1 - Intro to AI and Search

What is Artificial Intelligence?

- Turing test

- Chinese room experiment

- Rational agents

    - Perceive the environment through sensors (percepts)
    - Act upon the environment through actuators (actions)
- Rationality vs Omniscience (全知)

    - An omniscient agent knows everything about the environment, and knows the actual effects of its actions.
    - A rational agent just makes the best of wat it has at its disposal, maximizing expected performance given its percepts and knowledge.

	Humanly	**Rationally**
Thinking	Systems that think like humans (Cognitive Science)	Systems that think rationally (Logics: Knowledge and Deduction)
Acting	Systems that act like humans (Turing Test)	Systems that act rationally (How to make good action choices)

AI Solver, SAT & CSPs, Classical Planning Model L1 P28-30

Why do we need such an AI

- Chesses: 2 player zero-sum game
- Music/Speech recognition
- Recommender systems
- Medical diagnosis: decision support systems
- Self-driven car
- Playing Atari Games: deep learning

Why do we need such AI Planning

- Space Exploration

    - RAX - first artificial intelligence control system to control a spacecraft without human supervision
- Business Process Management

- First Person Shooters & Games

    - Classical planners playing Atari Games
- Interactive Storytelling

- Network Security

- Logistics/Transportation/Manufacturing

    - Multi-model Transportation, forest fire fighting, PARC printer
- Warehouse Automation

- Multi-Agent Path Finding, Post China, Amazon
  - Automation of Industrial Operations (Schlumberger)
  - Self Driving Cars

Summary

  - A research agenda that has emerged in last 20 years: solvers for a range of intractable models.

  - Solvers unlike other programs are general as they do not target individual problems but families of problems (models).

  - The challenge is computational: how to scale up

  - Sheer size of problem shouldn't be impediment to meaningful solution

  - Structure of given problem must recognized and exploited

  - Lots of room for ideas but methodology empirical

  - Consistent progress

    - effective inference methods (derivation of h, conflict-learning)
    - islands of tractability (treewidth methods and relaxations)
    - transformations (compiling away incomplete info, extended goals, ...)