

How (not) to build a tuner

PHYS 319 Personal Project

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Outline

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 - Audio Input and Signal Processing
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Motivation

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This is
going to be fun.



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Demotivation

Why it wasn't a good idea:

- I spent more time building a tuner than actually playing music in the last year.
- 250+ dollar kit worth of parts is outperformed by by brother's 30 dollar device.
- Curse of the physicist: Real life often makes everything you thought would be doable harder.

High-Level Overview of Functionality

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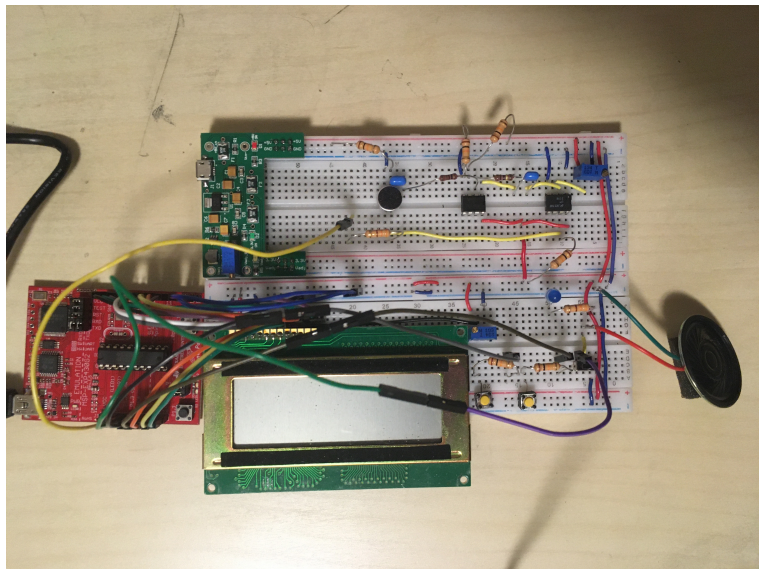
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- Metronome for tempo

High-Level Overview of Functionality

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- Measure the frequency of the played note and return how off it was
- Play the specific frequency for tuning by ear
- Metronome for tempo
- Display & Interface on device itself

A complicated mess



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```
156
157 char* int_to_note_string(int note) {
158     switch(note) {
159         case 16:
160             return "C2";
161
162         case 17:
163             return "C#2";
164
165         case 18:
166             return "D2";
167
168         case 19:
169             return "D#2";
170
171         case 20:
172             return "E2";
173
174         case 21:
175             return "F2";
176
177         case 22:
178             return "F#2";
179
180         case 23:
181             return "G2";
182
183         case 24:
184             return "G#2";
185
186         case 25:
187             return "A2";
```

Audio Input and Signal processing

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- Electret mic. picks up the signal

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- Op-Amp amplifies signal

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Comparator converts to square wave

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Processed Signal gets sent to MSP

User Controls

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Buttons to change notes

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Switch to turn speaker on/o

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Interrupt buttons on MSP to switch tuning/metronome modes

LCD Display

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Potentiometer for screen contrast

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R/S pin, E pin, and 8 data pin inputs from MSP

MSP program

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Measuring input signal width

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Outputs to LCD display

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PWM output

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Interrupt Handling

MSP program

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Outputs to LCD display

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Interrupt Handling

Internal counter and input handling for bpm/notes

Demo

LCD photos as I anticipate it will be impossible to see camera

Issues/Improvements

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- ▮ Potential stronger amplification, but could be a hardware limitation due to low SNR for quiet signal.

Outlook

