Full Adder

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Why is the full adder important?

- The full adder adds.

Okay, but really, why is the full adder important?

- The full adder adds three one-bit binary numbers and produces a sum value and a carry value.
- The full adder is important because multiple full adders are used in the ALU to add n-digit binary numbers.
- The full adder is used to make more complex adders (like the ripple carry adder) which can add larger numbers together.

What instructions does the full adder support?

- The full adder supports the ADD and SUB (because of 2's compliment, subtraction is just addition) assembly instructions.
- The full adder makes up a portion of the ALU, so the full adder gets input from the register file and the sign extender.
- The ALU outputs to the data memory and the control ROM.

Implementation overview

- The full adder takes in three inputs, A, B, and Cin. It outputs S (sum) and Cout.
- The circuit utilizes XOR, AND, and OR.
- Iff multiple inputs are 1, Cout is 1. Iff an odd number of inputs are 1, S is 1.

Test cases

A	B	Cin	S	Cout
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Implementation issues

- None of us actually experienced any issues with implementing the full adder!
- One potential issue relating to the full adder could be the misplacing of wires when creating the module, as this would yield incorrect results.

Gate delay

- The full adder has a gate delay of 7.