What we have learnt in this course

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Roughly three parts of the course

Lectures 1-10, Lab 1-5: Expand your notion of "computation".

- Scribbler

- Pseudocode

- Game of life, cellular automata, physical systems (weather, twister..)

- Web, networks, websearch, datamining.

- Turing-Post programs (universal programs, undecidability)

- Digital sound and music

Lectures 11-16; Labs 6-7: Looking inside current computers

- Boolean logic

- Circuits (combinational, and sequential)

- Finite state machine (the "controller")

- CPUs and computer organization.

- Silicon chips; microprocessors; Moore's Law

- Caching and Multitasking

Lectures 16-24; Labs 7-10: New Concepts that arose from study of computers and computation

- WWW and the Internet

- Efficient computations, P vs NP, NP-completeness

- Bioinformatics

- Cryptography; Zero Knowledge Proofs

- Viruses/Worms/Zombies/Cybersecurity

- Machine Learning

- Artificial intelligence.

Study guide for final (see handout)
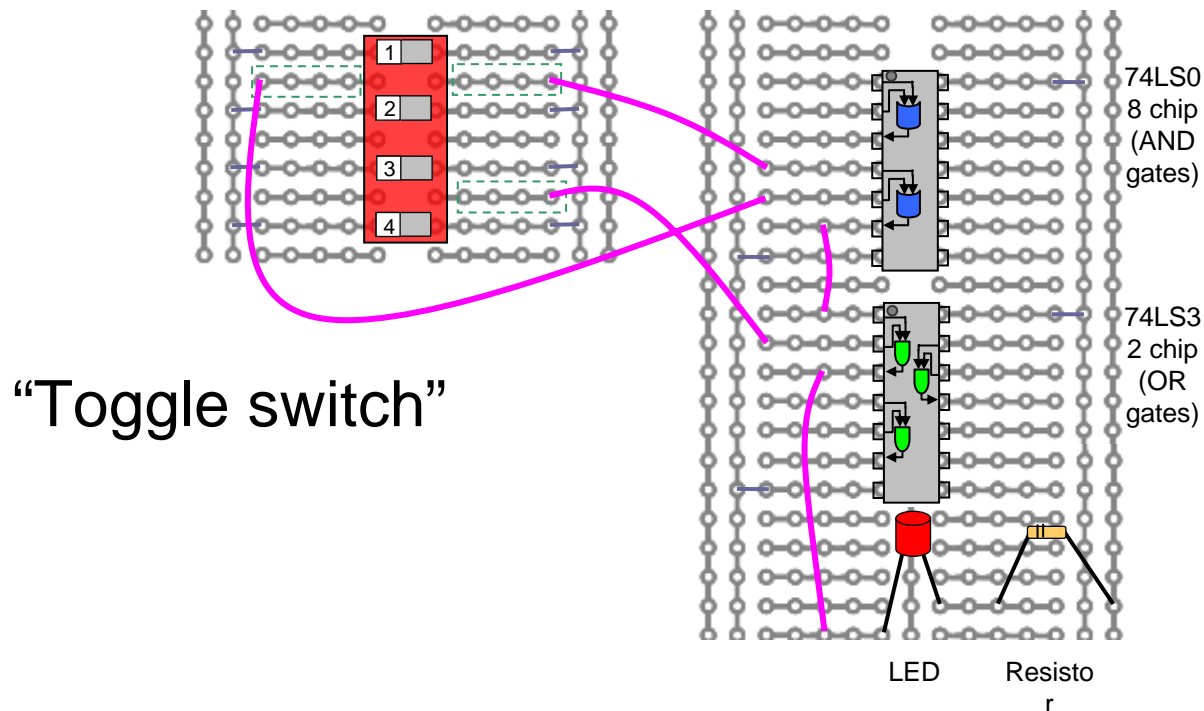
Two types of questions:
  (a) Test a particular skill
   (b) Test knowledge of a topic at a conceptual level.

Suggestion: Focus on "basic concepts"; main themes
of lecture/lab/reading rather than arcana. Exam is closed-book.

Example of Type (a) question

Here is a diagram of a combinational circuit assembled on the breadboard. It has three inputs, coming from the toggle switch. Write its truth table (output of 1 corresponds to LED lighting up).

"Toggle switch"

74LS08 chip (AND gates)

74LS32 chip (OR gates)

LED   Resistor

Examples of Type (b) questions

• What is the difference between a virus and a worm? All things being equal, which would tend to propagate faster?

• Explain in a couple of lines how the current internet deals with congestion issues.

Many short questions.

One news

We will not count the grade for one lab and one HW (your worst one)

Some final thoughts on the Searle discussion

(and where all this is heading)

A billion-line computer program

is in principle

Nothing but a Turing-Post program

And therefore

Nothing but a symbol manipulator

Somewhat like: "Man is nothing but a bundle of atoms."

Quick Poll: What do you predict?

1. Computers will NEVER pass the Turing Test and will not be considered conscious in any way.

2. Computers will pass the Turing Test but will not be considered conscious or intelligent ("humanlike").

3. Computers will never pass the Turing Test but some may be considered conscious (e.g., like a cat or dog).

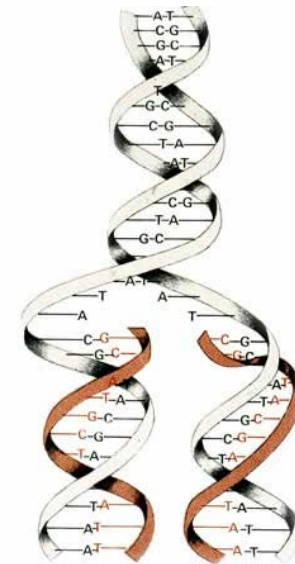4. Computers will pass the Turing Test and will be considered conscious.

Unlike Searle, I find #2 impossible; all the rest seem possible.

If pressed, I would guess #4

History of science is replete with phenomena that were once mysterious and unexplainable.

Self-reproduction

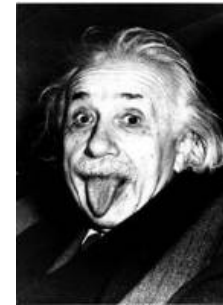Once explained, quickly integrated into our worldview

Generally accepted fact about AI

Programming all necessary knowledge into computers is hopeless.
Only hope : General purpose Learning Algorithms

Many years of learning

Approach already successful in restricted domains:
Deep Blue, Google, Automated Stock Trading, Checking X-rays.

Thoughts about Deep Blue

May 11th, 1997
Computer won world champion of chess
(Deep Blue)   (Garry Kasparov)

(Reuters = Kyodo News)

- Tremendous computing power (ability to "look ahead" several moves)

- Programmed by a team containing chess grandmasters.

- Had access to huge database of past chess games.

- Used machine learning tools on database to hone its skills.

"Human-machine computing"

"Second Life"

- Online community where everybody acquires an "avatar." (Piece of code; point-and-click programming as in Scribbler.)
- Avatar customizable but follows laws of physics in imaginary world (remember: weather simulation)

Weird 2ⁿᵈ life facts

(See handout)

- Ability to buy/sell. ("Linden dollars")
- Budding markets in real estate, avatar skins, clothes, entertainment, "teaching" avatars new skills, etc.
- Emerging political systems

An interesting viewpoint: Second-Lifers are teaching the computer what "human life" is.

(Analogies: Chess database and Deep Blue, WWW and Google.)

The most interesting question

Not:

"Will computers ever be conscious?"

But:

Where will all this take **us**?

(and our science, society, politics,…)

Enjoy your future in the computational universe!