EE / CprE / SE 491 – sdmay26-12
ABC with Modern Components
Week 1 Report

08/25/2025 – 09/23/2025
Client: Alexander Stoytchev
Faculty Advisor: Alexander Stoytchev

Team Members:

Gavin Bunker — *Recorder, Purchasing*
Ryan McFadden — *Client Liaison*
Samuel Schroeder — *Team Leader*
Vance Arnold — *Team Facilitator*
Bryan York — *Hardware Lead*
Kyle Koch — *Software Lead*

Summary

During this reporting period, our team's goal was to gain familiarity with the project topic, the tools we will be using, and the previous team's progress. Each team member conducted research into the history and design of the ABC, practiced using KiCAD to design a PCB equivalent of the ABC's adder/subtracter module, and reviewed the previous senior design team's documentation. We also worked to define the roles and structure of our team.

Past Week Accomplishments

- Samuel
  - Project research into the history and design of the ABC
    - The goal of this research was to get an understanding of why we should build this modern replica and how the original design functioned, so that an accurate replica can be built.
    - Read through the Department of Computer Science's site on John Atanasoff and the ABC (John Vincent Atanasoff and the Birth of Electronic Digital Computing)
    - Checked out and read the first chapter of *The First Electronic Computer* by Burks and Burks, which contains a brief history of John Atanasoff and an in-depth description of the design of the ABC.
  - Review of the previous senior design team's progress
    - Reviewed the final poster, presentation, and demo videos on the previous team's site (sdmay25-29 • Implement the ABC Computer with Modern Technology)
    - Briefly looked over their design document
  - KiCAD practice
    - Converted the logical design of the adder/subtracter module found in *The First Electronic Computer* to modern logical diagrams.
      - The logical diagram from the book. All symbols have direct modern equivalents, except for the highlighted symbols.

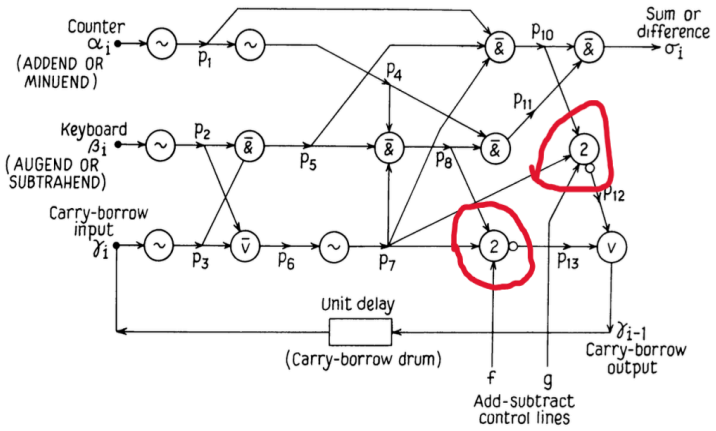
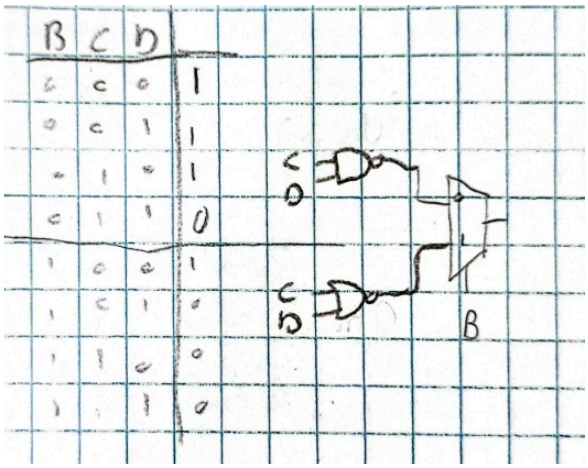


Fig. A.17. Logical structure of Atanasoff's add-subtract mechanism

- My logical design of those symbols based on the intended behavior.



  - Converted the logical design into a PCB schematic using KiCAD.

- Kyle
  - Project research into the history and design of the ABC
    - Read through the first few sections of the Department of Computer Science's site on John Atanasoff and the ABC (John Vincent Atanasoff and the Birth of Electronic Digital Computing). This was to better understand the history and some of the genius behind the computer.
  - KiCAD practice
    - Converted the logical design of the adder/subtracter module found in *The First Electronic Computer* to modern logical diagrams.
    - Then spent some time watching a few different YouTube videos to better understand how the software works and how to better use the software for future assignments in this class.
  - Past Research
    - Spent some time looking over a bit of the information the group left for us on their website and then on their GitLab. This was useful to see what they had actually done and some of the important information they had left for us.
- Bryan
  - Look through the files from the previous Senior Design Team
    - Understand some important information that may be used for our project
    - Find important information regarding the Full Adder Model to share with the team for KiCad PCBs.

    - KiCad Practice
        - Designed and built my own version of the Full Adder/Subtractor module for the ABC, and modernized it in the previous years' Senior Design Team.
        - Answered questions and provided input to other team members on how to use the KiCad Software and important items to include in their circuits.
    - Research
        - Read through the beginning of “The First Digital Computer” book to understand the basic concepts behind Atanasoff’s computer.
        - Watched videos and documentaries explaining how to operate the ABC and interviews with Atanasoff himself.
- Ryan
    - Learned from the previous Senior Design Team
        - Reached out to a few of their team members on LinkedIn with some initial questions and to make a connection
        - Read through some of their documents/presentation to learn about their processes
    - Communicated meeting time and initial tasks with Dr. Stoytchev
    - KiCad Practice
        - Got introduced to KiCAD by beginning to design my own version of the Full Adder/Subtractor module for the ABC
        - Learned by doing and from asking for help from other team members (especially Bryan) when I got stuck
    - Research
        - Read the beginning of “The First Digital Computer” book and took notes to better understand the basic concepts behind Atanasoff’s computer and how he developed the digital logic and physical implementation of his machine
- Vance
    - Review of previous Senior Design Team
        - Took a close look at the design of their project, including their Full Adder/Subtractor. Compared their design with mine to find differences and similarities to ensure component quality.
    - KiCAD Practice
        - Completed a KICAD tutorial to learn the basics of schematic and PCB design.
        - Designed and nearly completed a build of my own version of the Full Adder/Subtractor module for the ABC, comparing it with the previous team’s version.
        - Asked for assistance from other team members (Bryan) when I needed help.
    - Research
        - Read the first section of *The First Electronic Computer: The Atanasoff Story* to gain a deeper understanding of the design and production of the ABC.
    - Team Dynamics
        - Kept team spirit high by providing motivating comments and feedback with all aspects regarding the team project.
- Gavin
    - Parts Purchasing
        - Researched and ordered key electronic components needed for the project to ensure timely availability and compatibility with our design goals.
    - Client Deliverable Brainstorming
        - Participated in early discussions to define possible deliverables for our client,

helping shape project scope and expectations.

- Meeting Minutes
  - Took notes during weekly meetings to document discussions, decisions, and action items, ensuring the team had a clear record to reference.
- KiCad Practice and Design
  - Spent the majority of my hours in KiCad learning the software and applying it to our project.
  - Designed the PCB schematic for the adder/subtractor module, focusing on translating logical design into a workable modern PCB implementation.
  - Reverse-engineered schematics from the book on the adder/subtractor module logic and a vacuum tube diagram to modern logic gates and truth tables.
- Research and Communication
  - Read project-related material to better understand the ABC and its design principles.
  - Coordinated with Dr. Stoytchev to clarify project expectations and communicated updates during weekly meetings.

Pending Issues

- We are waiting for our first order of parts from ETG to arrive so that we can start building breadboard prototypes of the ABC modules.
- Scheduling a weekly meeting between all team members and our client/advisor, where all team members are regularly available for an adequate amount of time, has proved challenging. We are still working with our advisor to find a suitable time.

Individual Contributions

Team Member	Contribution	Weekly Hours	Total Hours
Gavin Bunker	Parts Purchasing, Client Deliverable Brainstorming, Meeting Minutes, KiCad addsub module PCB design (Majority of hours in KiCad)	11	11
Ryan McFadden	KiCAD practice, project research/reading, communicating with Dr. Stoytchev, and weekly meetings	10	10
Samuel Schroeder	Project Research, practice using KiCAD to convert logical designs into PCBs	11	11
Vance Arnold	KiCAD practice and Add/Sub module design, individual ABC reading, researched last year's team project, team motivation	10	10
Bryan York	Fundamentals of KiCad help and Individual Research on ABC Design	15	15
Kyle Koch	KiCAD practice for the Add/Sub module, reading of the Book, meetings, and looking into past group's work	9	9

Plans for the Coming Week

- Each team member should start making a breadboard prototype of the ABC's adder/subtracter module to practice converting logical designs into physical prototypes and to better understand the previous team's final product. This is dependent upon receiving all the necessary parts.
- Each team member should finalize their PCB design to be production-ready.
- Each team member should practice solving systems of linear equations using Atanasoff's modified Gaussian Elimination algorithm to better understand what the computer did.
- Start creating VHDL simulations of the adder/subtractor logic for verification.
- Begin creating the diagrams and technical manual for the adder/subtractor module.
- Create standard PCB dimensions and pin locations.