EECS 473 Final Project: Metronome

EECS ELECTRICAL ENGINEERING AND COMPUTER SCIENCE UNIVERSITY OF MICHIGAN

BOSCH

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Introduction

Metronomes are devices that produce an audible click at regular intervals. While simple, they are essential to learning music.

Problem

While the metronomes currently on the market provide basic functionalities that are sufficient for non-professional musicians, there are no products that offer the capabilities needed to practice more advanced music.

Solution

We built a product that improves on existing top models by offering:

- Arbitrary time signatures
- Layered subdivisions
- Modern user interface
- Rechargeable battery

The following are configurable features of our metronome:

- Time signature
- Tempo (BPM and note value)
- Layered subdivisions

The metronome supports multiple modes:

- Main mode
- Pitch generator mode
- Tetris mode
- Flash update mode

Software

The interface is designed for significant user configurability. This allows musicians to practice pieces with non-standard rhythms. We use FreeRTOS as our operating system to integrate all peripherals and processes.

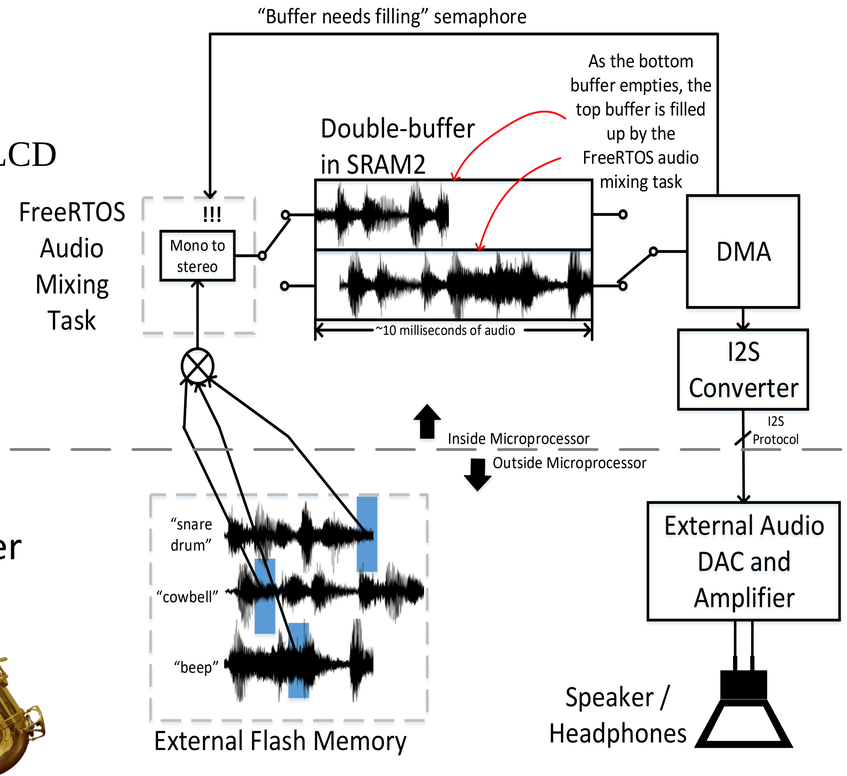
Hardware

- STM32F7 MCU
- 16-bit 320x240 color TFT LCD
- Speaker & boost circuit
- Rechargeable LiPo battery
- WM8985 Audio Codec
- 3.5 mm audio jack
- ¼” input jack

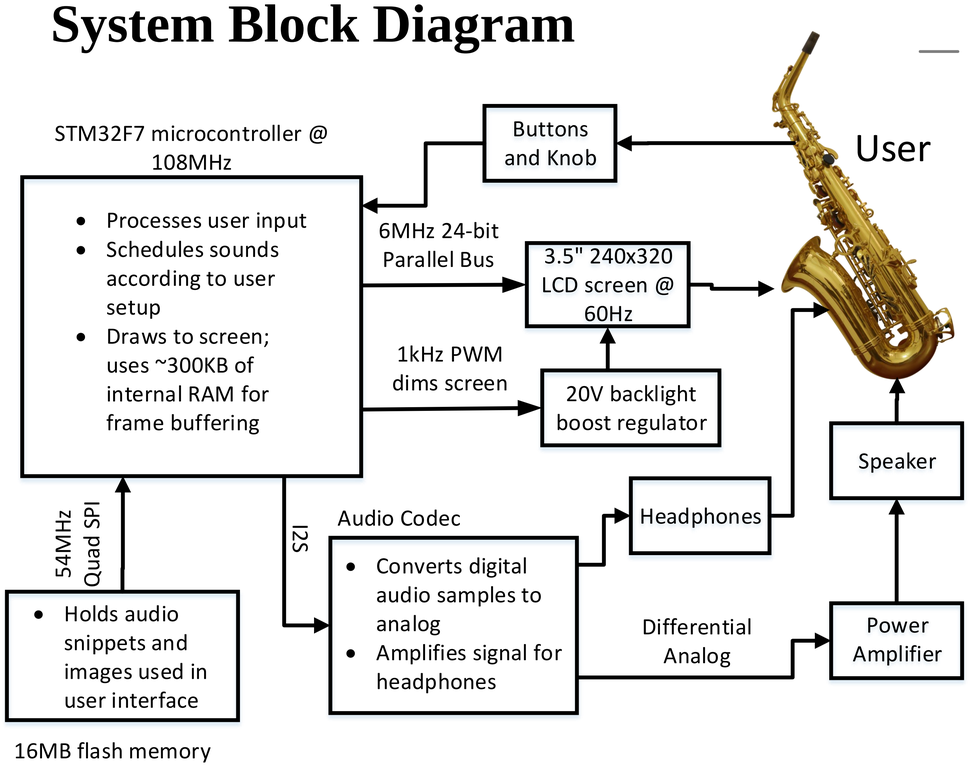
Audio System

Once the user enters a rhythm they want to play, data structures representing the user’s rhythm are fed into the audio system.

Sounds are stored in flash memory, mixed by the microcontroller, sent to the audio codec, and then played over the speakers or headphones.



System Block Diagram



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