

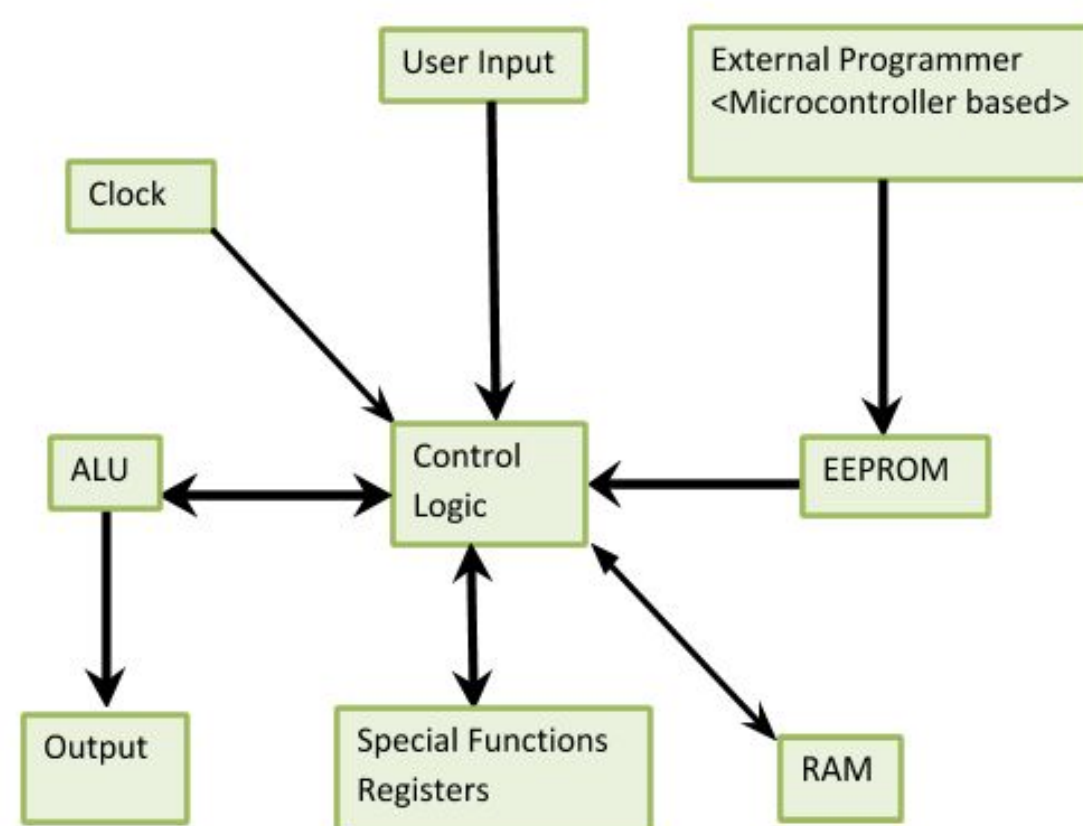
Project Description

We are creating an 8-bit CPU kit to teach the fundamentals of computer architecture to high school level students and hobbyists. This will be achieved by making a product that takes the traditional cpu and breaks it up into its individual components, making it easier to understand what each piece does. Our product will be made up of the four main components of a CPU. These components being the ALU, control logic, memory, EEPROM, and special function registers.

Motivation

Motivation for this product came from the lack of easy to understand courses about basic computer architecture. Currently there are no easily accessible 8-bit CPU kits on the market that come with a curriculum to learn from. The most important aspect is that our product is to be simple, but still have enough content for users to use and learn from. This product can't just be another tool that users just quickly complete and lose interest in. Our goal is to keep them engaged and wanting to dive deeper into what computer architecture is.

Block Diagram of CPU



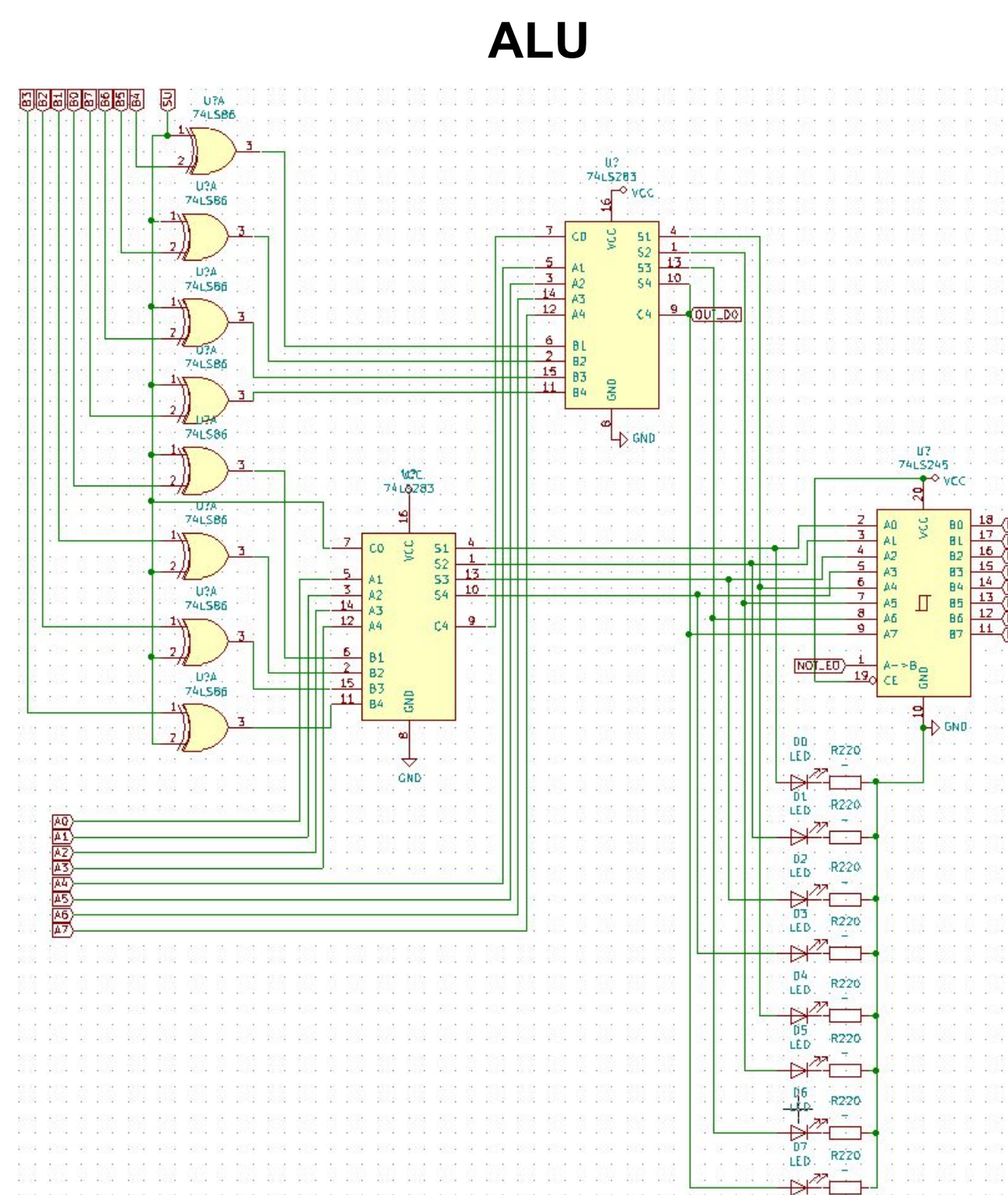
Key: direction of arrows indicate the direction of data flow

Existing Products and Solutions

The Gigatron TTL is a 8 bit computer that showcases all the pieces of the block diagram. The drawback to this approach is that all the blocks are together instead of being broken apart. This creates a mess of components where no one component is highlighted for its work and explained in detail.

Current Progress

We are currently working on our 3rd revision of the PCB's for the ALU, memory, and control logic. We have completed the microcode, EEPROM programmer, output, input, and clock for the hardware. The curriculum in the rough draft stage of development. We are currently working with a third party and educators to make sure the curriculum meets the highest standards of education.



Arithmetic Logic Unit Function

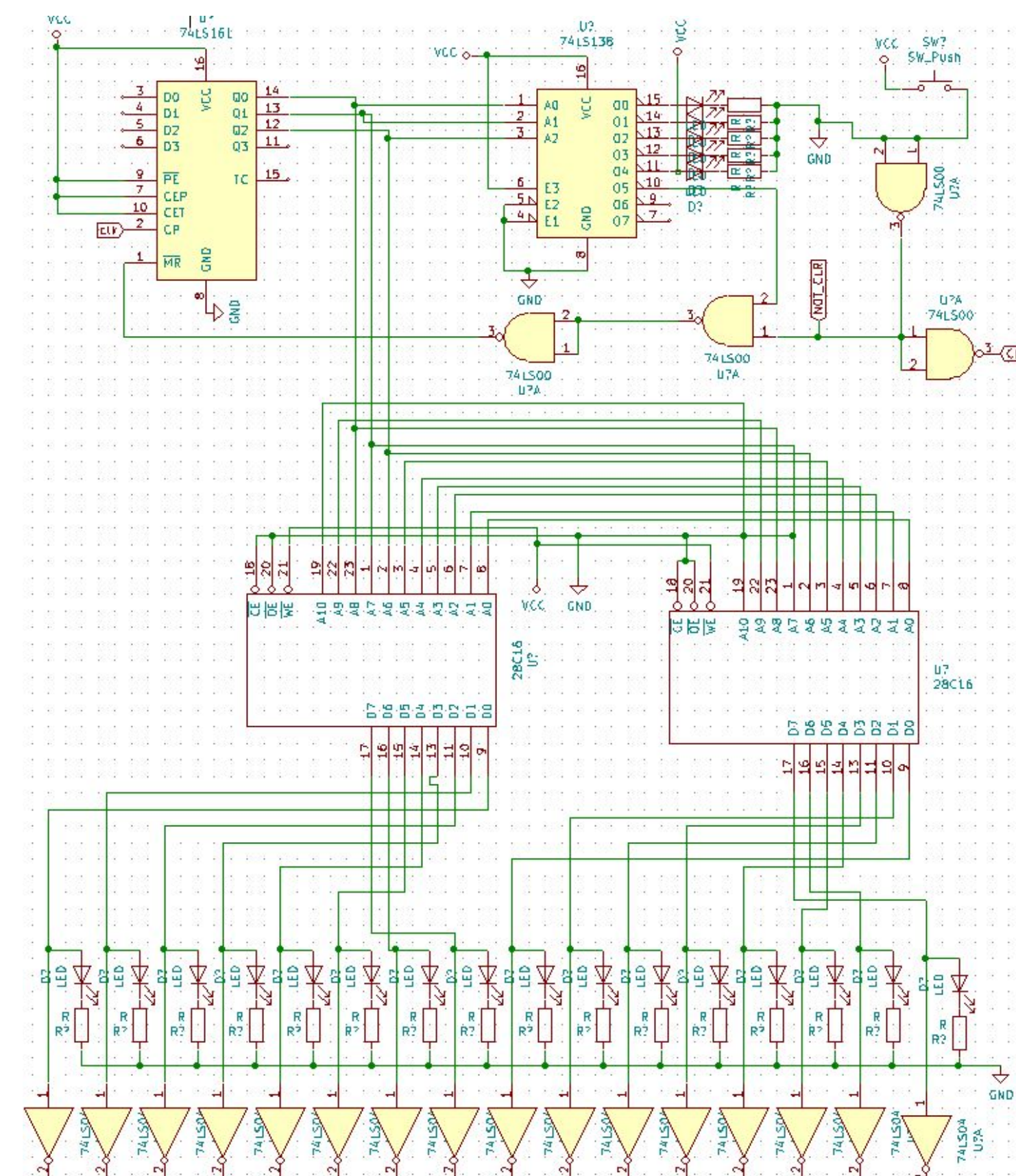
The ALU's primary focus is to add and subtract in this SAP-1 Computer.

Adding and subtraction happen by passing the bus on the left through the two 4-bit adders in the middle.

On the right the signal is decoded to the bus as well as output through leds for the user to interact with as a visual aid.

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Control Logic



Control Logic Function

The Control logic's primary function is that of controlling what is and what isn't on. It does this but first checking if power is on.

Nex the logic check's what instruction register is being read and changes the outputs of the appropriate flags. Doing so also illuminates leds as a visual aid for the user.

Value Proposition

Our project will give students and hobbyists an easy way to learn basic computer architecture with a focus on the CPU. The focus will be on making this knowledge more accessible and easy to use and understand. This will give an opportunity for students and hobbyists to get a headstart if looking to move towards a field dealing with computer architecture. Our product will focus on the actual architecture instead of just dealing with peripherals.

Product Benefits:

- Easy to understand
- Greater accessibility than other products
- Does not require additional software to operate
- Adaptable curriculum

Team

Our team is comprised of many talented individuals. We have the experience and knowledge to build the appropriate circuits and program them efficiently.

Eric Walter - Electrical Engineer

Tyler Tetens - Computer Engineer

Justin Merila - Computer Engineer

Jeremy Ho - Computer Engineer

Acknowledgements

We would like to thank Dr. Stanley for advising us on our project. We would also like to thank the ECE department for helping us become the professionals we are.