3-D Audio Optimization Tool

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Motivation

- Audio is tested in a “perfect” setting
- Audio is configured by professional audio engineering and technicians
- Home audio systems have imperfections in their room’s frequency response
- Straightforward implementation to fix this issue
- Should work with all speaker systems

Deliverable

- 3-D Audio Optimization Tool
- Generates dynamic FIR filter
- Portable digital audio filter (Teensy)
- Works with any analog audio source

Materials and Methods

- RP4 plays audio and generates filter
- Microphone records speaker output
- Teensy applies filter to live audio signal
- Tested with 5.1 Surround Sound Audio System
  - 5 speakers, 1 subwoofer

Reflection

- Syncing up audio signal a non-trivial challenge
- Filtering creates significant delay
  - Current implementation is audio only
- Faster filtering would allow audio/visual sync
  - Very short filter generation tones (10-20 ms)
  - Filter truncation (order of 4800-9600)
- High quality microphone is important

High-Level Block Diagram

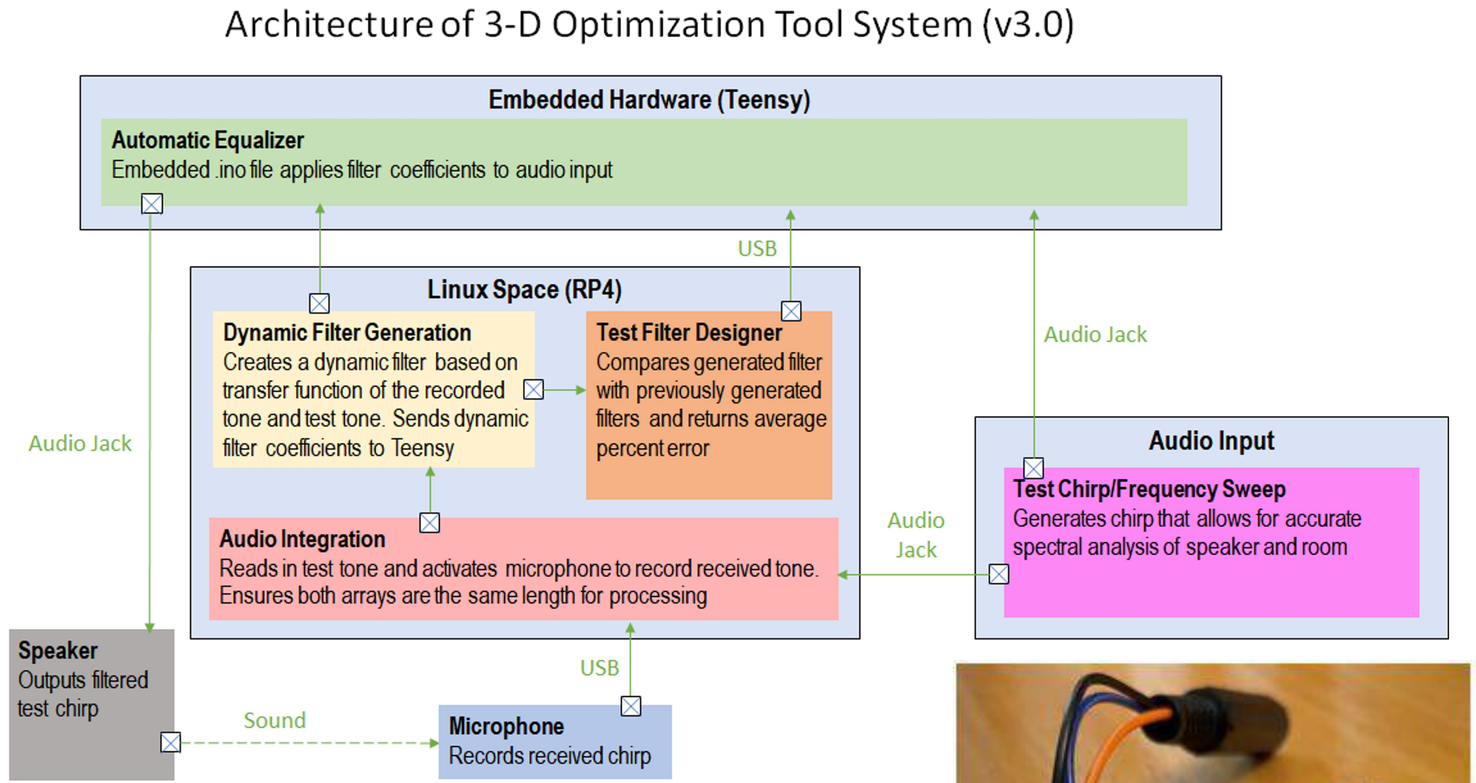

Figure 1: Block diagram of the system

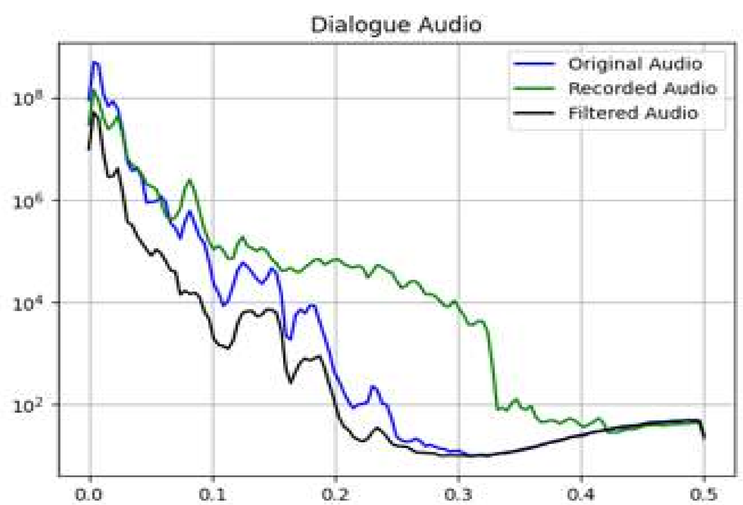

Figure 2: Dialogue Audio

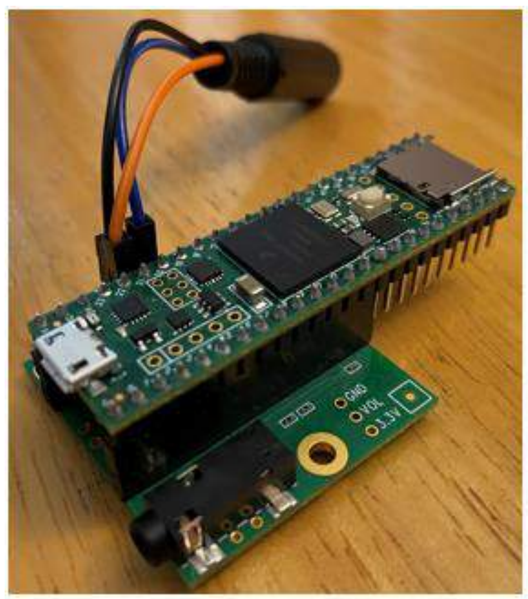

Figure 3: Final Deliverable

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