16-Bit Simple ALU

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Background:

Speaking freely, we both agree that hardware design is something we want to continue doing in the future. For me, Levi Randall, I want to help design processors for a living, so designing a simple one in Verilog seems like a great way to prepare.

Proposal:

We propose a simple 16-Bit ALU along with a Control Unit that takes in two inputs: A and B along with an OP code to select the operation. The OP code and A input shall be derived from data that is fed into the Control Unit. The ALU will be capable of Adding and Subtracting numbers, using Two’s Complement, in a Ripple Carry Adder. It shall be able to shift bits left or right depending on the OP code. It shall be able to execute basic logic functions like AND, NAND, OR, and NOR. Lastly, it will be able to multiply two 8-bit numbers by using an 8x8 Binary Multiplier to create a product of up to 16 bits. All these processes will happen in parallel with each other and the final number given as the output will be decided using a series of multiplexers in conjunction with the OP code. These ideas can be visualized in the schematic below,

