EE/CprE/SE 491 WEEKLY REPORT 1

1/23/24 – 2/6/24

Group number: 6

Project title: HW Design for ML-Enabled Computer Vision

Client &/Advisor: JR Spidell / Mohammad Tayeb Al Qaseer

Team Members/Role: Taylor Johnson (DDRM to output display), Deniz Tazegul (Video Stream to FPGA), Liam Janda (VDMA to DDRM), Ritwesh Kumar (Video Stream to FPGA)

- ○ **Weekly Summary**

  The objective for this week was to meet with both the client and the project advisor to gain a better understanding of the project's goals. The team met individually with the client to help determine what skills the team could contribute to the project and what roles each of the members should take on. The project has shifted to a project that is more software-oriented. Instead, the team will be creating a video pipeline for machine learning computer vision.

- ○ **Past week's accomplishments**

  • Deniz: Downloaded the required tools for the project (KiCad, Telegram, and the GIT repo). Had 1-on-1 with the client, and we discussed strengths and background and why this project was ranked highly. Discussed the possibility of pivoting the project to something more focused on software, a video pipeline for machine learning purposes to better suit the team's skills. During our team meeting, we all agreed to shift focus to this new project.

  • Liam: Downloaded KiCad and became familiar with its layout. JR sent a schematic from a past group which was unfinished. Since the project file was from an older version of KiCad, it was required to update the project symbols for them to work with the current KiCad tools. Created a questions document where the team can add questions to ask JR during the next meeting. Had a personal meeting with JR, where he was able to get a better grasp of which role may be best in this project. Once everyone had a meeting with JR, he proposed to change the direction of the project from hardware implementation to software, which the team was all on board with.

  • Taylor: Downloaded the KiCad software and reviewed the application's basic functions. Reviewed the previous team's design schematic that the project is to continue building

from. Met with the client one-on-one to discuss individual skill sets and initial thoughts on the hardware design project. The client proposed reworking the project to fit the team's skills.

• Ritwesh: Downloaded and installed KiCad software. Met 1-on-1 with the client to discuss the project. Shared past experiences with programming languages including C, MATLAB, and PyTorch. Ritwesh described an experience outside of class where he worked on a research project with a Ph.D. student on a biosensor and related this to his current interests in data science and signal processing. This information was used to decide to change the focus of the project from a hardware circuit design architecture to a software-oriented machine learning computer vision video pipeline scheme for video processing. Ritwesh agreed to the change as it fit with the skills and interests and felt he could contribute in a more meaningful way to this revised project as compared to the original.

Group: The team discussed potential applications of and users to this new project with the client. Machine learning for computer vision has applications in medicine, avionics, and disability care to name a few. A user of this technology would need a way to distinguish objects or determine patterns from an incoming video stream, like a doctor identifying abnormalities during a surgical procedure, or a person without eyesight identifying hazards in their path as they navigate a busy city. A computer could translate the video stream into some other form of communication, or use pattern recognition to make identifications before a human can.

- **Pending issues**

  • Group: Since the project is shifting, the team is looking into what paperwork/initialization work will need to be done to ensure it is acceptable by the class and advisor. This is a group effort and all members are dealing with these issues.

- **Individual contributions**

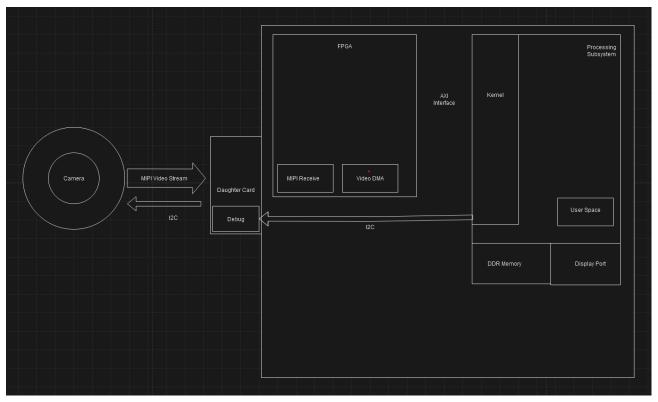| NAME	Individual Contributions *(Quick list of contributions. This should be short.)*	Hours this week	HOURS cumulative
Deniz	Met with client/advisor/team	6	6
Liam	Worked with KiCad schematic, Met with client/advisor/team	6	6
Taylor	Met with client/advisor/team, Reviewed	6	6

	KiCad software and schematic		
Ritwesh	Met with client, advisor, and team, and reviewed KiCad schematic and project block diagram	6	6

- **Plans for the upcoming week**

    • Deniz: Read the datasheets for the MIPI video controller and start the slide deck, acquire the base code for this project, and meet with the advisor to detail how this project will look now that it has changed.

    • Liam: Read and understand the basics of AXI VDMA and the Eval FPGA board through datasheets, and relay that information to the team. Understand how the FPGA will connect to the other devices in the system.

    • Taylor: Attend weekly meetings with our client, team, and advisor. Review the datasheets for the display port/video processing. Start a slide deck for keeping track of information on what I've learned.

    • Ritwesh: Plan to meet with the advisor to discuss how they can advise the team on the revised project. Additionally, plan to meet 1-on-1 with the client and with the team and client to discuss specific details and duties to perform going forward. Ask for any relevant starter code, applications needed to install, and datasheet information to help start with. Lastly, begin work on the slide deck and ask the client about it if there are any questions.

- **Summary of weekly advisor meeting**

    The team introduced ourselves and discussed how to plan out this and next semester. A good goal to have is to have the schematic and layout diagram finished this semester so that it can be printed and tested next semester. However, since the project has changed, these goals will have to be re-evaluated.

Block diagram for the video pipeline for machine learning computer vision.