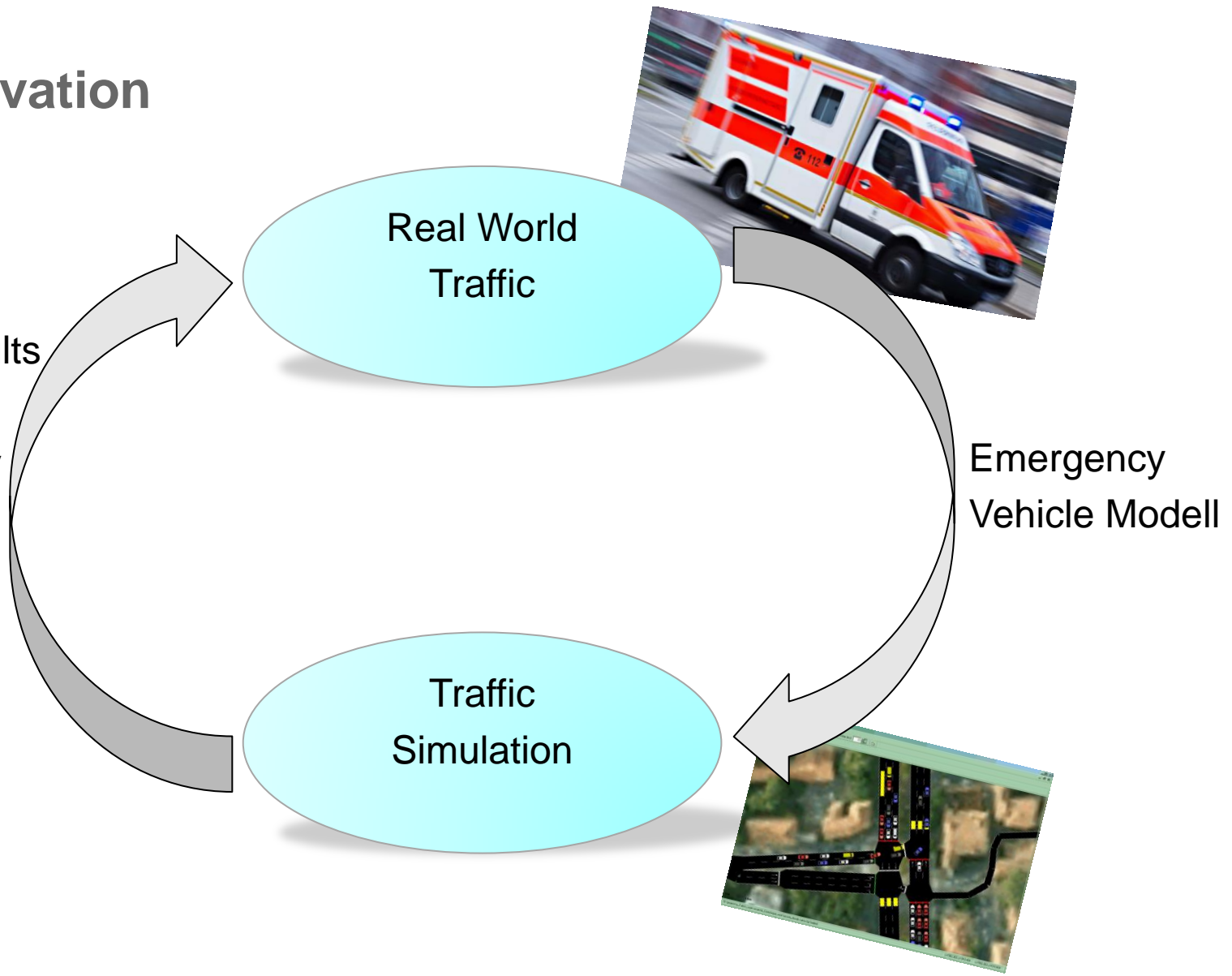


DLR



# Motivation

Simulation Results  
for improving  
Traffic Efficiency  
and Safety for  
Emergency  
Vehicles

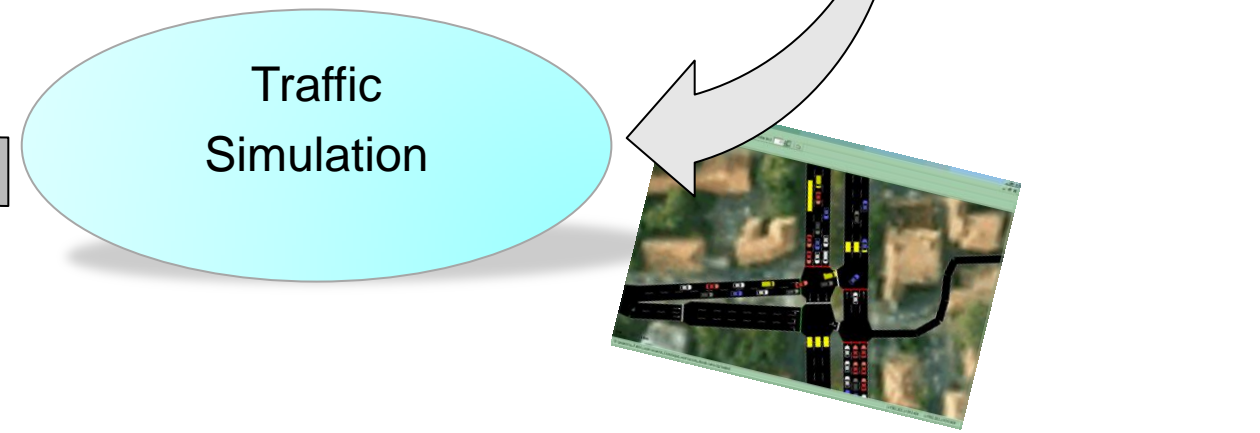
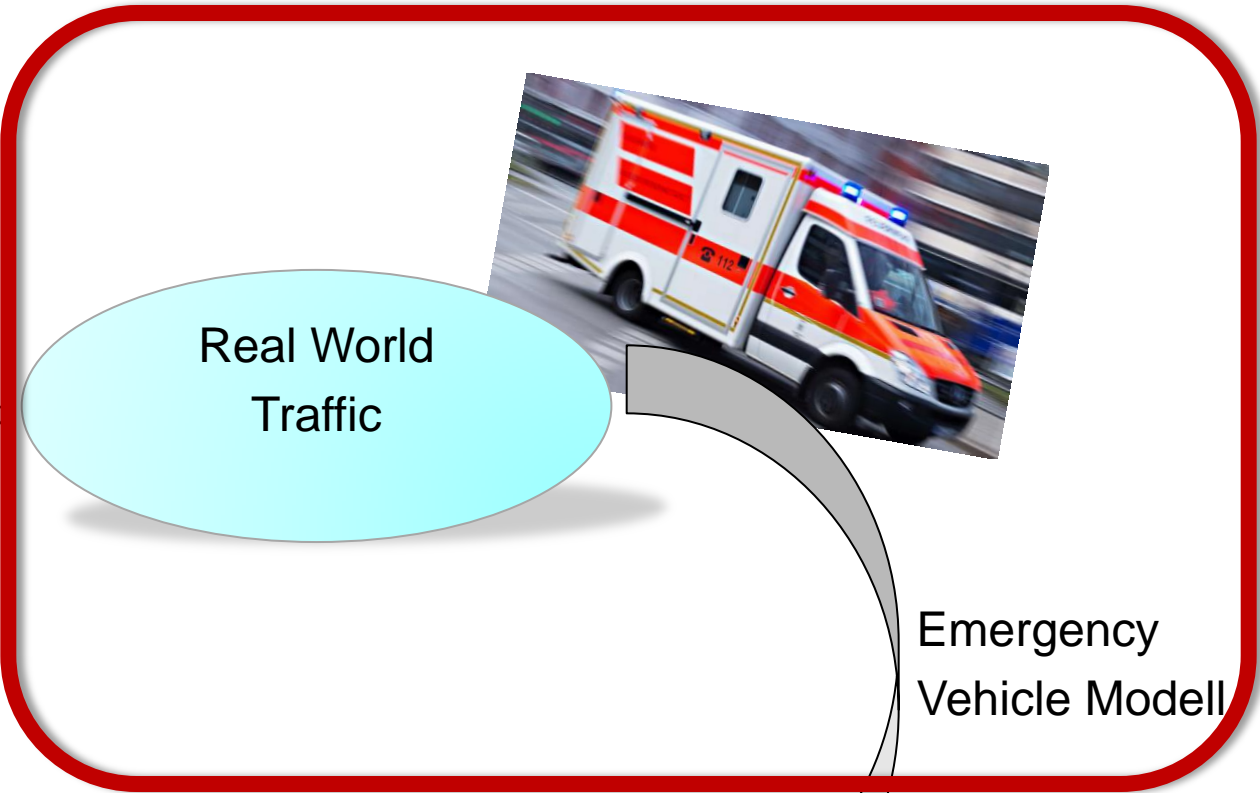


Emergency  
Vehicle Modell



# Motivation

Simulation Results  
for improving  
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# Traffic Safety for Emergency Vehicles

- Emergency vehicles are more involved in car accidents:
  - Probability is 8 times higher
  - 1 person is killed every 272,000 emergency drives

→What are the main reasons for the accidents?

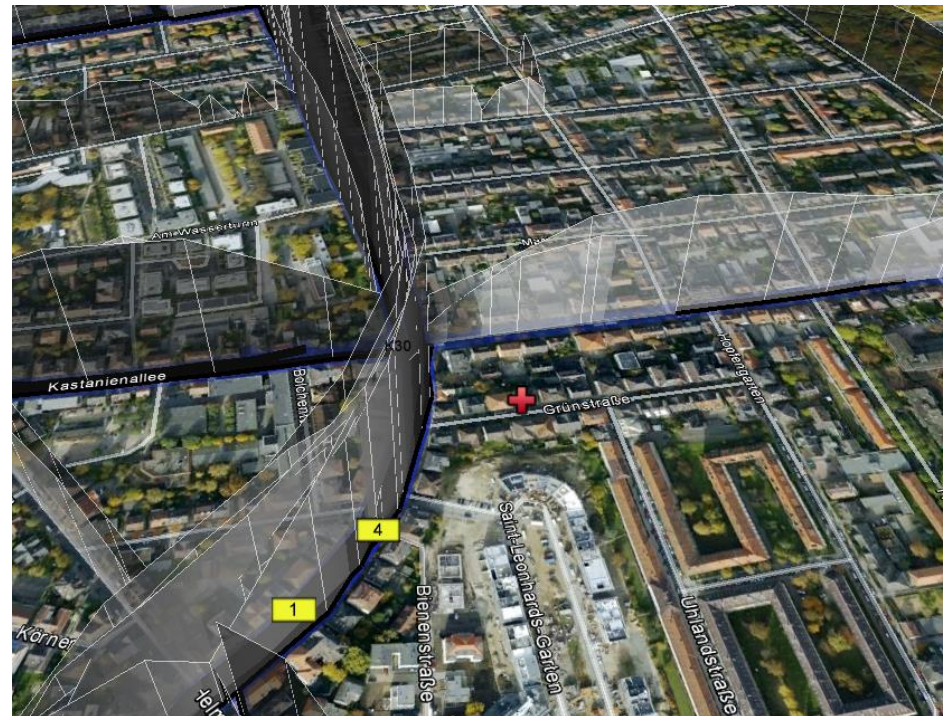
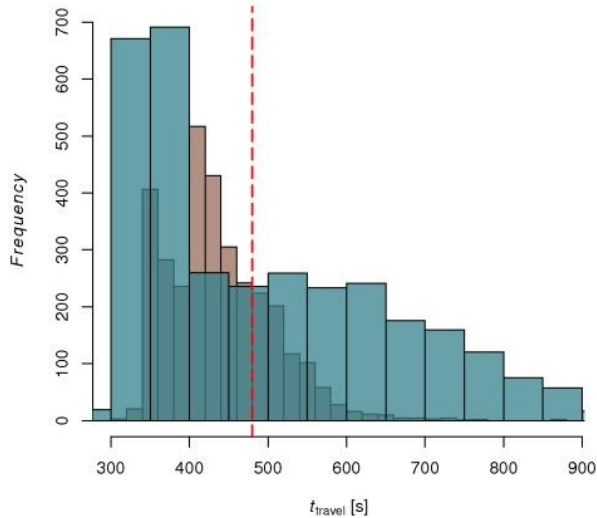
- Time pressure
- Special rights





# Rescue and Respond Time in Germany

- Legal maximum time
- Around 8 and 15 minutes
- Real rescue time is in average 8.7 minutes
- 95% of all operations reach the incident location less than 17 minutes.



# Emergency Vehicles

Emergency vehicles types:



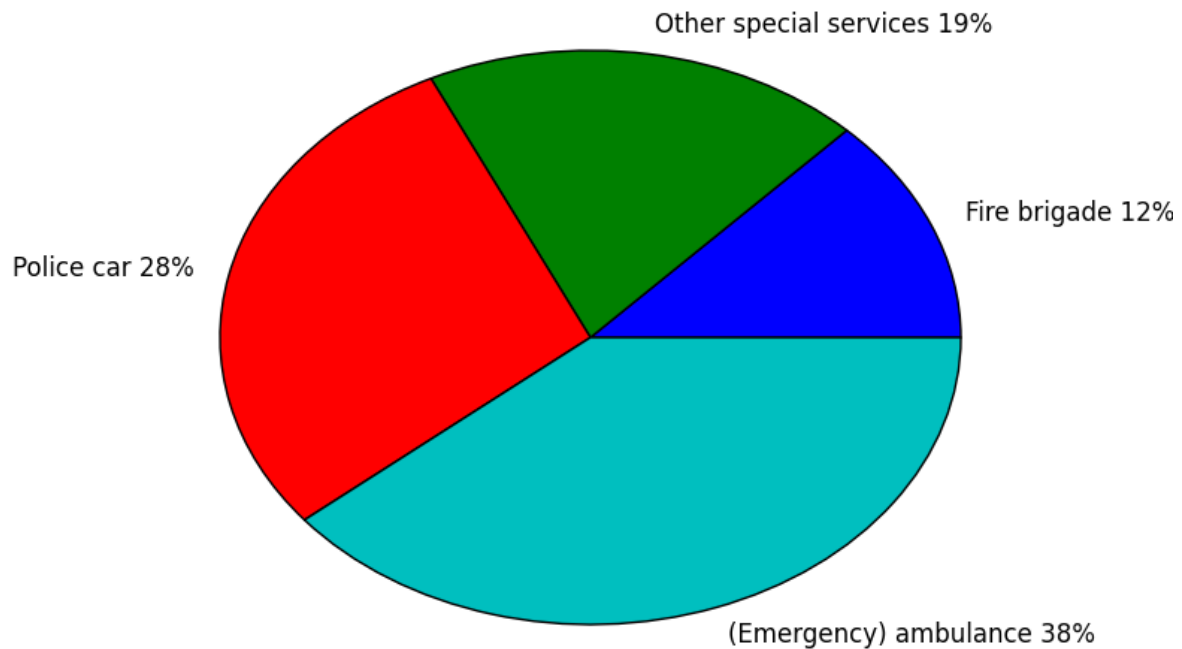
These cars have special rights:

- If necessary to reach the destination as fast as possible
  - Flashing blue light and siren
- Emergency vehicles are allowed to break road rules

# Methods

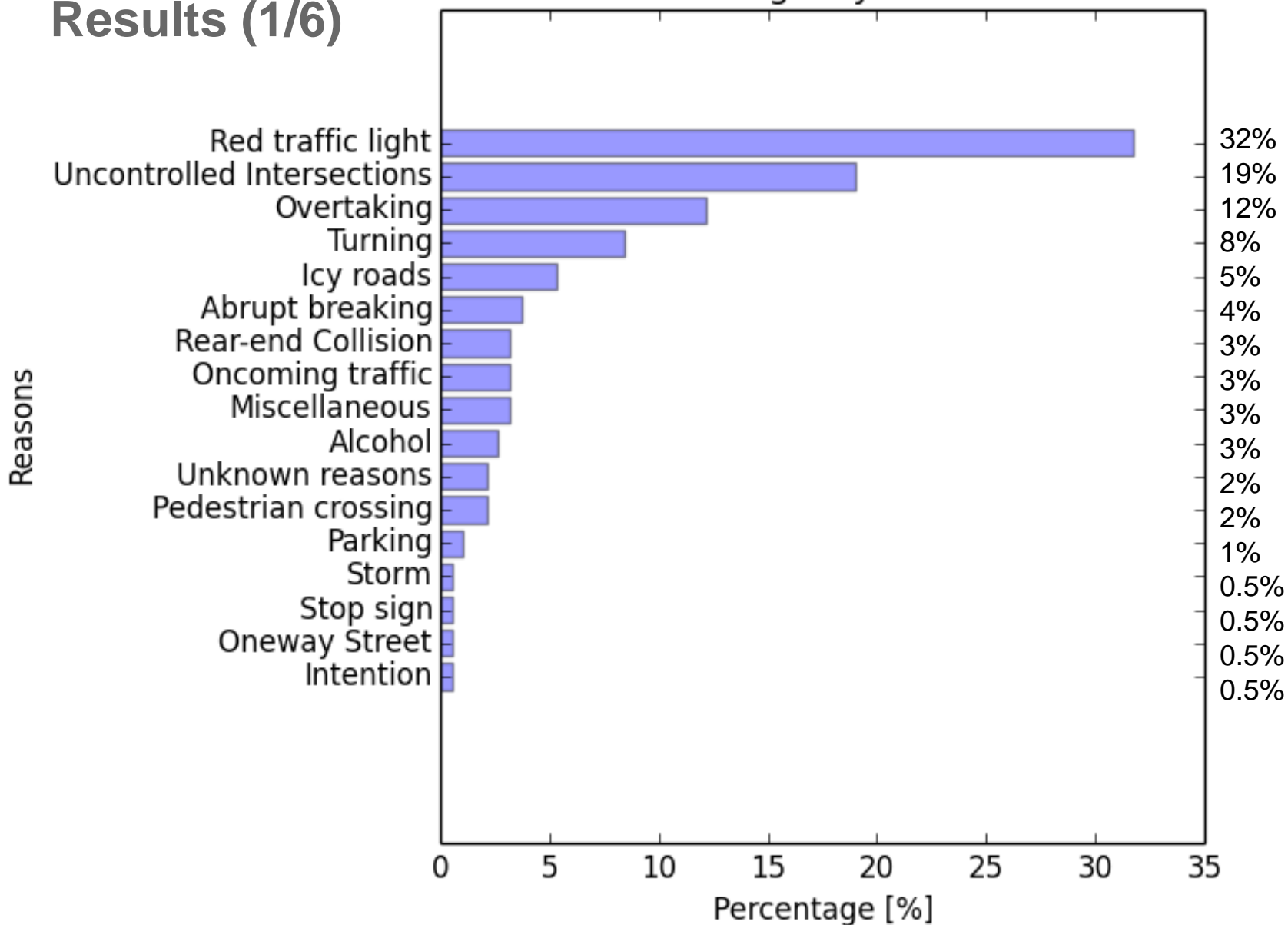
- Accidents reports of emergency vehicles:
  - Operations with special rights
  - newspapers and reports
  - 189 accidents in Germany (2009-2015)

Emergency Vehicle Types involved in Accidents



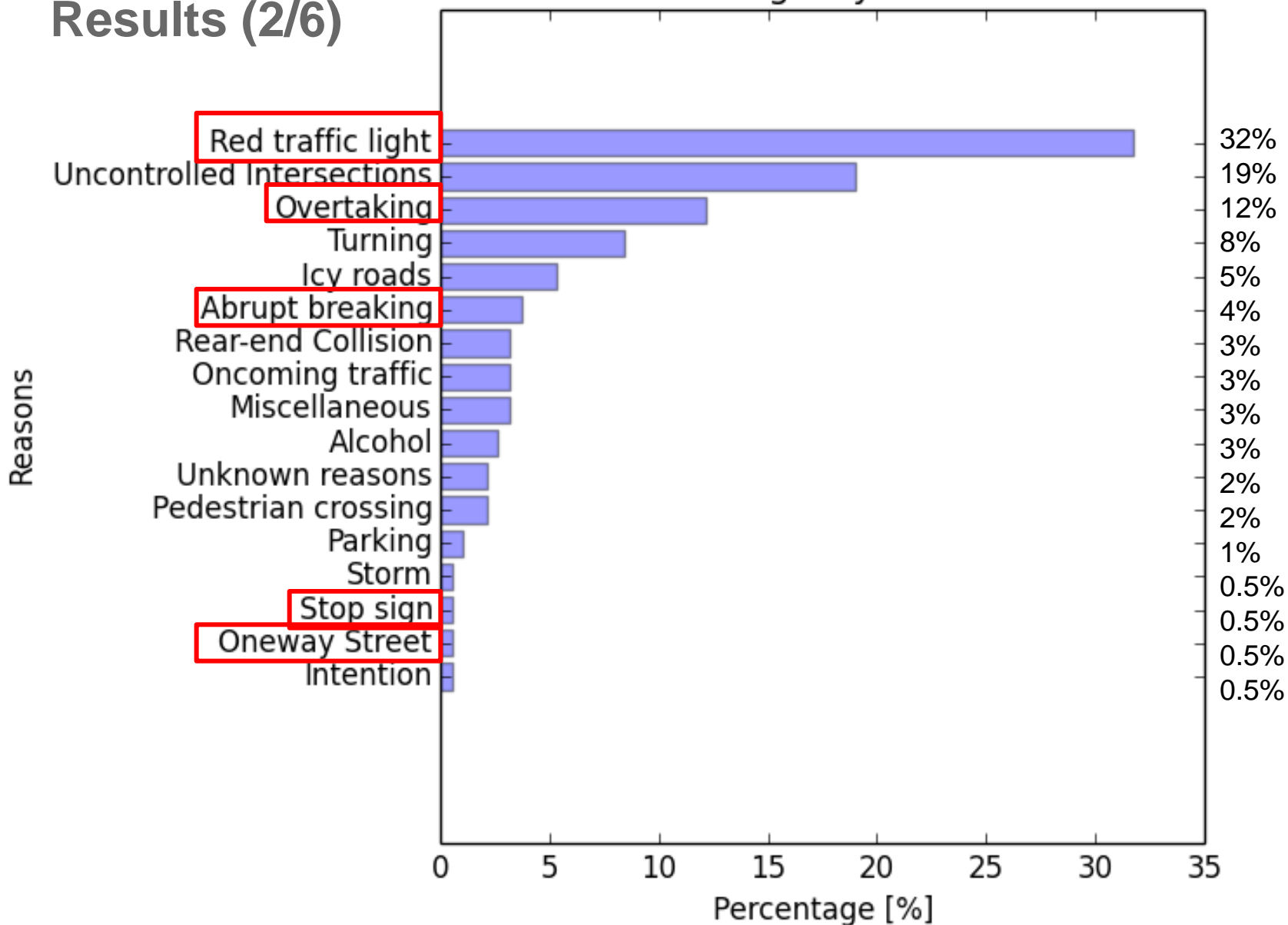
# Results (1/6)

## Reasons for Emergency Vehicle accidents

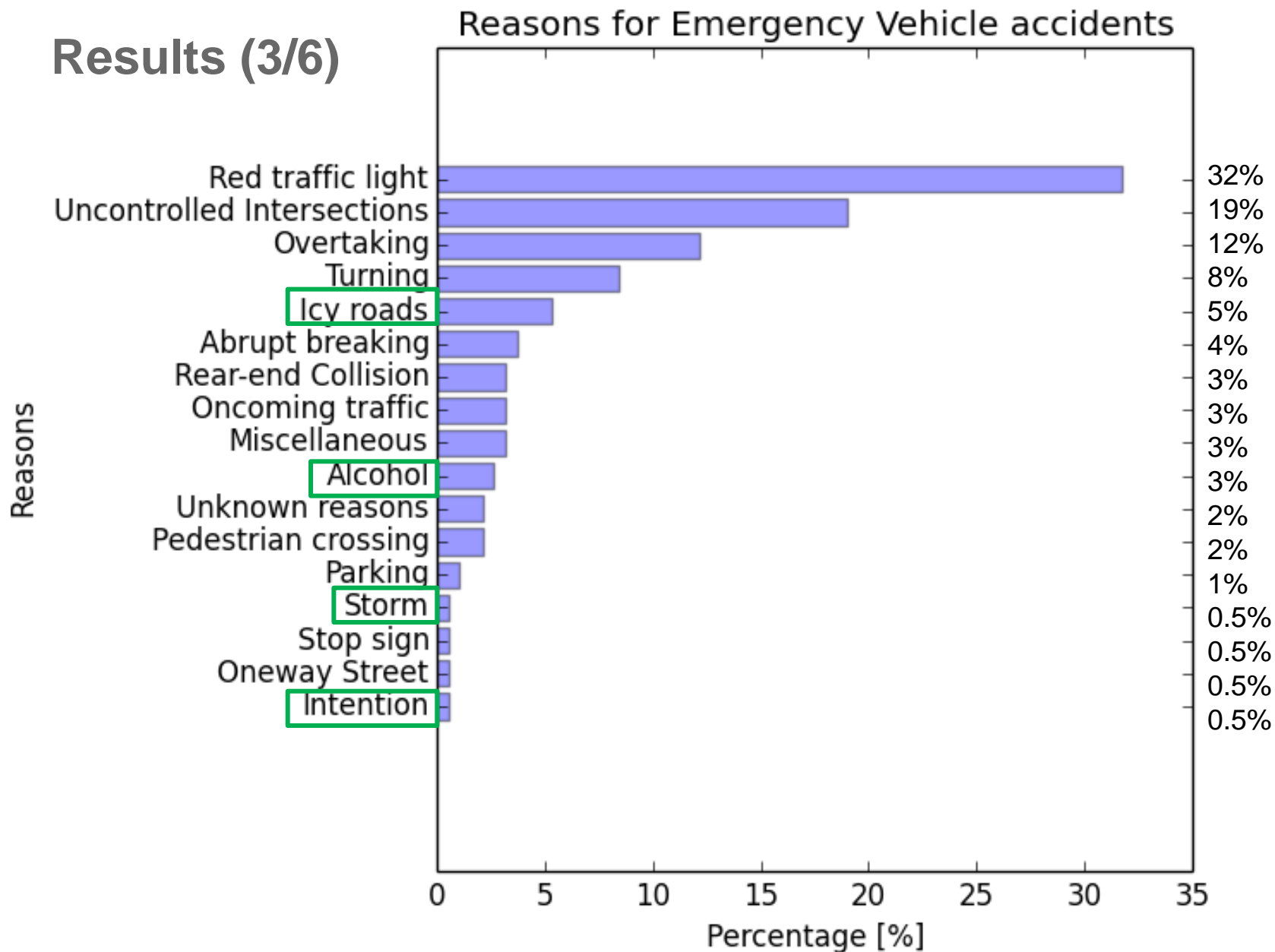


## Results (2/6)

### Reasons for Emergency Vehicle accidents



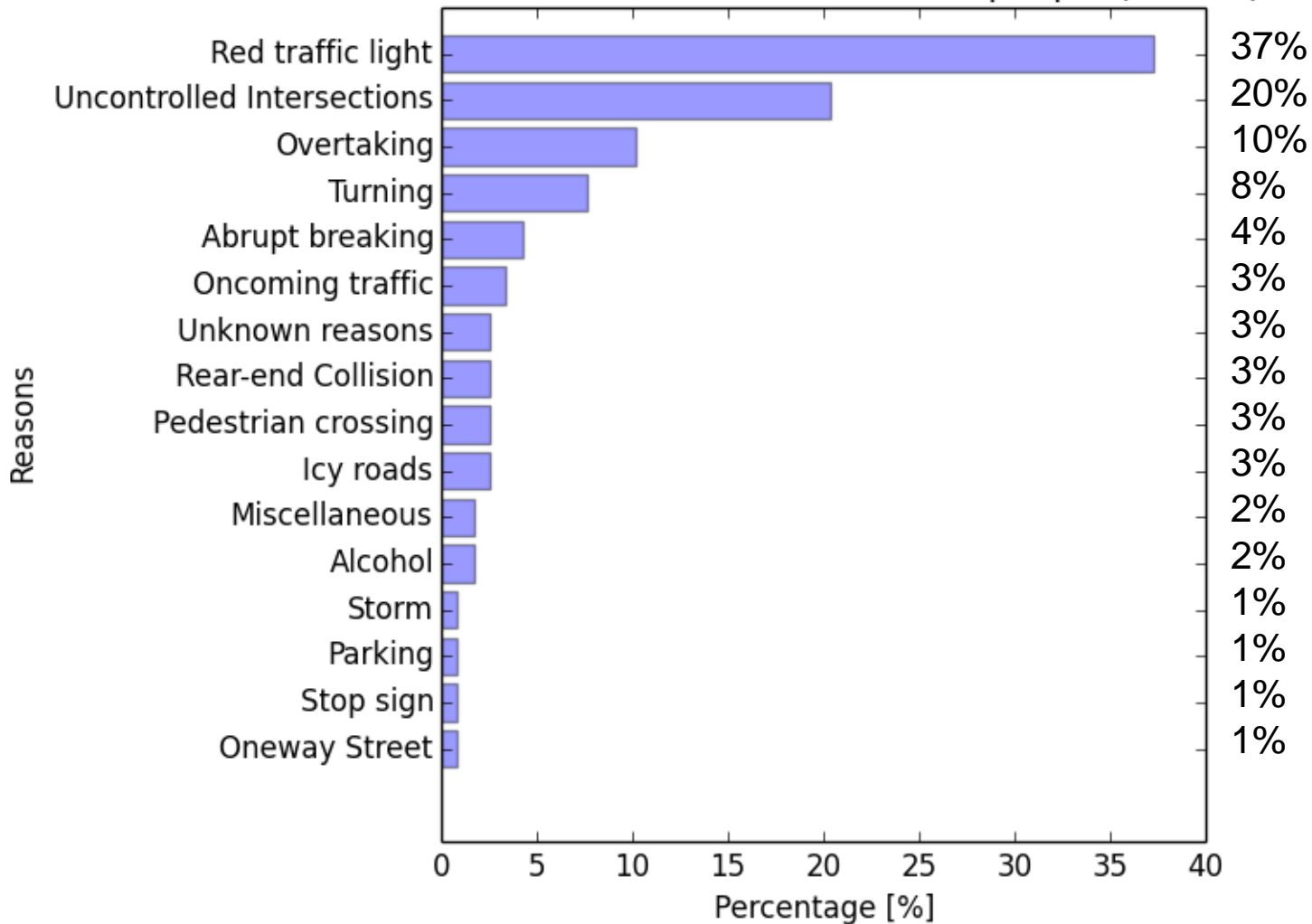
## Results (3/6)



# Results (4/6)

## 291 people were insured

Reasons for accident with insured people (n=118)



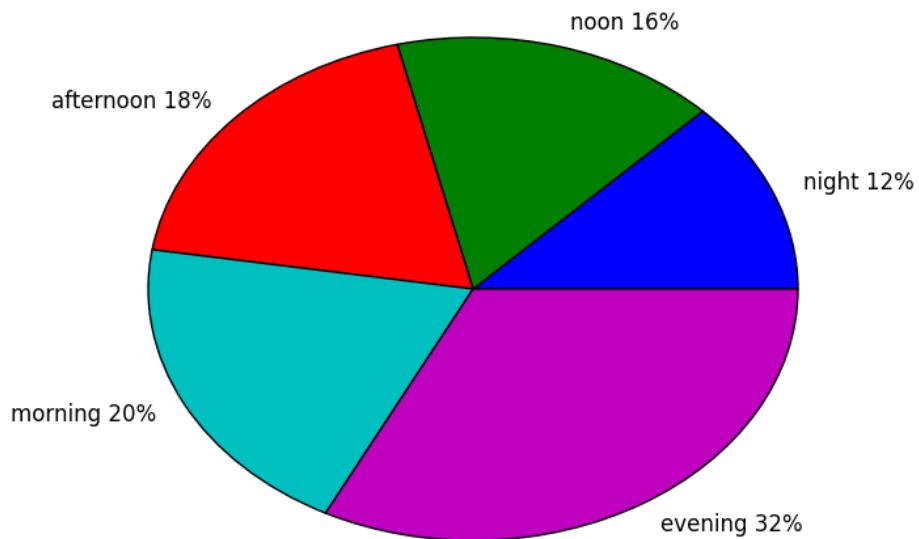
# Results (5/6)

## 12 were killed people

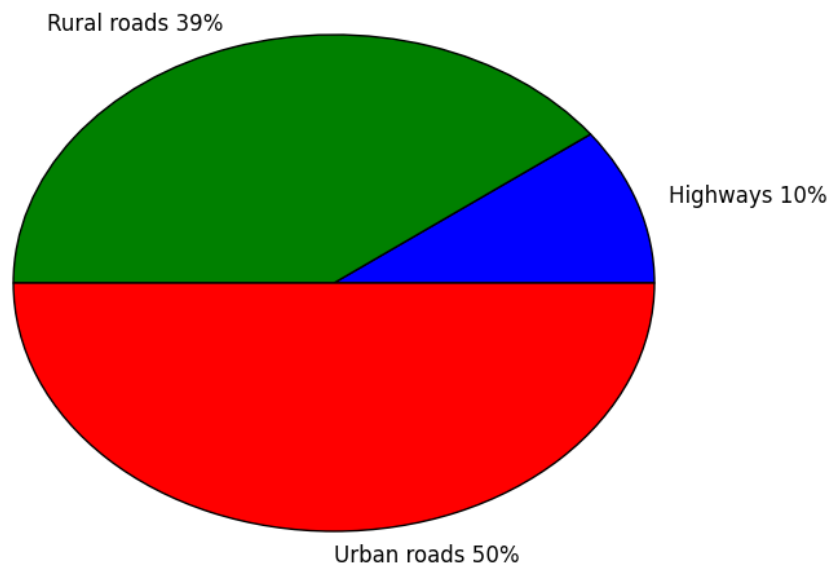


# Results (6/6)

Time of the accidents with emergency vehicles (n= 80.0)



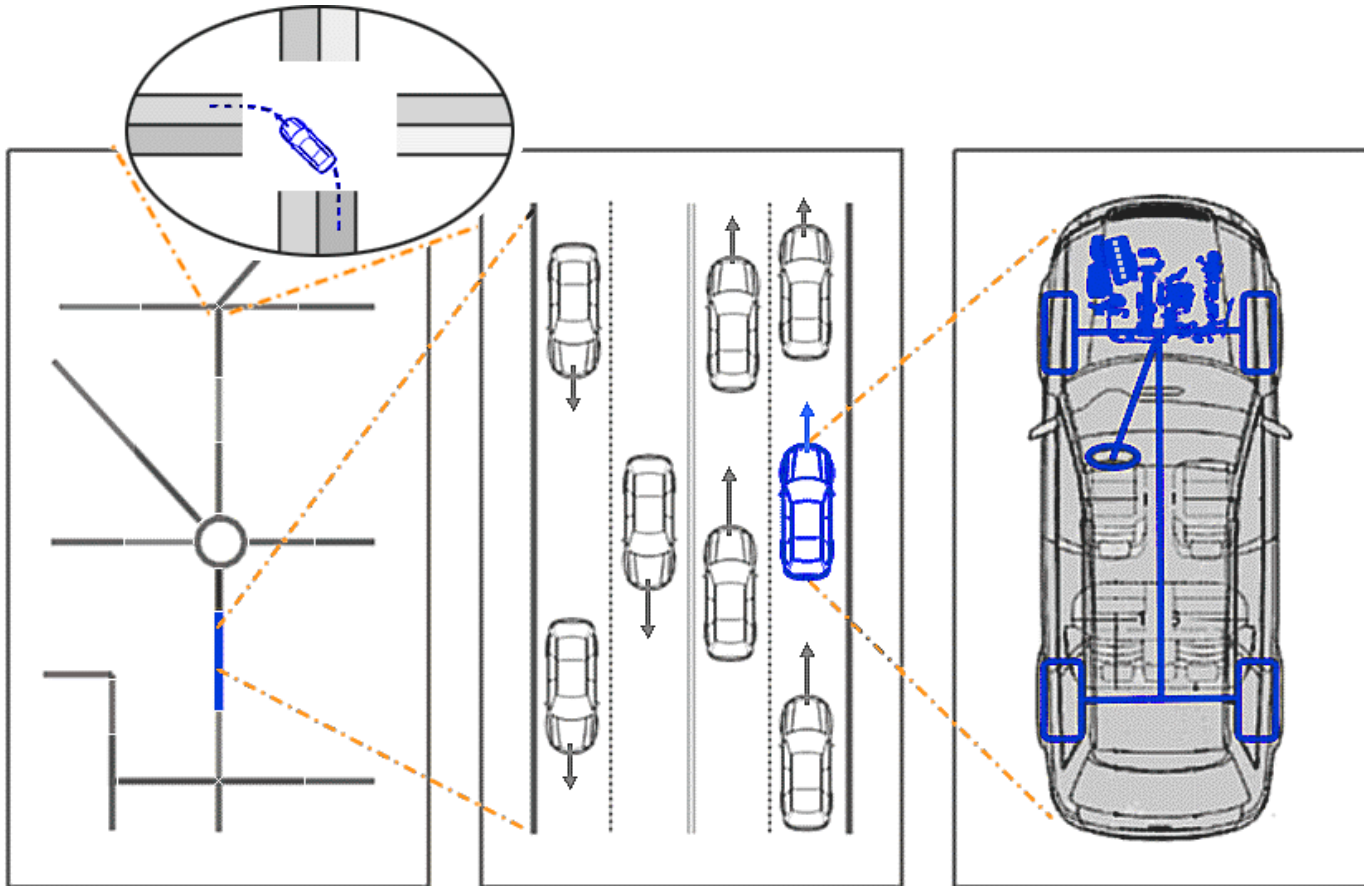
Road types of accidents with emergency vehicles (n= 88.0)



# Discussion

- Newspaper data are already filtered
  - heavy accidents will get more attention
  - There will be a lot more accidents
  - Very detailed
- The results are similar to other studies
- Emergency vehicle driver should be supported

# Simulation in SUMO



# Simulation in SUMO



- SUMO was first released in 2002
- Used worldwide
- Increasing number of users
- High level of awareness in science
- Open source

# But...

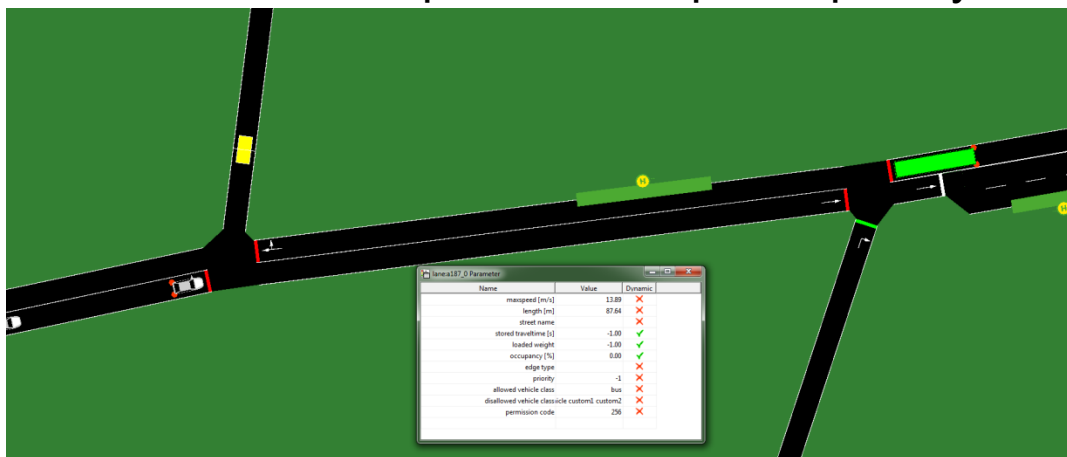


Current state of SUMO:

- All traffic rules are followed
- No accidents
- No emergency vehicles are modelled

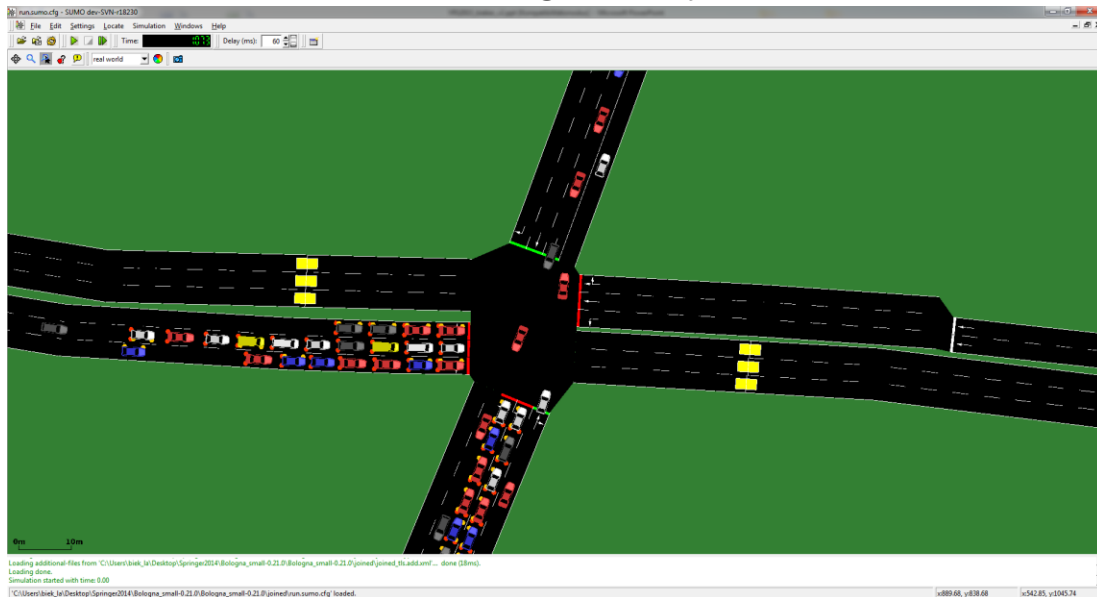
# Special Rights of Emergency Vehicles 1/2

- Speeding
  - Modelled with “SpeedFactor” in “VehicleType”
- Use restricted roads
  - Modelled with “vClass” in “VehicleType”
- Violate red traffic lights
  - In TraCI Vehicle “speed mode”
- Request priority at intersections
  - „impatience“ requests priority



## Special Rights of Emergency Vehicles 2/2

- Use emergency lane
- Use one way streets in opposing direction
- Overtake other vehicles
- Ignore stopping restrictions and parking prohibitions
  - Parking is not modelled in SUMO
  - Stopping is only possible at defined stops at the moment



# Conclusions

- Accidents statistics of emergency vehicles
- Emergency vehicles have more accidents while using special rights
- Most of the accidents are happening at intersections
- Next studies should investigate:
  - How traffic safety can be improved for emergency vehicles
  - Traffic simulation models for emergency vehicles
  - Traffic safety model
  - Evaluate traffic safety solutions for emergency vehicles with a simulation



**Questions? Comments?**

# Acknowledgement

This work has been partly funded by the German-Israeli Foundation for scientific Research and Development. The author wishes to acknowledge the Foundation for their support.

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