3.5
Supplemental: DFA philosophy

A finite program can be simulated by a DFA...

1. Finite program = a program that uses a prespecified bounded amount of memory.
2. Given DFA and input, easy to decide if DFA accepts input.
3. A finite program is a DFA!
   # of states of memory of a finite program = finite.
   # states $\approx 2^{\#\text{ of memory bits used by program}}$
4. Program using $1K$ memory = has...
5. Turing halting theorem: Not possible (in general) to decide if a program stops on an input.
6. DFA $\neq$ programs.

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But universe is finite...

1. Estimate # of atoms in the universe is 10^{82}.
2. Assuming each atom can store only finite number of bits.
3. So... number of states of the universe is finite!
4. So... All programs in this universe are DFAs.
5. Checkmate Mate!
6. What is all this nonsense?

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So what is going on...

1. Theory models the world. (Oversimplifies it.)
2. Make it possible to think about it.
3. There are cases where theory does not model the world well.
4. Know when to apply the theory.
5. Reject statements that are correct but not useful.
6. Really Large finite numbers are

THE END

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(for now)