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# PSE

# Verkehrssimulation

Performance and Model Evaluation

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# Content

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- Current State and Drawbacks
- Requirements
- Performance Analysis
  - ◆ Runtime Analysis
  - ◆ Memory Analysis
- Model Evaluation
- Final Presentation

# Current State

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- Your traffic simulator is capable of simulating
  - ◆ Flexible traffic networks given in XML
  - ◆ Textual and visual output of simulation results
  - ◆ Traffic behaviour at various types of intersections
  - ◆ Handling of activities (incl. computation of routes)
  - ◆ (Multi-Lane Traffic)
- Drawbacks
  - ◆ No possibility for visual model evaluation yet
  - ◆ No performance analysis yet

# Requirements

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- A good simulator should have the following characteristics
  - ◆ Efficiency / Performance
    - Deal with large networks and many vehicles in reasonable amount of time
    - Efficient usage of memory
  - ◆ Fault-Tolerancy
  - ◆ Realism
    - Accurate and realistic models
    - Adaptivity,...
  - ◆ ...

# Performance Analysis

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- Important parameters are
  - ◆ Memory usage
  - ◆ Overall Runtime
  - ◆ Runtime of certain parts
  - ◆ ...
- Runtime should be as fast as possible without neglecting detail
  - ◆ Multiple simulation runs
  - ◆ Parameter studies
  - ◆ ...
- Memory Efficiency: large scenarios possible

# Runtime Analysis

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- Several runtimes are interesting
  - ◆ Overall runtime
  - ◆ Runtime of preprocessing steps (e.g. parsing the network and activity files)
  - ◆ Simulation runtime
- Various types of time
  - ◆ CPU time vs. Real time
  - ◆ Different users are addressed
- Different ways of measuring runtime
  - ◆ Internal Java methods of measuring time
  - ◆ Linux `time` command (cf. man-Page)

# Runtime Analysis (2)

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- Real time – simulation time ratio is an important measure
- Provides information of computational speed compared to real world measurements
- A ratio greater than 1 is desired!
  - ◆ Starting at a specific point in time predictions for the future can be made
  - ◆ ...
- Value often used for comparing simulators

# Memory analysis

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- Memory is a critical factor
- Scenarios should fit into main memory
- Otherwise, parts of the scenario have to be swapped to external memory (e.g. hard disks)
  - ◆ Access to external memory much slower than access to main memory
- Several ways of measuring memory consumption of program
  - ◆ Internal Java methods: `java.lang.runtime` , e.g.
  - ◆ Linux command `top`
  - ◆ Information provided at `/proc`
  - ◆ ...



# Final Presentation

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- Each group has to present their final simulator
- The presentation should last between 10 and 15 minutes
- Present your simulator, its features and things of special interest
- Show the results you computed by preparing sheet 6
- All participants of the group have to participate actively in the presentation

# Questions?

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