Traffic Simulation

Agent-Based Modelling

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Traffic Problems

- Road network — critical infrastructure
- Many risks
  1. Congestion
  2. Noise and Polution
  3. Accidents
- Complex system — risks are difficult to predict

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For example — Congestion

- Congestion increases travel time — bad
- Build more roads — increase capacity.
- What happens?
  1. less congestion?
  2. or more congestions?
- Could be either...
- Risk may redirect traffic into new bottlenecks
- Risks may manifest far from the proposed reconstruction

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For example — Speed limits

- How do you maximise road throughput?
- What is the effect of speed limits?
  - Higher speed limit $\Rightarrow$ individual travels faster
  - Throughput normally unaffected

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Scenarios — Speed limits

- Steady traffic on straight road
  - distance between vehicles = 3s
  - constant throughput
- Intersection
  1. Other traffic at high speed = difficult situation
  2. Increase safety margins
  3. Distance between vehicles is reduced
  4. Throughput is reduced
- Varying speeds
  - Difficult to maintain constant 3s distance
  - Erratic flow
  - Likely to decrease throughput

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Traffic Simulation

When the problem is to complex for analysis, try simulation

1. Agent-based simulation
2. Vehicles as agents
   1. perception: traffic ahead
   2. behaviour: brake or accellerate
3. Vehicle strategy
   - drivers may be more or less risk seeking
   - drivers may behave more or less randomly
4. Landscape
   - roads
   - intersections

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Conclusion

- Traffic and Road Management
  - many complex problems
  - many good cases for simulation
- Project for you:
  - Investigate relationship between a speed and throughput in a roundabout

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