CDA 4203/4203L Spring 2022

Computer System Design -- Final Project

Prototypingof an Audio Message Recorder

Deadline: Monday, 2nd May 2022

*This project carries 25% of the lecture grade and 50% of the lab grade. Start early!*

*Assigned Wednesday, 30th March 2022*

Note: Each team can have at most three (3) students.

**Overview**

In this project, you will prototype an audio recorder/player using the ANVYL FPGA Board. The player must be implemented with picoBlaze soft microcontroller as the main controller. The design should have the standard features of an audio recorder, namely, ability to record an audio message, play/pause/delete an audio message selected by the user from the audio library. The user interface is through the Serial Terminal, push buttons, LEDS, and the dip switches.

Serial Terminal

Audio CODEC

picoBlaze

micro-controller

Storage

Memory

LCD

Display

User Controls

Figure 1: High-level block diagram of audio recorder/player

Microphone

& Speaker

Design Requirements

The following are the design requirements:

R1) On start up, the system must show a welcome message and then display a menu

--Switches control the menu options

* + 1. Play a message
    2. Record a message
    3. Delete a message
    4. Delete all messages
    5. Volume control

R2) For options 1 and 3 above, the system should display the audio library and the user should be able to scroll up or down in the list and then select it to play or delete.

--Two BTN’s control up and down

++When reaching end of list, rollback to start of list.

--One BTN controls selecting play, another to select deleting

++Display a message and options to confirm playing/deleting.

R3) When the memory is full, the system should display a “MEMORY FULL” message.

1. If memory is full:
   1. Don’t allow recording
   2. Emphasis deleting a message

R4) While playing an audio message, the user be able to pause/resume and skip the message.

--One switch for pause/play

--One switch for skipping to next message

++If reaching the end of message memory, rollback to the start of memory.

++Can only skip forward

R5) While a message is being played or recorded the user should be able to interact with the system through the menu. In other words, the picoBlaze should not be tied up with playing/recording the message.

Instantiate the menu module in a wrapper, include logic to control this somehow.

R6) The total record time should be at least 4 minutes.

--Use an approximation of time.

--Display a warning that recording time is getting close to maximum.

--Once maximum recording length is reached, stop recording and display a message.

R7) The recorder should be able to record/store atleast 5 messages of variable duration.

--Record and save 6 messages.

**Project Team**

You are allowed to work with at most two students in the class. A reasonable work distribution is along these lines – serial terminal interfacing, Codec interfacing, and User Control and Memory Interfacing. Each project member’s grade will be decided based on their contribution.

**Deliverables and Demo**

By **5pm on Monday, 2nd May**, you should submit the following deliverables:

* **Project Demo Video**: Your team must upload your project demo video that demonstrates all the features.
* **Project Report**: A project report template will be posted on Canvas**.** The project report should be complete in all respects. Include all relevant details of your design and Verilog code in the report.
* **Project Code:** You should upload an archive (zip format) of your project code.

**Grade Distribution**

The grade distribution is based on (a) your report; and (b) the working features of your design:

* Message Recording
  + (4 pts) Can record a message
* Message Playback
  + (3 pts) Plays a message
  + (2 pts) Pause and continue
  + (2 pts) Delete a message
  + (1 pt) Delete all messages
  + (1 pt) Skip a message
* User Interface
  + (2 pts) Scroll up/down
  + (3 pts) Can interact while system is playing/recording a message
  + (2 pts) Volume control with level indicator
* System Messages
  + (2 pts) Welcome message – display for at least 5 seconds or until user presses a button
  + (2 pts) System memory full
* Total Record time is at least 4 minutes
  + (3 pts) Constraint met
* Final Report
  + (3 pts) Report with design details

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