

What Artificial Intelligence has to do with Traffic ?

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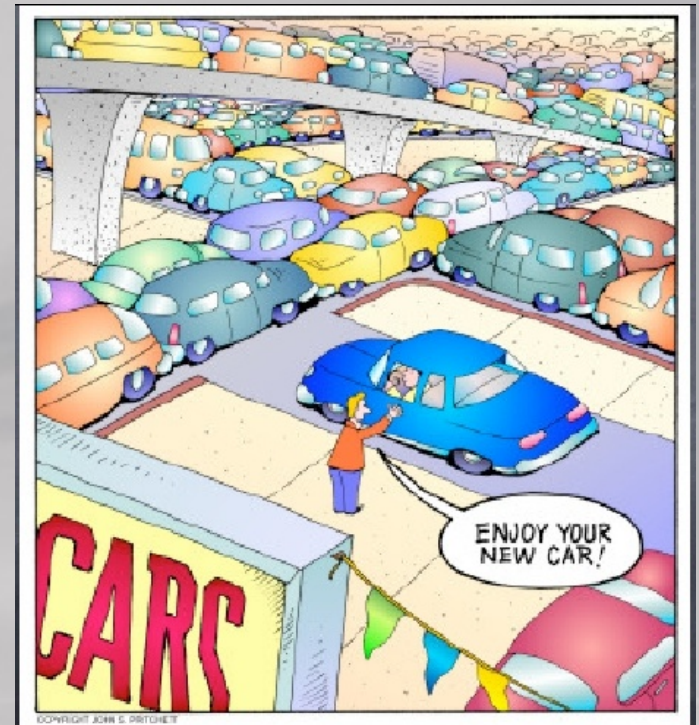
Motivation

- Example from Brazil
 - Good media exposition...
 - ... but: consequences?



Motivation

- Increasing middle class
 - Middle class “kit”:
 - Cell phone
 - TV
 - ...
 - Car
 - ...



Challenges

- Increasing demand for mobility
- Bad infrastructure

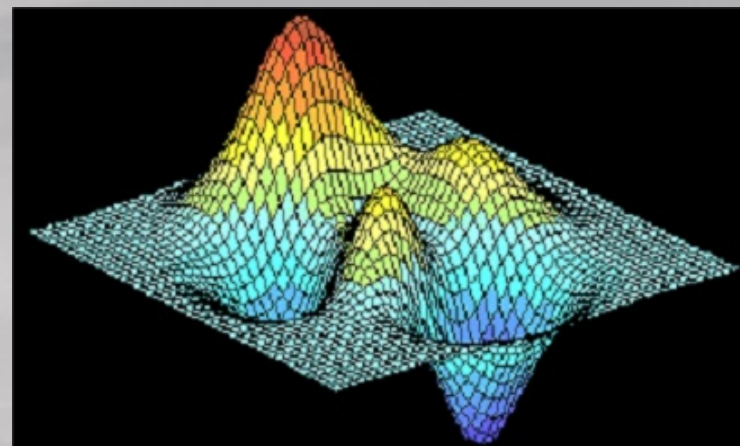


Outline

- Otimization
- Artificial Intelligence
- Traffic Engineering
- Putting All Together
- The Challenge Ahead
 - FIFA Cup 2014

Otimization

- Process used to determine the optimum value of something
- Webster: an act, process, or methodology of making something (as a design, system, or decision) as fully perfect, functional, or effective as possible; specifically : the mathematical procedures (as finding the maximum of a function) involved in this
- Normally: computationally hard !



Artificial Intelligence

- In this case: provides heuristics to solve computationally hard problems
 - Find the best possible path
 - Find the cheapest possible flight, hotel, etc.
 - Find the best possible recommendation of movie, route etc. for me
 - ...

Traffic Engineering

- So far:
 - Methods to provide infrastructure to cope with demand of transport of people and load
- Currently:
 - Methods to optimize infrastructure to cope with demand of transport of people and load



Putting All Together

- Optimization methods: close to dead end
- Need to address problem using:
 - New technologies (GPS, RFID, ...)
 - Useful information
 - Personalized information (cell phone)
 - Distributed artificial intelligence
 - Agents
 - Sensor networks
 - ...

Where can AI Help?

- Addressing distributed, dynamic, incomplete information
 - How do I go fastest from A to B?
 - Need to reason with incomplete information
 - How to engineer autonomous driving?
 - How to make self-interested agents to act for the good of the global system?
 - Market-based approaches,
 - mechanism design,
 - negotiation

How Close Are We?

- DARPA challenge
 - Autonomous driving

The Urban Challenge

This pimped-up Chevrolet Tahoe is now, officially, the cleverest car in the world. It was the winner of the \$2m first prize in the Urban Challenge, a competition held on November 3rd. The challenge, issued by America's Defence Advanced Research Projects Agency, was to design a robot car capable of negotiating urban streets and normal traffic. Although the streets in question were part of an old airforce base in southern California and the "normal" traffic was driven by professional stunt drivers, the test was nevertheless fairly realistic. *Boss*, as the Tahoe was dubbed by the engineers from Carnegie Mellon University who fitted it with the necessary controls and software, managed to travel the 88km (55 mile) course at an average speed of 22kph without hitting anything and without too many infractions of California's traffic regulations.



What do we do?

- Project **MOBIL**: Modeling of control and demand routing in Intelligent Transportation Systems using multiagent environments
- Problems:
 - Increasing demand
 - Centralized control



MOBIL

- Objectives:
 - Intelligent cars !!!
 - Microscopic, agent-based modeling
 - Efficient routing for route recommendation
 - Use of modern technologies
 - GPS, mobile phones, embedded systems



Challenges Ahead

- World Soccer Cup 2014
 - Prevent transportation chaos
 - Information, information, information
 - Tourists
 - General public

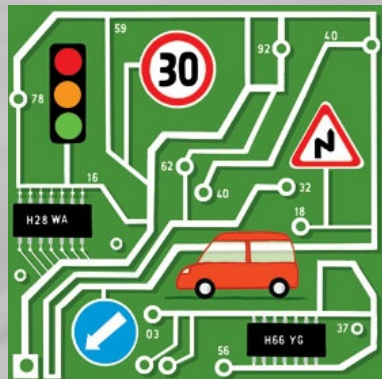
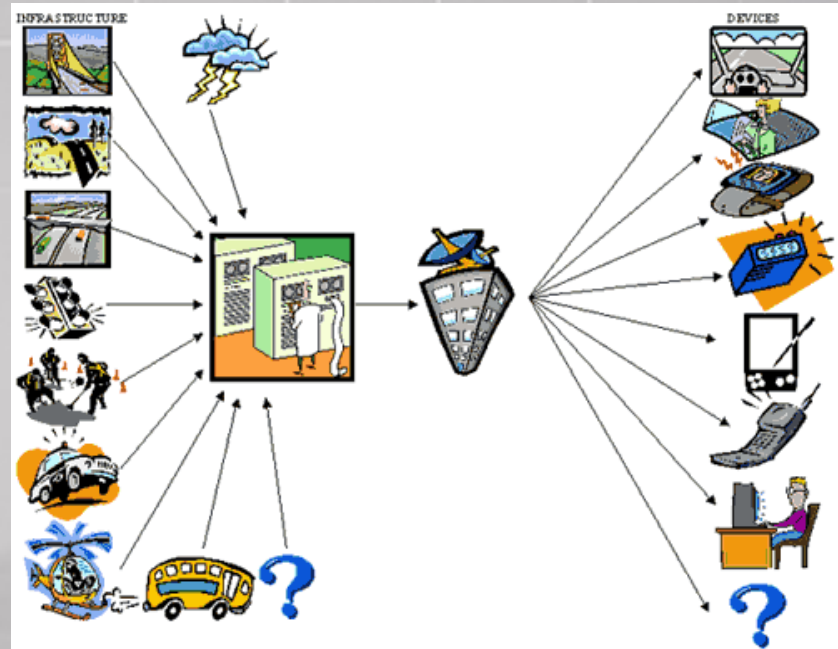
Challenges Ahead

- To go from here....



Challenges Ahead

● ... to here



Thanks !

- Short Bio: Prof. Ana Bazzan (PhD, Univ. Karlsruhe, 97) is associate professor at the Comp. Science Inst. at UFRGS; works on the frontier of traffic and AI since 1993; several projects with Germany; research area: multiagent systems
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