

CDA 4203/4203L

Spring 2024

Computer System Design

Final Project Report

Due by 11:59PM, 1 May

Today's Date:	4/26/2024	
Team Member Names:	Lazar Lazarevic Brendan Berlin Johan John Joji	
Your U Numbers:	U01879091 U85612955 U53186961	

Work Distribution	Brendan researched and worked on all things pertaining to the audio codec and sockit top. Lazar worked on all things pertaining to the ddr2 memory. Johan worked on the menu psm file and uart stuff. We all came together 4 days a week for several weeks to share what we had learned and figure out how to connect everything that we had been researching.
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Feedback: Your feedback is extremely important to improve the mini-project for future course offerings.

Total Number of Person Hours Spent:	<p><i>Estimate the number of hours spent by each team member and add the three numbers.</i></p> <p>Brendan: 23 hours</p> <p>Johan: 28 hours</p> <p>Lazar: 21 hours</p> <p>Total: 72 hours</p>
Exercise Difficulty: (Easy, Average, Hard)	Hard
Issues You ran into:	<p><i>List all problem/issues you faced while doing this project.</i></p> <p><i>(please use bulletized list)</i></p> <ul style="list-style-type: none"> · <i>We couldn't figure out why it wasn't recording but we determined that you needed to have the feedback switch turned on for sockit top to accept audio data.</i> · <i>We had issues instantiating the memory in ISE.</i> · <i>We have some issues with the buttons being buggy. I think they are just super sensitive.</i>

Any Suggestions to improve this project:	<i>I think that this project could use some more instruction. Because it is based on so much stuff that we are unfamiliar with, it would be nice and help with learning if we were given more instruction and we more so just had to put everything together.</i>
Any Other Feedback:	

Put the link to your demonstration Video here (on YouTube, etc.). Make sure you show as much as you could achieve in the Video.

<https://youtu.be/Eu4xqRAyRH4>

Overview

Describe the overall functionality of the system. Describe any and all relevant interfaces. Maximum 1 page.

We decided to control our board using 3 buttons. They are just the 3 push buttons that are located on the board. We have a menu with option such as:

- 1) Play a message
- 2) Record a message
- 3) Delete a message
- 4) Delete all messages
- 5) Volume control

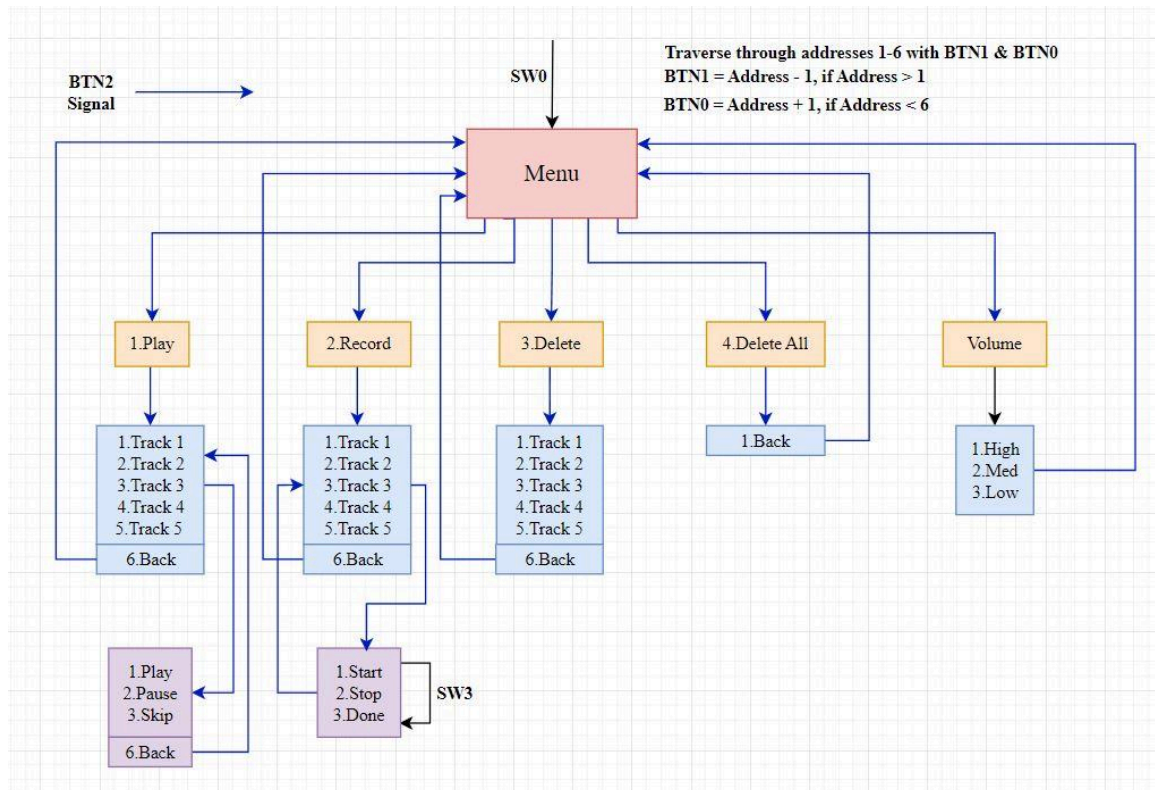
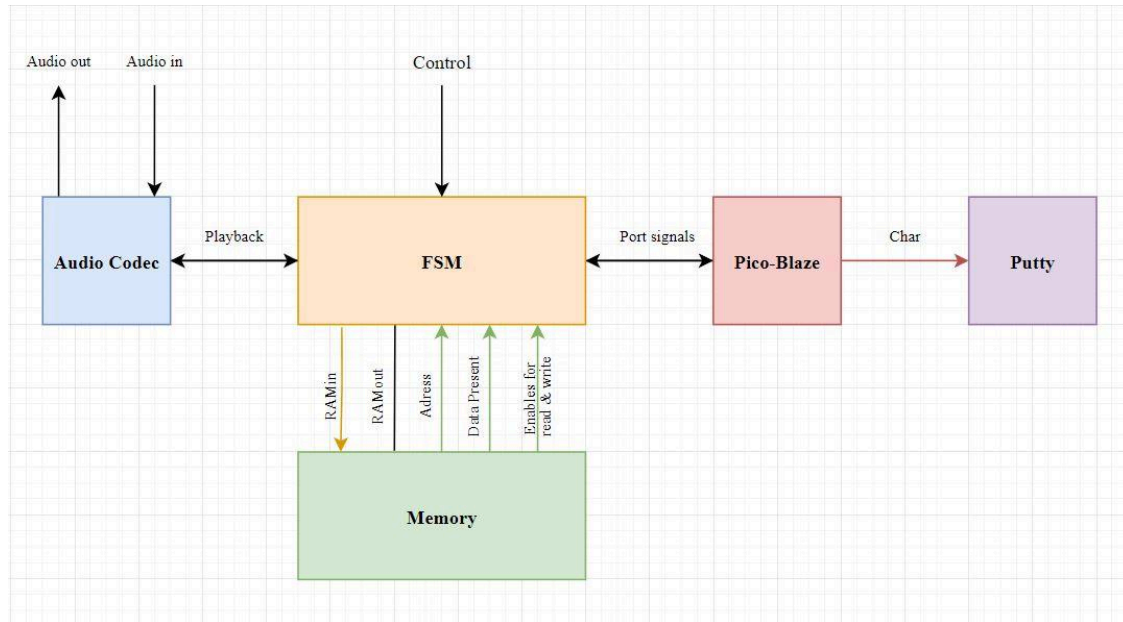
One of the buttons scrolls up through the menu, one scrolls down through the menu, and the other buttons selects an option. When you select “play a message”, there is a sub menu that asks which message you want to play, and then when you select a message, another sub menu pops up that allows you to play, pause, or skip that message. When you select “record a message”, it asks you which message you want to record and then you simply record the message and press done when you are done recording. When you select “delete a message”, it asks you what message you want to delete and then it deletes that message. For “volume control”, there are just 3 options:

- 1) High
- 2) Med
- 3) Low

To actually record a message, switch 3 must be on and this is because in socket top, switch 3 is used for the feedback, so for the audio codec to actually accept any audio, that switch must be on.

System Block Diagram

Show a detailed diagram of the system design. This should include all major blocks and ICs, and show all datapaths and control signals.



Codes

Include source codes. The length of this will vary widely; depending on how much of your design's functionality is in software.

The codes are attached in the submission folder. Both our controller fsm and our psm file are over 500 lines each so if we put screenshots of our code in this report, it would be a major pain and take up a ton of pages. I spoke to Dr Kermani and he said I could state that the codes are attached in the zip file that we submitted. He said that I just needed to state in my report that he said he is ok with that.

Discussion and Conclusions

In this section, discuss how you arrived at your major decisions. Discuss any aspects of your design that you would do differently if you had it all to do over again, and why. Include any and all thoughts you have on the project, how it could have been done differently or better, etc.

At first, we were gonna do a very simple menu that just displayed the basic options for each operation such as playback, record, etc. As we began testing, we decided that we would need to add submenus for each option if we wanted to be able to include all the necessary functionalities for full credit. We decided to use the buttons to control the board because it is a bit simpler than figuring out how to use the keyboard input to control everything. We had to do a lot of trial and error for the fsm but we were able to figure it out after just trying a bunch of different things and testing different inputs and outputs until it finally worked. We really didn't have any issues with the clocks. We just followed the hints in the project directions and the clocks worked with minimal debugging needed. We couldn't figure out how to do the volume control at first but after reading the datasheet and researching the audio codec, we found the volume control in the i2c_av_config module and we changed it so that is being multiplied by some value that is based on what the user inputs for the volume setting. The biggest issue we ran into was that we could not get it to record anything. We figured out that it was just a simple detail we overlooked within sockit top. In the audio codec test (which uses sockit top), switch 6 needs to be on to directly feedback the microphone input to the speaker. We found out that even if we are feeding the microphone input into the RAM instead of directly feeding it back out to the speaker, switch 6 still needs to be switched on to accept any audio input. Once we figured that out, our project was basically done. The delete option is pretty simple. To delete a specific message, we just reset that message's memory address. To delete all messages, we just reset all of the memory addresses. If we had to do it all over again, we would have liked to get picoblaze to use the keyboard inputs to control everything, but we just didn't have enough time to implement that.