Engineering Notebook

Morgan Smith

Meeting Entry - September 5, 2023

Objective: Intro to the Team and Gathering Requirements

Summary:
Today marked the beginning of our project. Our initial discussions focused on understanding the scope of the project and outlining the requirements. The team brainstormed potential features and functionalities to be added, and we established a list of things that we would like to get done this semester. We agreed to use the Digilent Nexys A7 development board for the initial implementation before porting it to the TVS. We also had a discussion about everyone's experience with FPGA's. Some people have a lot of experience and some people have none. I fall right in the middle. I have some experience but not a ton.

Meeting Entry - September 7, 2023

Objective: Material Outlining and Dividing Work

Summary:
In this meeting, we outlined the essential project materials and established a plan for dividing the work. We talked about documents, resources, and research materials needed for different aspects of the project. Responsibilities were delegated so that each person had a clear understanding of their tasks.

Meeting Entry - September 12, 2023

Objective: Defining Architecture and Technical Specifications

Summary:
We talked about the technical aspects of our project. We defined the architecture, emphasizing the integration of a Xilinx MicroBlaze soft-core CPU on the Artix 7 FPGA, and the FreeRTOS that would run the server. Vivado version was determined, and other necessary materials were either obtained or a plan for obtaining them was made. The team also identified potential challenges and outlined strategies to mitigate them.

Meeting Entry - September 14, 2023

Objective: Installing and Debugging Vivado Download

Summary:
In today's meeting, the primary focus was on ensuring that all team members installed and debugged Vivado, which is the software we are using for the FPGA development. The session

began with a step-by-step walkthrough of the installation process, addressing common issues that might arise. Each person debugged their installations. By the end of the meeting, we all had a functional Vivado setup. The only exception was me. I have a Mac and the software is not compatible with my computer. I emailed one of my professors to see if he had a spare laptop. Luckily, he was able to lend me a computer with Vivado already installed on it.

Meeting Entry - September 19, 2023

Objective: Progress Update and Research Review

Summary:
This meeting focused on the progress made thus far. Coding efforts were discussed, with particular attention given to addressing Vivado problems encountered during implementation. The team shared insights gained from individual research on FPGA, MicroBlaze, and related topics. This exchange of information proved valuable in refining our approach and ensuring a cohesive understanding among team members.

Meeting Entry - September 21, 2023

Objective: MicroBlaze Tutorial And Research Explanation

Summary:
Today's meeting centered around a comprehensive exploration of MicroBlaze through tutorials and research. The team collectively engaged in a tutorial session, gaining hands-on experience with MicroBlaze implementation on the Artix 7 FPGA. We talked about the key concepts, functionalities, and potential applications. Team members shared their research findings and addressed potential challenges associated with integrating MicroBlaze into our project. After this meeting I had a better concept of the MicroBlaze Soft CPU and how it would be integrated into our project.

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Meeting Entry - September 26, 2023

Objective: MicroBlaze Tutorial And Research Explanation Continued

Summary:
During this meeting we worked on the same thing as the last one. We continued to look at the MicroBlaze through tutorials and continued research discussion. Coding efforts related to MicroBlaze implementation were shared and discussed. We were able to collectively worked through challenges and solidified the understanding of MicroBlaze.

Meeting Entry - September 28, 2023

Objective: GPIO, UArt, QSPI, and other IP Implementation Discussion

Summary:
In this meeting, the team talked about the implementation details of various IPs, including GPIO, UART and QSPI for our project. The focus was on understanding the configuration, integration, and potential interdependencies of these IPs within the system. Team members shared insights gained from research and began collaborative coding efforts to implement these IPs in the context of the project. We talked about optimizing configurations and ensuring seamless interaction between different IP’s.

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Meeting Entry - October 3, 2023

Objective: Planning for Digilent Nexys A7 Implementation

Summary:
With the foundation laid, our focus shifted towards the transition to the Digilent Nexys A7 development board. We outlined a detailed plan for this migration, considering hardware compatibility and potential adjustments needed. The team discussed the importance of the transition and planned for testing procedures to validate the functionality on the new platform.

Meeting Entry - October 5, 2023

Objective: Discussion Of HTML design and Functionality

Summary:
Today we mostly talked about the design and functionality of the HTML components within our project. We discussed the structure and layout of the interactive web server. We explored potential design patterns and user interface considerations to ensure a user-friendly experience. Conversations also revolved around the integration of dynamic content and real-time updates through HTML and JavaScript.

Meeting Entry - October 10, 2023

Objective: Discussion Of HTML design and Functionality Continued

Summary:
We talke about the telemetry visualization, command input forms, and overall responsiveness of our web server. By the end of the meeting, we had a clearer vision of the HTML elements.

Meeting Entry - October 12, 2023

Objective: Intro Into Xilinx SDK and FreeRTOS implementation

Summary:
We talked about the Xilinx Software Development Kit (SDK) and the implementation of FreeRTOS. The session started with an overview of Xilinx SDK, highlighting its features and capabilities for FPGA development. We all tried navigating the SDK environment. This was a little difficult since there were issues with how people downloaded the SDK. It would work for some people but not others.

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Morgan Smith

Meeting Entry - October 17, 2023

Objective: FreeRTOS Hello World Design and Implementation

Summary:
In this meeting we focused on the practical implementation of FreeRTOS. The objective was to create a "Hello World" design, which would tell us if we had the correct integration of the real-time operating system.

The session began with a walkthrough of the FreeRTOS "Hello World" template, emphasizing key functions and configurations. We participated in coding exercises, implementing and testing the basic functions of FreeRTOS within the project.

Meeting Entry - October 19, 2023

Objective: FreeRTOS Hello World Design and Implementation Continued / Debugging

Summary:
Continuing from our last meeting, we extended the focus on the FreeRTOS "Hello World" design and its implementation. We used debugging techniques to address any issues encountered during the initial coding phase. Emphasis was placed on identifying and resolving potential pitfalls, ensuring a robust and error-free integration of FreeRTOS into our project.

Meeting Entry - October 24, 2023

Objective: 1PPS Discussion and Beginning of Implementation

Summary:
Today's meeting centered around the implementation of the 1 Pulse Per Second (1PPS) functionality within our project. We defined the requirements and specifications of this component. We also dicussed the precision and synchronization aspects required for working with time-sensitive data. I didn’t have a lot of knowledge on this topic so by the end of this meeting I had a better understanding of the 1PPS.

Meeting Entry - October 26, 2023

Objective: Implementation of 1PPS

Summary:
After the last discussion, the team started the coding phase, beginning the implementation of the 1PPS feature. Collaborative efforts were directed towards integrating this functionality with

the existing project structure. Challenges and potential optimizations were talked about, but we haven't encountered any yet.

Meeting Entry - October 31, 2023

Objective: 1PPS Debugging and Constraint File Problems

Summary:
We delved into the debugging phase of the 1 Pulse Per Second (1PPS) implementation. We wanted to address any issues during the initial coding of the 1PPS feature. We all worked on troubleshooting and debugging the code, ensuring that the timekeeping functionality met the required precision and synchronization standards. We also talked about the constraint files because some of us had challenges with that. The members with more experience were able to help them.

Meeting Entry - November 2, 2023

Objective: 1PPS Debugging and Constraint File Problems Continued

Summary:
During this meeting, we did the same things as the last with debugging and working on the constraint file issues. This took a long time to debug but by the end of this meeting we were closer to fixing it completely.

Meeting Entry - November 7, 2023

Objective: Updating and Refining SDD, SRS, and Test Plan

Summary:
Today's meeting focused on the task of updating and refining our Software Design Document (SDD), Software Requirement Specification (SRS), and Test Plan, incorporating essential diagrams for clarity and completeness.

We revisiting our existing documentation and identifying areas that required enhancement or clarification. We took into account all of the feedback from our TA, Gage, and fixed the document. We made class diagrams to represent the structure of our software components, data flow diagrams to illustrate the flow of information within the system, and use case diagrams to showcase various interactions with the system. I specifically worked on the requirements document and some of the SDD.

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Morgan Smith

Meeting Entry - November 9, 2023

Objective: Updating and Refining SDD, SRS, and Test Plan Continued

Summary:
Continuing from the previous meeting, we refined our Software Design Document (SDD), Software Requirement Specification (SRS), and Test Plan. Specific attention was given to incorporating additional diagrams, including class diagrams for a detailed representation of software structure, data flow diagrams to illustrate information pathways, and use case diagrams for various system interactions. The aim was to provide a comprehensive and accessible overview of the project's architecture and functionality. We got a good chunk of these documents finished in class, but also worked on them outside of class to make the deadline.

Meeting Entry - November 14, 2023

Objective: FreeRTOS WebServer Implementation Begin

Summary:
In today's meeting, the team started on the implementation of the FreeRTOS WebServer. The objective was to initiate the integration of FreeRTOS with an interactive web server.

Challenges and potential optimizations were addressed collaboratively, fostering a dynamic and problem-solving atmosphere. By the end of the meeting, the team had successfully laid the groundwork for the FreeRTOS WebServer implementation.

Meeting Entry - November 16, 2023

Objective: FreeRTOS WebServer Implementation Continued

Summary:
Continuing from the previous meeting, today's session sustained the momentum in the implementation of the FreeRTOS WebServer. The team remained focused on the features of the web server within the FreeRTOS environment. We have responsive user interfaces, efficient data exchange between the server and external computers via TCP over Ethernet, and secure handling of telemetry data from the onboard AXI bus and peripherals.

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Morgan Smith

Meeting Entry - November 21, 2023

Objective: FreeRTOS WebServer Implementation Debugging and Finalizing

Summary:
Today's meeting focused on the crucial phases of debugging and finalizing the FreeRTOS WebServer implementation. The objective was to address any issues or inconsistencies identified during the development phase and ensure that the web server functionalities met the project requirements.

We spent this time debugging and examining the codebase for potential errors, and troubleshooting any issues that arose. We refined the user interface, optimizing data exchange mechanisms, and ensuring the secure handling of telemetry data.

Meeting Entry - November 23, 2023

Objective: Final Presentation and Documentation Creation and Practicing

Summary:
In today's meeting, we finalized the final presentation and refined the project documentation. The objective was to consolidate our achievements, challenges, and the overall project journey into an impactful presentation and well-documented set of materials.

We each made our own presentation slides that effectively communicated key milestones, features, and the architectural aspects of the enhanced Total Verification System. Emphasis was placed on creating visuals, including diagrams and code snippets, to enhance clarity and understanding. I personally worked on the GPIO slides as well as the challenges and lessons learned slides. We all practiced the presentation together. Feedback and suggestions were exchanged to further enhance both the presentation and accompanying documentation.
The Software Design Document (SDD), Software Requirement Specification (SRS), and Test Plan received final refinements to ensure accuracy and completeness.