Zedboard Audio Player

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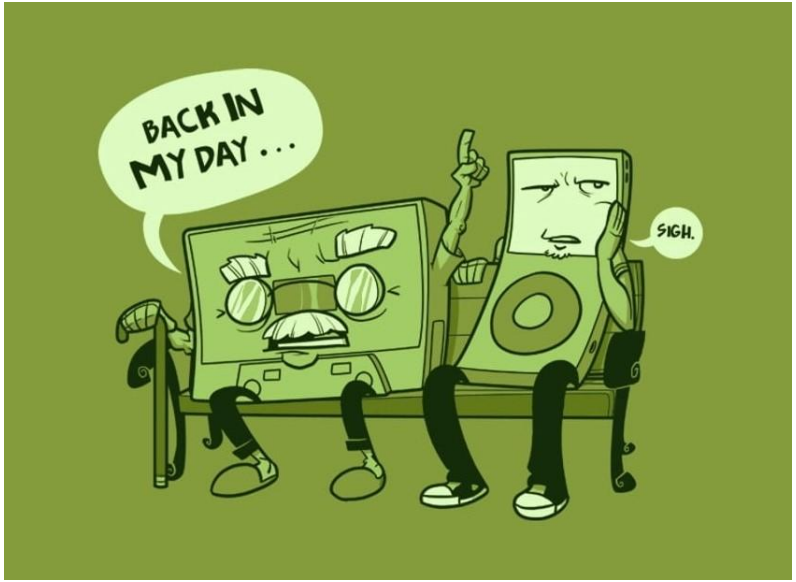
Audio Player Goals (basic)

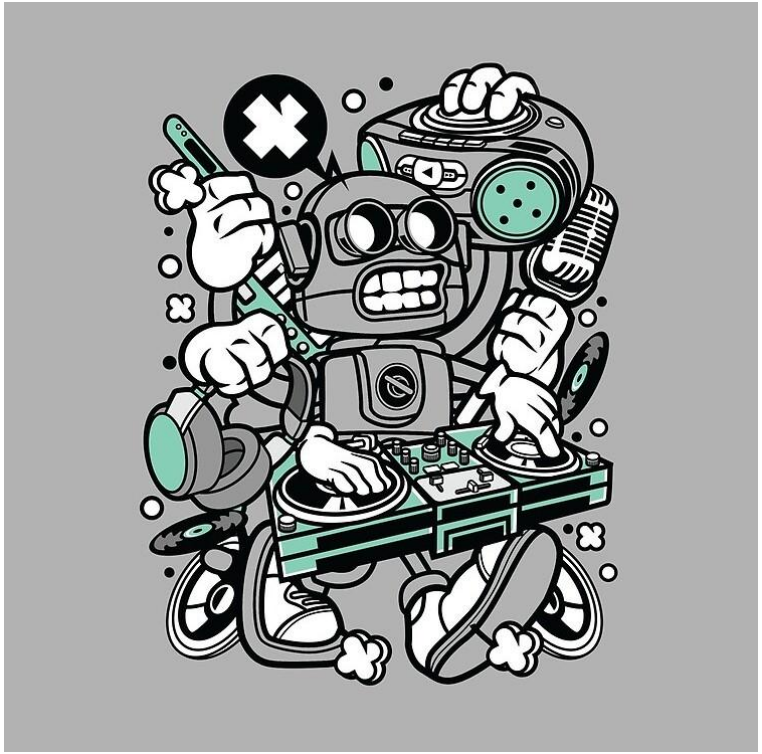
Basic Functions: Use the Zedboard to...

- Record and replay sound samples
- Use line in/out
- User Interface
  - User controls record/replay
  - Rename recordings



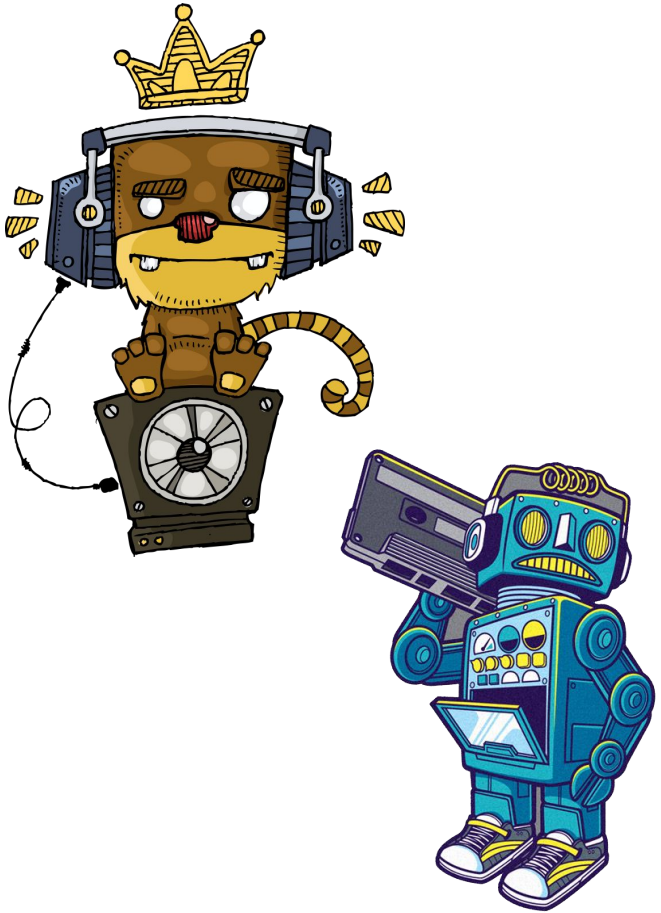
Audio Player Goals (Advanced)

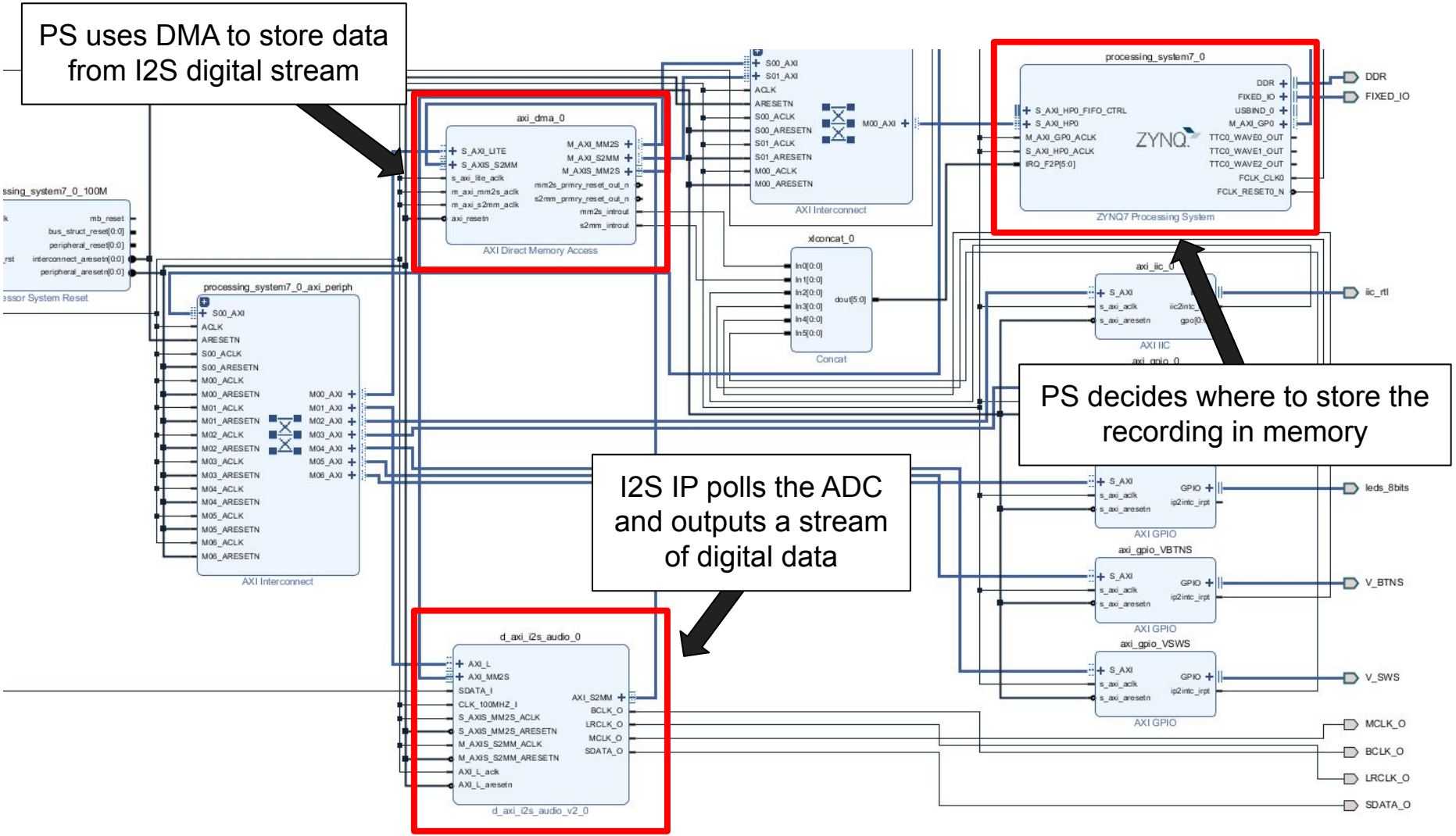
- Advanced UI
  - List available recordings
  - Rename, edit, delete recordings
- Record/Replay
  - Concat/splice recordings
- Mixing/Editing
  - HW/SW Relay
  - HW/SW Sound filters
  - Adjust volume, pitch, treble/mid/bass
  - Adjust replay speed
  - All of the above?



Accomplishments

- Basic UI
  - Display user controls
  - Display status of audio device
- Record/Replay
  - Able to record up to 5 recordings of arbitrary length
- User Operations
  - User can take multiple recordings
  - User can replay any of recordings
- Mixing/Editing
  - Not implemented




PS uses DMA to store data from I2S digital stream
PS decides where to store the recording in memory
I2S IP polls the ADC and outputs a stream of digital data
axi_dma_0
AXI Direct Memory Access
AXI Interconnect
processing_system7_0
ZYNQ7 Processing System
xlconcat_0
Concat
axi_iic_0
AXI IIC
axi_gpio_0
AXI GPIO
axi_gpio_VBTNS
AXI GPIO
axi_gpio_VSWS
AXI GPIO
processing_system7_0_axi_periph
AXI Interconnect
d_axi_i2s_audio_0
d_axi_i2s_audio_v2_0
DDR
FIXED_IO
iic_rtl
leds_8bits
V_BTNS
V_SWS
MCLK_O
BCLK_O
LRCLK_O
SDATA_O

Project Challenges

- Storing a recording in memory
  - Learning how to transfer samples from the ADC to memory using the DMA
- Organizing multiple recordings in memory
  - Understanding how to lay out each recording in memory using the DMA
  - How to index these recordings and how to replay them repeatedly
- Receiving user input
  - How do we know how long to set the recording?
- Understanding audio sample rates
  - XaxiDMA_Simple_Transfer() has a set max limit
  - Changing sample rate changes byte size of our recordings
- Hearing audio from the Zedboard
  - Using the VDI machine’s remote audio settings made it so we couldn’t hear our recordings

Project Solutions

- Storing a recording in memory
  - Guides from Digilent's examples provided a good reference for how to operate the DMA and I2S module
- Organizing multiple recordings in memory
  - Recordings are laid out in memory sequentially
  - Use arrays to store a playlist, and structs to store metadata about recordings
- Receiving user input
  - Using PuTTY to get user input - specify length of recording through keyboard
- Understanding audio sample rates
  - Set a cap for audio recording length
- Hearing audio from the Zedboard
  - Use MS Teams to call the VDI

Project Rubric

Score: n/200

Attributes	Proficiency/Performance Scale		
	1: Beginning - Unsatisfactory - Low Level	2: Accomplished - Satisfactory - Medium Level	3: Exemplary - Beyond Satisfactory - High Level
Demo and Report	Limited demo and report [20 pts]	Full demo, report includes description of all major components [50 pts]	Entertaining demo, report also includes detailed figures and system evaluation results [80 pts]
User Interface	User inputs work, but no visible UI [30 pts]	Basic Terminal UI [60 pts]	Advanced AS screens, scrolling options, etc.) [90 pts]
Sound Recording	Able to record/replay a single sound sample [50 pts]	Being able to record/replay multiple sound samples [90 pts]	Able to concatenate/splice recorded sound samples [130 pts]
Extra Features	Play sound sample at different volumes [20 pts]	Modify pitch of sound sample [40 pts]	Change speed of sound sample relay [60 pts]
	Mic SW/HW Relay Mode [30 pts]	Modify treble, mid, bass components individually [40 pts]	Combine multiple sound mixing/editing features [60 pts]

Thanks Toto