

Kanto - Audio Player

kanto

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Project Overview:

Our project will be an audio player with a graphical user interface and an interesting visualization of the audio. The user will be able to store audio tracks on an SD card in a custom audio codec. We will then use a hardware-accelerated algorithm to decode the audio data and play it back on the FPGA's audio output. We will simultaneously display a visualization of the audio being played. The user interface will allow the user to select a track and skip or rewind to different portions of the current track.

Sensor Inputs:

- + SD Card - to read audio data
- + PS/2 Keyboard - user interface control, I/O

Outputs:

- + Video - for user interface and visualization
- + Audio - for music

Algorithms Implemented:

The audio codec will consist of sparse arrays containing the FFT output of fixed-size portions of the audio sample's time domain. Our algorithm will take the inverse FFT of the encoded data to generate the audio for playback.

The visualization will take characteristics of the current audio portion (e.g the dominant frequency or signal power) of the current audio portion and map them to parameters of the visualization (e.g color and pattern).

Hardware & Software Components:

Hardware Components

- + Audio Playback Unit
 - Stores a buffer of decoded audio data and plays it on the audio output
- + Video Driver
 - Stores a buffer of the video pixels and communicates with VGA port

- + Audio Decoder

- Takes encoded frames and decodes them using FFT

- + Visualization Unit

- Accelerates visualization algorithm and writes visualization to video driver

Software Components

- + User Interface

- Handling keyboard input
- Displaying certain graphical elements

- + I/O

- Read encoded audio from the SD card and push it to the decoder
- Read decoded audio from decoder and push it to playback and visualization units