Lecture 8

Part One

Symbol Systems, AI Programs, Intelligence, the Turing Test

TBA Topic Suggestion

- In a special edition of the journal *Cortex* in 2006 Max Coltheart issued a challenge:
  - What has functional neuroimaging (fMRI) shown us about the mind thus far?

- Various people wrote in saying what their fMRI experiments show us about the mind
  - Coltheart says that none of these examples are cases of fMRI showing us about the mind

TBA Topic Suggestion

- He says that since there doesn't seem to be a case that answers his challenge this raises the following question:

  - Is it that fMRI can't show us anything about the mind *in principle?*

TBA Topic Suggestion

- Current debate
  - Cortex, 2006
  - Debated at the Cognitive Science conference last year
- Draws on some of the themes of this course

– The relationship between mental (cognitive) states and brain states
– The role of philosophy as unifying and critiquing

- It would be a shame not to look at something so close to home

Plan

- Symbol Systems
- AI Programs
- Intelligence
- Turing Test

Symbol Systems

- Newell and Simon (pioneers of AI) A symbol system is:
  - A physical device that contains a set of interpretable and combinable items (symbols)
  - And a set of processes that can operate on them (copying, conjoining etc)
  - These are necessary and sufficient conditions for intelligent action

Symbol Systems

- The meaning (content) of the symbol is meant to be determined by its place in the network (of inputs, other states, and outputs)
- Meant to be a case of the semantics (meaning / content) being determined by the syntax (place in the network or processes operating on the symbols)
- Like how the states of the machine table (0,1 etc) were defined in relation to inputs, other internal states, and outputs

Coke Machine Table

- State 0
  - If $1 is input then goto state 1
  - If 50c is input then goto state 2
- State 1
  - If 50c is input then output coke and goto state 0
  - If $1 is input then output coke and output 50c and goto state 0
- State 2
  - If $1 is input then output coke and goto state 0
  - If 50c is input then goto state 3
- State 3
  - If $1 is input then output coke and output 50c and goto state 0
  - If 50c is input then output coke and goto state 0

Symbol Systems

- The plan is to use a symbolic code to store long term knowledge (a knowledge database)

- Intelligence is then the ability to successfully search the database to find a solution to a given problem

AI Symbol System Programs

- Restaurant Script
- SOAR

Transparency of Symbols

- We think about things like trees, cats, colors etc
- A ‘transparent symbol’ is a symbol with content that is familiar to us
- The machine table helps make sense of symbols that have content that are not transparent to us
  - Cognitive psychology?
  - Neuroscience?

Intelligence

- We take some behaviors to indicate intelligence
  - Playing chess
  - Solving equations or ‘real world’ problems
  - Conversing in language
- Intelligence seems (intuitively) to have something to do with sophisticated cognitive processing

Can a Machine Think?

- There had been much controversy over whether machines could (one day) think
- There was much controversy over how we would know whether a machine really was thinking or not
- Alan Turing proposed the ‘Turing Test’

The Turing Test

- Three independent judges get to converse via tele-terminal. They can ask whatever questions they like
  - They might be conversing with a human…
  - They might be conversing with a computer…
- If the computer fools 2 out of 3 judges then the computer wins
  - The computer deserves to be regarded as a genuine thinker
  - So then the issue becomes ‘can a machine pass the test?’

Eliza

- Eliza was developed as a model of a Rogerian Psychotherapist
- The program takes sentances of English and transforms them into outputs (Rogerian Psychotherapy style)
- Does pretty well sometimes. Also has fallback phrases
  - Hmm… Interesting…
  - Tell me more…
  - Check out the program online!

Parry

- Parry was developed as a model of paranoid schizophrenia
- The program takes sentences of English and transforms them into outputs (paranoid schizophrenia style)
- Does pretty well sometimes. Also has fallback phrases
  - The Mafia are after me!
  - Are you thinking of hurting me?

Turing Test

- 2 out of 3 psychiatrists thought they were conversing with a person with paranoid schizophrenia
  - Parry passed!
- A problem with these programs is that they aren't 'normal' people so they can have fallback phrases
- The judges may have underestimated AI and not asked probing enough questions
- The psychiatrists were ethically limited because they didn't want to risk further disturbing a psychiatric patient

The Turing Test

- ‘Odd’ answers were attributed to the Rogerian orientation or the paranoia
- The psychiatrists couldn’t question freely incase they upset an ill person
- So maybe Parry didn’t pass the test

Can Machines Exhibit Intelligence?

- The invention of the pocket calculator seemed to debunk solving equations as indicative of genuine intelligence
  - Pocket calculators can calculate but they don't seem to be very intelligent or to be *thinking* or *understanding* what they are doing
    - Good model of a person obsessed with numbers?

Concerns

- It might be that it isn't enough to *behave* intelligently
  - Once we find out how something does it the explanation can be 'debunking'
- A criticism of AI is that while computers might mimic behavior they don't seem to do it the way we do it (their architecture is very different from ours
- Another criticism of AI is that no amount of state transitions can give us genuine intelligence