Complex Combinational Logic Blocks

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Building Functions from Logic Gates
We've already seen how to implement truth tables using AND, OR, and NOT -- an example of combinational logic.

Combinational Logic Circuit
• output depends only on the current inputs
• Stateless

Quick review + example
Then examples of some useful combinational circuits

Review: Building AND/OR/NOT Logic Circuit
Can implement ANY truth table with AND, OR, NOT.

Decoder
n inputs, 2^n outputs
• exactly one output is 1 for each possible input pattern

Example: 7-Segment Display Decoder
Add two bits and carry-in, produce one-bit sum and carry-out.

Full Adder
Four-bit Ripple-Carry Adder

- A1, B1, C1
- A2, B2, C2
- A3, B3, C3
- A4, B4, C4

Multiplexer (MUX)
- n-bit selector and 2^n inputs, one output
- output equals one of the inputs, depending on selector

LC-3 Arithmetic/Logic Unit (ALU)

Summary
- Building AND/OR/NOT Logic Functions
- Useful Complex Logic Blocks
  - Decoder
  - Full Adder
  - Ripple-carry Adder
  - Multiplexer
- LC-3 Arithmetic-Logic Unit (ALU)