



Intelligent traffic light control using reinforcement learning

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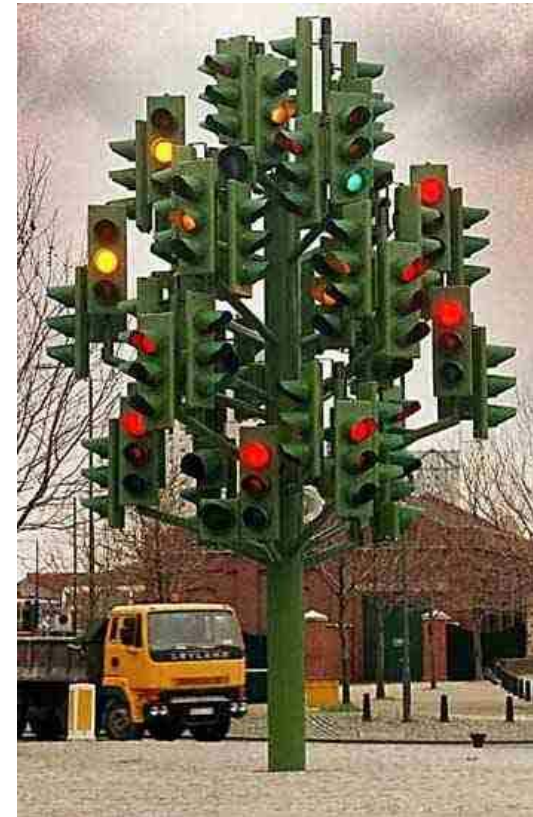
Interactive Collaborative Information Systems

Background

- Recent trend in AI/Machine Learning: modeling and control of distributed, *multi-agent* systems
- Examples:
 - Robocup
 - Internet/cell phone routers



Our problem domain: traffic control



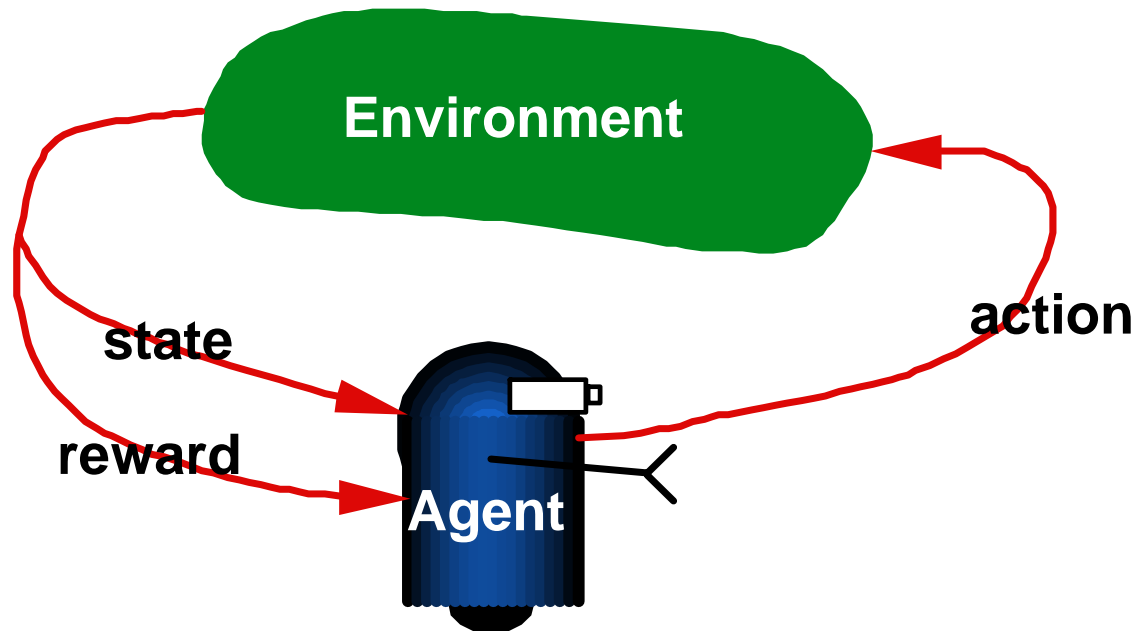


Intelligent traffic light control

- Machine learning for traffic light control
 - method: reinforcement learning
 - goal: minimize average traffic waiting time
- Use existing traffic simulator
 - developed by Universiteit Utrecht machine learning group

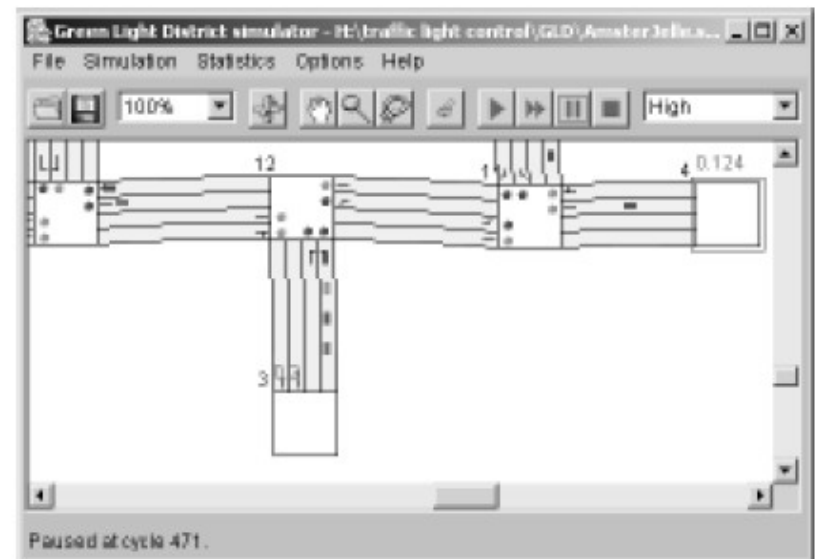
Reinforcement Learning (RL)

- Goal: learn good (optimal) policy which maps states to actions, based on delayed scalar rewards
- Agent learns autonomously through trial-and-error
- Policy maximizes a measure of *cumulative* reward



Traffic simulator

- “Green Light District” (GLD) simulator
- Developed by Marco Wiering’s group in Utrecht
- Allows building of road network, junctions, traffic lights
- Already implements a number of non-learning and reinforcement learning controllers
- Marco Wiering is available for urgent questions





Goal

- Use GLD simulator to implement and test a novel variation of one of the RL algorithms



Concrete steps

- Download GLD and get it running
- Study basic RL and GLD papers
- Run one of the implemented RL algorithms and replicate the results reported in GLD papers
- Implement and test a variation of one of the RL algorithms
- Write report



This project offers...

- Hands-on experience with state-of-the-art RL algorithms
- Important real-world application
- Contribute to large research project (ICIS) that is starting up now



Literature

- Sutton & Barto (1998). Reinforcement learning: an introduction. MIT Press.
- Kaelbling, Littmann, & Moore (1996). Reinforcement learning: a survey. Artificial Intelligence Research, vol. 4, pp. 237-285.
- M. Wiering, J. van Veenen, J. Vreeken, and A. Koopman. Intelligent traffic light control. Technical Report UU-CS-2004-029, University Utrecht, 2004.
- M. Wiering, J. Vreeken, J. van Veenen, and A. Koopman. Simulation and optimization of traffic in a city. IEEE Intelligent Vehicles symposium (IV'04), 2004.
- GLD simulator: <http://www.cs.uu.nl/people/marco/>