Principles of Programming

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Monday September 9, 2013

Algorithms and Programs

- Old: $>$ 2500 years
  - Babylonians: arithmetic, compound interest, compute length of hypothenuse of right triangle.
- New: automation. $<$ 300 years.
  - Jacquard Loom, Basille Bouchon's loom, Babbage's Difference Engine, punched cards.
- Problem: encoding the algorithm.
  - First step: what the hardware can do
    - ★ ILLIAC computer, see its instruction set (ex: p.75 of the Manual).
  - Second: stored program
    - ★ Stored program, Von Neumann architecture
  - Third: think of humans a little...
    - ★ Fortran was a step forward, but it still had a 3-way branch.
    - ★ but things are still bad

(Programming) Languages

- Formal Languages. Syntax and Semantics.
  - Wikipedia gives a silly definition using strings. Refers to Frege's Begriffsschrift as an example, but that language is 2-dimensional!
  - Syntax: Markdown, HTML, official Java grammar
  - Semantics: operational (how to run), denotational (what it means, using math)
- Programming Languages
  - There are a lot of them. Some are truly bizarre.
  - APL was weird, but almost mainstream. Too dense.