EE/CprE/Se 491 Weekly Report 2
9/19/24 - 9/26/24
sdmay25-28
Digital ASIC fabrication
Client & Advisor: Dr. Duwe

Team Members
Calvin Smith – Issue Tracking
Camden Fergen - Testing Lead
John - Team organizer
Nicholas - Verilog Lead
Levi - Client interaction

Weekly Summary

During our weekly team meeting, we narrowed our project to two/three ideas. One idea was to create an MNIST Image Classification ASIC, where we would be able to draw out a number 0-9 and the ASIC would be able to classify it appropriately, we would also be minimizing the gate delay that occurs by removing some redundant gates (i.e. when the weights are already determined to be 1 or 0, we can remove the gate and just pass the value accordingly). The other two options are very similar, we would use the E-Ink display and intermittent computing to display some values. One of these ideas is to display a map according to your geolocation using a GPS sensor. The other option is to have multiple sensors that read environmental qualities (e.g. air quality, noise level, temperature, etc.); this would then be displayed on the screen when there is enough power.

Pask Week Accomplishments

- Calvin:
    - Experimented in TensorFlow by creating 20 different models in attempt to attain a low parameter model that retains reasonable accuracy over MNIST
    - Created a circuit reduction demonstration for the meeting with Dr. Duwe on Friday, for further elaboration upon the model circuit reduction Idea
    - Defined the BMSIC project for the sake of proposal
- Camden:
    - Researched the various display that we may want to implement for this project, ie e-ink, memory LCD, and IO needs for them
    - Identified use cases for both ideas of the project to see how viable they could be to the panel
    - Worked on weekly presentation for Duwe meeting

- John:
    - Researched E-ink, MIPS, and Memory LCD displays
    - Worked on the E-ink section of the presentation
    - Created the block diagram for the E-ink display
    - Looked into the caravel design process
- Levi:
    - Researched E-ink displays
    - Caravel readings/familiarization
        - https://github.com/efabless/caravel/blob/main/docs/caravel_datasheet_2.pdf
        - https://caravel-harness.readthedocs.io/en/latest/getting-started.html#user-project-area
    - Started chipForge onboarding
- Nicholas:
    - Recreated Lab2 datapath 1 of CprE 3810 in verilog for the purpose of using it to test the Caravel design process.
    - Set up caravel repo tools on personal computer.
    - Did research on implementing Verilog code in a caravel repo.
    - Generated the gds layout for the provided example project from the eFabless github. Ran the gds layout in klayout and observed the layout of the circuit.
    - Began to assign i/o to the datapath.

Name	Individual Contribution	Hours this Week	Hours Cumulative
Calvin	BMSIC	5.8632	11.8632
Camden	Product research and project design ideas	6	12
John	• Block Diagrams • Research displays • Presentation	6	12
Levi	Product research and EFabless tutorials.	6	12
Nicholas	Verilog coding, setting up tools for caravel, and testing caravel tools.	8	14

Plans for Upcoming Week

- Calvin:
  - Begin learning software for required for the efabless process
  - Implement a floating point multiplication unit in Verilog for the purpose of learning, but also for potential use in BMSIC
- Camden:
  - Dig deeper into the caravel and how you'd interface with sensors
  - Ensure idea is selected so we can narrow research
  - Help/watch other team members in Efabless tooling to learn as well
- John:
  - Dedicate time into caravel and Efabless
  - Generate datapath for CPRE 3810 lab 2
  - Once project is selected, research and layout a plan/block diagram
- Levi:
  - Learning Efabless and Caravel Template I/O specifics
  - Implement/study implementation of lab 1 & 2 from CprE 3810
    - Learn limits of Caravel template
  - Finish chipForge Onboarding tutorials
  - Further product research into decided project
- Nicholas:
  - Will generate a working gds layout for datapath 1 of lab 2 CprE 3810.
  - Will begin working on components for our actual project.

Summary of weekly advisor meeting

On 9/20, we discussed with Duwe possible project ideas. We were able to get rid of a lot of ideas and were able to find out a few that we wanted to dive into. Got a lot of questions answered regarding the feasibility of our project and what he expects. We were able to decide that we most likely wanted to use the E-Ink display and create a GPU accelerator in order to display onto the E-ink display.