

CS 4725 / CS6705
FOUNDATIONS OF
ARTIFICIAL INTELLIGENCE

Introduction

Housekeeping

- Google 'Ulieru' (first link) - Teaching
- Course Outline (will be updated based on your feedback!)
- Textbook: S. Russell and P. Norvig
Artificial Intelligence: A Modern Approach
Prentice Hall, 2003, **Second Edition**
- Class Reps:
Zeinab Noorian (grad); Mat Roscoe

How will we proceed(?)

- Exam or Project based?
- Lab?
- What would you like to learn?
- Learn a beautiful (and easy / intuitive) agent language?

What is AI?

- Various definitions
- **Building intelligent entities.**
- Getting computers to do tasks which require human intelligence.
- But what is “intelligence”?
 - Simple things turn out to be the hardest to automate:
 - Recognising a face.
 - Navigating a busy street.
- Understanding what someone says (**‘ability to summarize’** [Zadeh])

All tasks require reasoning on knowledge

Knowledge representation

- Goal: develop data structures that make it easy to represent diverse, “real-world” knowledge
- Typical approaches
 - Logic (propositional, predicate, normative)
 - Semantic networks (nodes, named links, hierarchies)
- Major challenge is automation of knowledge capture (“knowledge engineering”)

Example

We can assert some facts and some rules,
then ask questions to find out what is true.

- Facts: ('Prolog style')

likes(john, mary).

tall(john).

tall(sue).

short(fred).

teaches(lecturer, artificialIntelligence).

Rules:

John likes *someone if* that someone is tall.

likes(fred, X) :- tall(X).

A person examines a course *if* they teach that course.

examines(Person, Course) :- teaches(Person, Course).

Note: Prolog is a language geared to representing knowledge and searching for solutions. Prolog programs are based on facts and rules, and run by asking questions.

Engineering goals of AI

- **Develop tools that can mimic capabilities of “intelligent” entities (e.g. humans)**
 - **Agents:**

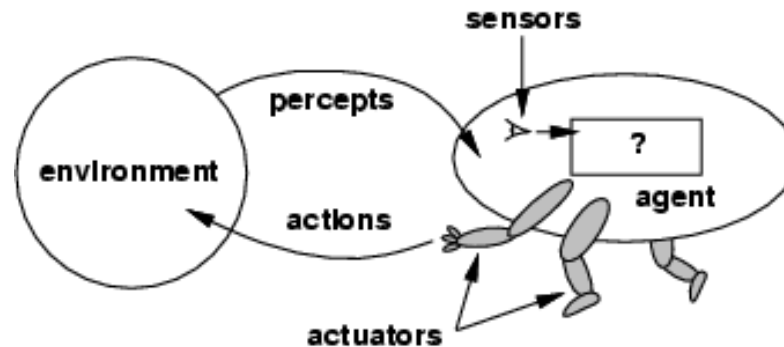
How can we develop and use practical “intelligent agents”.

 - Sensory responsiveness
 - Speech, vision, ...
 - Manipulation (control) of environment
 - Planning, actions, feedback
- **Create useful “smart” programs able to do tasks that would normally require a human expert**
 - **Knowledge Engineering:**
 - How do we elicit the human expertise required?
 - Complex data processing
 - Retrieval, filtering...

Approaches to AI

- Symbolic AI:
 - *Intelligence*: **manipulation of symbols**
 - *AI*: symbolic representation of knowledge, search through representations
- Statistical AI:
 - *Intelligence*: **learn from statistical regularities in data**
 - *AI*: development of “information filters”
- Embodied AI:
 - *Intelligence*: **dealing with challenges in environment**
 - *AI*: construction of **agents** that combine “rational” & “emotive” capabilities

Agents and environments



- The **agent function** maps from percept histories to actions:

$$[f: \mathcal{P}^* \rightarrow \mathcal{A}]$$

- The **agent program** runs on the physical **architecture** to produce f
- agent = architecture + program

Typical AI Problems

- Intelligent entities (or “agents”) need to be able to do both “mundane” and “expert” tasks:
 - Mundane tasks - consider going shopping:
 - *Planning* a route, and sequence of shops to visit!
 - *Recognising* (through *vision*) buses, people.
 - Communicating (through *natural language*).
 - ‘Expert’ tasks are things like:
 - Medical diagnosis.
 - Equipment repair
- Often “mundane” tasks are the hardest ...

We will cover:

Knowledge representation:

- How do we represent knowledge about the world in a formal manner that can be manipulated in a sound and efficient manner?

Planning as a subset of search:

- How can an AI system go through all the possibilities in a systematic manner when looking for solutions to complex problems.

Agent architectures

? (your wishes!!!)

Homework

- Due on Friday, Jan. 8, 2010

Write one paragraph with your ‘definition’ of AI and based on it state your expectations from this course (what would you like to learn?)

[Please remember: “ability to summarize is the quintessence of intelligence” – so write a **short** paragraph!... 😊]