- An algorithm is a concrete procedure to solve a particular problem (that is, give a particular output for each input)
- [A heuristic is an algorithm that is a short-cut to approximately solve a problem more quickly or easily — humans use a lot of them]
- Turing machines provide a concrete procedure for carrying out any algorithm that could be invented
- Turing speculated that any procedure that could be expressed as an algorithm could be carried out on a Turing machine

    - This has come to be called the Church-Turing thesis: Anything that *can be computed by any system* can be computed by a computer (a Turing machine)

    - That is: all computing devices have the same limits on computational power

    - This includes the brain!

But can a machine "think"?

- That depends on what you mean by "think"
- Turing's main idea is that "intelligence" is defined by what a machine's input-output function
- He expressed this by a test he called the Imitation Game, now usually called the Turing Test
- If the responses a device gives seem intelligent—in the opinion of an impartial intelligent judge—then it is intelligent!

  - "Intelligence is as intelligence does"

The Turing Test

Can a machine "think"?

or a better yet:

What observable behavior would count as thinking?

A judge "texts" back and forth with a mystery entity.

If the entity is a computer, it tries to pretend to be a human being.

If it passes, is its behavior "intelligent?"

Or is it just a "simulation" of intelligence?

- Artificial Intelligence

  - attempts to program computers to be intelligent

- "Getting computers to be intelligent" and "understanding the computations that underlie human intelligence" are the same thing—flip sides of the same coin

  - If we knew the algorithms underlying human cognition, we could implement them on a computer and get real AI

Highlights of AI

- Samuels' checkers program

  learns and improves; eventually beats human players including its programmer

- Eliza: simulates a psychotherapist

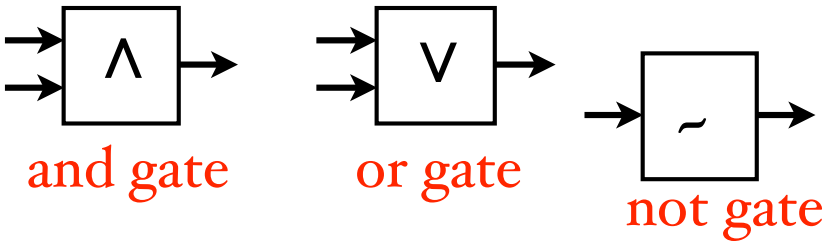
  Surprisingly convincing in a limited domain; shows that apparent intelligence often reflects simple underlying rules

- Chess: Much harder to simulate human intelligence; doesn't beat human champion until 1996

- Vision, language: still working on it

Logic gates

Same as connectives,
but as a piece of a circuit



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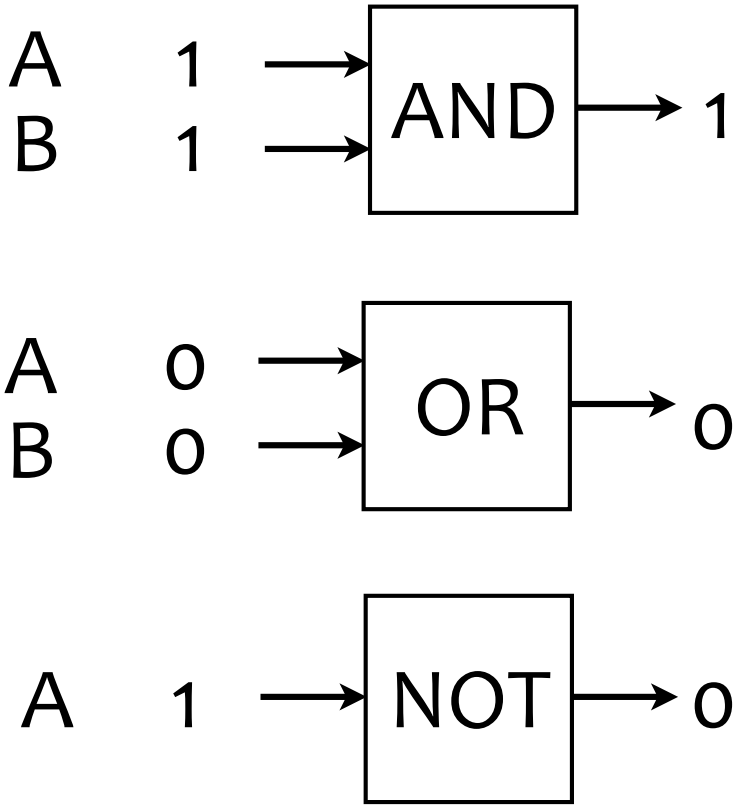

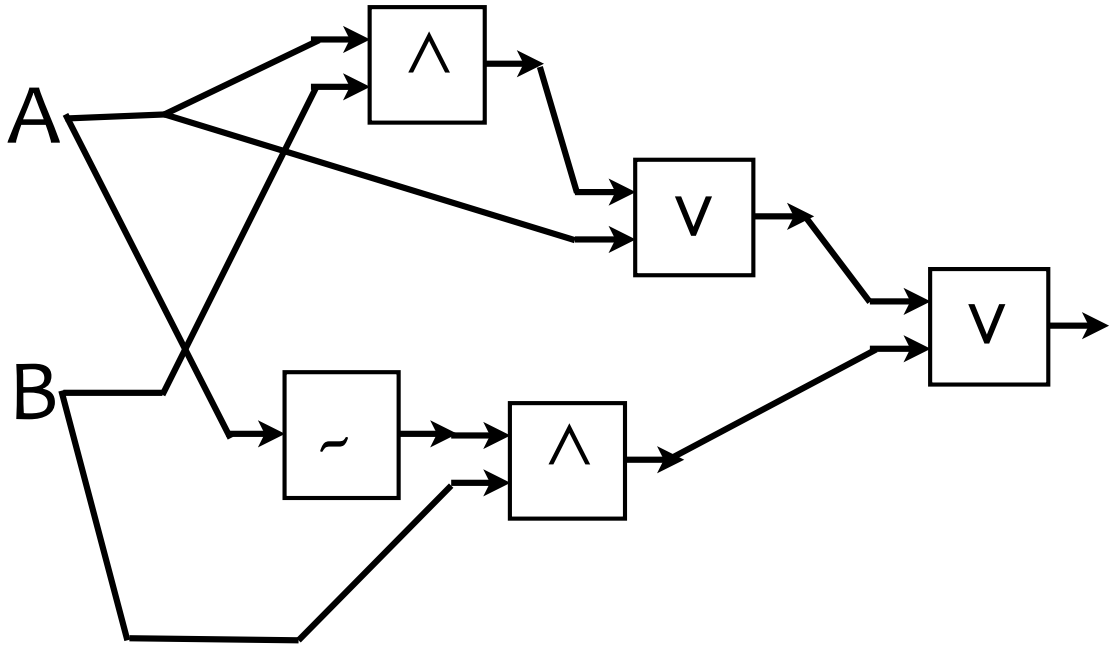

Logic is like a machine; machines are like logic