EE/CprE/SE 491 WEEKLY REPORT 02

9/19/2024 - 9/26/2024

Group number: sdmay25-19

Project title: ReRAM AI Accelerator

Client &/Advisor: Dr. Henry Duwe and Dr. Cheng Wang

Team Members/Role: Noah Mack, Olivia Price, Sam Burns, Travis Jakl

- **Weekly Summary**

  During our Sunday workday we were able to resolve the issue with the final LVS check. We were able to resolve this issue by clicking a button that identified our top level schematic as a subcircuit. This week we also attended a meeting with the senior design TA and gained some useful insight into how to approach our project. During our meeting on Friday we got a very basic start on our design document and started thinking about how we want it to look.

- **Past week accomplishments**

  • Sam Burns: Worked on creating a ReRam Testbench in Xschem. I also spent time looking through the previous teams github which allowed me to look through their schematics and better understand their circuit design. In addition, I spent some time reading through the technical documentation on ReRam provided by SkyWater both on general operation and initial setup.

  • Olivia Price: Read a paper about ReRam and tried to grasp how it works. Also looking at ideas from previous teams and seeing if their design could be improved. The main objective this week was to see what the block diagram consisted of and if pass members' designs could potentially be implemented into the final layout. If their designs were not good enough to be implemented then that's where we need to start brainstorming at.

  • Travis Jakl: Looked through the previous team's design documentation and found their block diagrams needed some clarification. Read about the ISAAC architecture and took notes to help when putting together our system. Also completed the inverter analog tutorial since it's been updated, as well as the blinky tutorial.

  • Noah Mack: Had a hiccup with some VDI issues, so spent some time trying to resolve that. While that was happening, I was following along with Sam as Gregory helped him complete the inverter tutorial. Individually, I ended up expanding on the blinky tutorial and completing the UART tutorial as well as expanding on it a little bit, which has helped me to get a better understanding of the digital workflow.

- **Pending issues**

  • Sam Burns: The main issue I have is whether or not we can use open source designs found online to integrate into our own design. This would allow us to rapidly expand the scope of our design and progress quickly.

  • Olivia Price: Will we be able to get a hold of the previous teams design.

  • Travis Jakl: Waiting to look into previous team designs so that I can create an RTL diagram to showcase module integration and functionality better visually.

  • Noah Mack: The only unexpected complications I ran into were with my VDI, which ended up being caused by an instance that was left signed in on a lab machine. Once I found that and signed out, I was able to continue my work as normal.

- **Individual contributions**

NAME	**Individual Contributions** *(Quick list of contributions. This should be short.)*	**Hours this week**	**HOURS cumulative**
Sam Burns	Read technical documentation about the ReRam cell from the skywater website which is also linked on our Working on a testbench for the ReRam Cell	6	23
Olivia Price	Read a technical document about ReRam, and looked at other people's designs. Trying to come up with a final design layout and see what is going to work and what is not going to work.	6	21
Travis Jakl	Searched through design documentation, looking for top-level designs, as well as lower level ones Read about ISAAC architecture Finished inverter tutorial and completed blinky tutorial	6	24
Noah Mack	Expanded upon my previous code from the blinky tutorial and completed and expanded on the UART tutorial. Read this paper about an existing ReRAM-based machine learning accelerator.	6	23

- **Comments and extended discussion**

Sam Burns: I feel a little uncertain of how to decide what is most important to work on and how to prioritize goals moving forward.

- **Plans for the upcoming week** *(Please describe duties for the upcoming week for each member. What is(are) the task(s)?, Who will contribute to it? Be as concise as possible.)*
  - Sam Burns: Getting the inverter and previous teams designs through precheck will be my main priority. Finish ReRam test bench and interpret simulation results. Look into doing the layout of the ReRam cell (I have heard this is an issue so it may not work). I want to read the documentation of the past groups to better understand their designs as well.
  - Olivia Price: Try to figure out how to test the previous team's components and see if they could work for the final design or start planning innovate them or get rid of them.
  - Travis Jakl: Once I've gotten a hold of the previous team's git repo, it will be creating visuals for the module designs and testing the modules so that I can understand how and if they all work.
  - Noah Mack: Keep working through the digital tutorials and attempt to simulate a ReRAM cell using the analog toolflow. Inquire with Gregory about the digital wrapper.

- **Summary of weekly advisor meeting** During our weekly meetings, we talked about the next step in understanding the tools. Our goal is to get our simulated inverter through pre-check. One of the tasks that was also discussed was making a list of requirements and constraints for this project. We also need to start creating test benches for different components that we have from other teams and see if they are adequate for our purposes. If they are not adequate then we need to evaluate if we can make a new one with our current knowledge or do research on how to make certain things. One of the most important things that the advisor told us is that we need to work on the scope of this project and what are we gonna bring to the table. An example of this would be if we think the amplifier is bad, then we need to tell the advisors and start working on finding designs for it.

Grading criteria

Each weekly report is worth 10 points. Scores will be awarded as follows:

- **8 – 10**: Progress for your project seems to be suitable. Documentation and hours reported by team members are adequate.
- **6 – 8**: There is scope of improvement both in your report and your project progress. Can consult with instructor/TA after class for further inputs.
- **< 6**: Please talk to instructors/TA after class hours about any difficulties that you/your team is facing.

Each weekly report should be unique in that they have a unique set of supporting details for your contributions. So please do not just copy your reports from the previous week. In addition, please avoid any personal pronouns (he, she, I, you). Try to keep your reports as neat as possible.