

# EE/CprE/SE 491 WEEKLY REPORT sdmay25-29

October 11, 2024 - October 17, 2024

**Group number:** 29

**Project title:** Implementation of the ABC using modern technology

**Client &/Advisor:** Professor Alexander Stoychev

**Team Members/Role:**

Connor Hand - Client Interaction and Team Organization

William Mayer - Meeting Time Tracking and Note-Taking

Peter Hurd / Noah Butler / Zachary Scurlock - Testing and Individual Component Design

Peter Hurd - Budget Handling

## Weekly Summary

The goal for this week was to prototype the adder-subtractor unit of the ABC on breadboards. In order to prepare for this, we had to research the adder-subtractor's design and design it using modern logic gates instead of vacuum tubes. After redesigning, truth tables confirmed that our circuit works the same as Atanasoff's. During our Wednesday meeting, Peter and Zach focused on our group's main task, prototyping the adder-subtractor circuit. Connor and Joey finished up the user needs lightning talk three slideshow as well as the design document part 1. Noah worked on the EEPROM by breadboarding it. On top of this, we continued to research other modules in the ABC and started brainstorming designs of modules and methods of performing input and output. We did not have to make any significant changes to our project or our methods of working on the project.

## Past week accomplishments

- Connor Hand: Color-coded confusing vacuum tube circuit and confirmed that the circuit we found online matches. Designed the adder-subtractor unit using an open-source program and confirmed that it works with two-bit additions and subtractions. I worked closely with Stoytchev during this process.
- Zach Scurlock: Constructed Adder/Subtractor Prototype, and researched how the original ABC converted binary to decimal
- Peter Hurd: Researched and diagramed the workings of memory components, constructed the Adder/Subtractor Prototype, brainstormed with team future parts needed
- William Mayer: Worked on a Java program that takes in equations and visualizes the process. Looked into details for the memory drum.
- Noah Butler: Researched the adder/subtractor and the EEPROM chip, set up the software for flashing the EEPROM and built a test circuit for it

## Pending issues

No issues arose during the week.

## Individual contributions

<u>NAME</u>	<u>Individual Contributions</u> <i>(Quick list of contributions. This should be short.)</i>	<u>Hours this week</u>	<u>HOURS cumulative</u>
Connor Hand	Re-drew vacuum tube circuit, designed modern implementation of adder-subtractor and confirmed it will work as intended.	6	16
Zach Scurlock	Constructed Adder/Subtractor Prototype, and researched/brainstormed ideas for binary to decimal conversion	7	15
Peter Hurd	Researched and diagramed the workings of memory components, constructed the Adder/Subtractor Prototype, brainstormed with team future parts needed	6	17
William Mayer	Worked on the Java program. Researched components. Contributed to group slide show and document.	5	13
Noah Butler	Researched the adder/subtractor and the EEPROM chip, set up the software for flashing the EEPROM and built a test circuit for it	6	14

## Comments and extended discussion

At the moment, we are having to have some discussions on how we want to implement I/O using modern logic, and how we want to implement decimal to binary. Currently, our ideas for I/O are using a keypad to enter numbers in the same way you would enter them into a punch card, and using some other method of inputting data, such as a QR code or barcode. Our ideas for converting to binary from decimal include generating a PDF to represent the bits, printing out the PDF, and running it through a scanner (this way is closer to the original implementation), or doing it all purely electronically.

## Plans for the upcoming week

- Connor Hand: This week, I will create an IC pinout diagram for our adder-subtractor unit. I will also create this diagram in KiCAD. I'm going to try to compare our modern logic circuit to the vacuum tube circuit and explain in detail how they are the same. I will also work on the documentation for our adder-subtractor module.
- Zach Scurlock: This week, I plan to improve the breadboard implementation of the adder/subtractor module prototype and begin creating the rest of them. I also plan on figuring out how to create a binary-to-decimal converter using seven-segment displays.

- Peter Hurd: This week, I'm going to start implementing some prototype circuits for the memory units into KiCad ahead of breadboard testing to help make the future construction of these circuits simpler. I am also going to begin writing up another part request for some more chips for us to use in implementing more logic functionalities.
- William Mayer: Continue working on the Java program visualizing the process. Further research into how input will be taken, as well as understanding the decimal to binary. Will review KiCad tutorials.
- Noah Butler: This week, I will try to look for any more information on the decimal-base 2 converter and make the table of values to load into the EEPROM to act as the lookup table for the decimal - base 2 convertor.

### Summary of weekly advisor meeting

During our weekly meeting we confirmed with our advisor that the adder-subtractor prototype is working as intended. We were able to compress our design down to 5 ICs instead of 6 while staying true to the ABC's logic. We had a discussion on methods of how we can store bits in our "drums" similarly to how it is done on the ABC. We also talked about the base conversion drum and went into great detail on how it works. We also proved that our EEPROM is working as intended.