



The EMMMA-K



A unique kind of electronic music keyboard



(intro)



Presentation Objective

This presentation is about a unique kind of home made electronic music keyboard that can be used with any computer software or music synthesizer that can handle USB MIDI.

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About Me

- I had a 40 year career in several industries including Aerospace a couple of times.
- My technical area of expertise is embedded systems, both hardware and software.
- I live in Atlantic Canada where we have long winters, perfect for working on electronics projects!
- For the past two and a half years I have been privileged to be a full time Maker, but I have always been an electronics hobbyist.



Electronic Music

- I have been enthralled by electronic music since I first heard a Moog Synthesizer when I was a teenager.
- A few years later when I first started working I built a simple version of my own design. It sounded great!
- Then my career got in the way...



Electronic Music Today

- There are still many stand alone synthesizers available but now you can make an amazing system with computer running Digital Audio Workstation software and a USB keyboard.
- This is a MacBook Pro running GarageBand and a low cost AKAI mini keyboard purchased from Amazon.



Electronic Music Today



Electronic Music Today

- This is an electronic guitar keyboard that works ok but with a lot of limitations.
- The secret to all this is MIDI!



MIDI

- MIDI is the Musical Instrument Digital Interface and a standard since 1983.
- It allows connecting musical instruments, keyboards and computers to each other by cable, USB, bluetooth and WIFI.
- With a keyboard and the appropriate software on your computer or tablet you can do amazing things.
- For performing none of this is very portable especially if the keyboard is a piano type!



The Dream

- I've always had the dream of making an electronic music keyboard that was hand held and easy to play. Something different!
- In October of 2016 I went to see Basia Bulat in concert at the Halifax Pop Explosion.
- She is a Folk and Pop Music singer songwriter from Toronto (Canada) who I really like.

Basia

- During one of the songs in that concert she used a hand held instrument that I had never seen before.
- I couldn't find out anything about it and this looks home made to me.
- I could do that!
- It was a very busy time for me at work at the time so I didn't pursue it.



A New Project Idea

- After the Bay Area Maker Faire last May I started thinking about a new project for this year and that got me interested in electronic music keyboards again.
- I had already discovered the Hurdy Gurdy which is a medieval age acoustic stringed instrument and wondered if an electronic keyboard could be modelled after that.
- Sure enough a few people had done something like that already but I thought I would give it a try.

The Hurdy Gurdy?

- Coincidentally (or not?) I saw two Hurdy Gurdy's from the 1700s in a museum in Florence on a visit after the Maker Faire Rome and that got me going!
- I originally called this project "Hurdy" as I had in mind it being only part of a Hurdy Gurdy.



What Next?

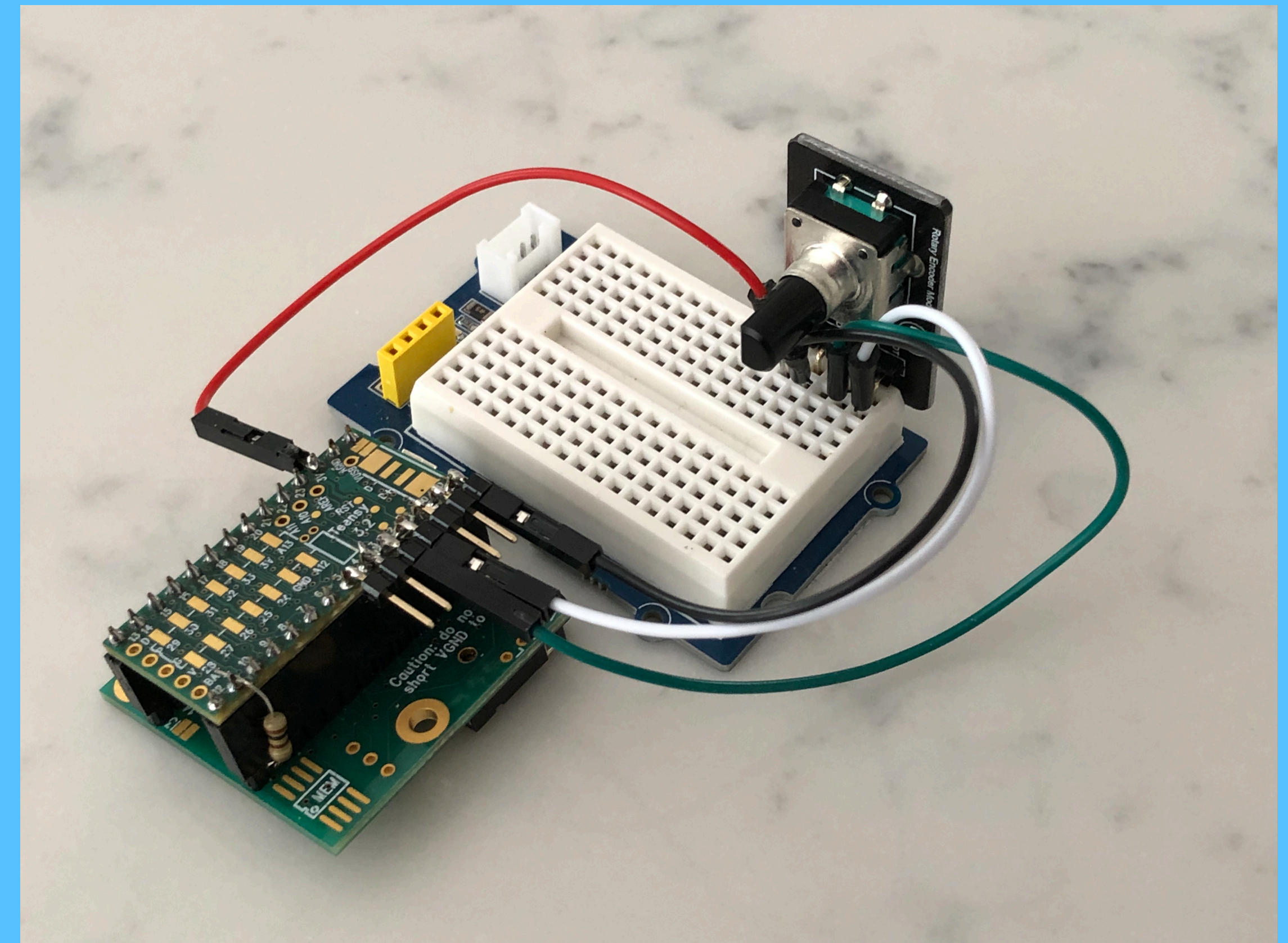
- Obviously what I ended up with doesn't look anything like a Hurdy Gurdy!
- Now I want to talk about how to go from idea to prototype using this as an example.
- I'm sure that this is something that every Maker knows intuitively but I would like to explain it to those who have never done anything like this before.

Step 1

- We need some kind of keys mounted on an enclosure of some kind (think of Basia's instrument).
- Maybe just some push buttons and something to make an electronic hand crank.
- For sure we need a microcontroller.



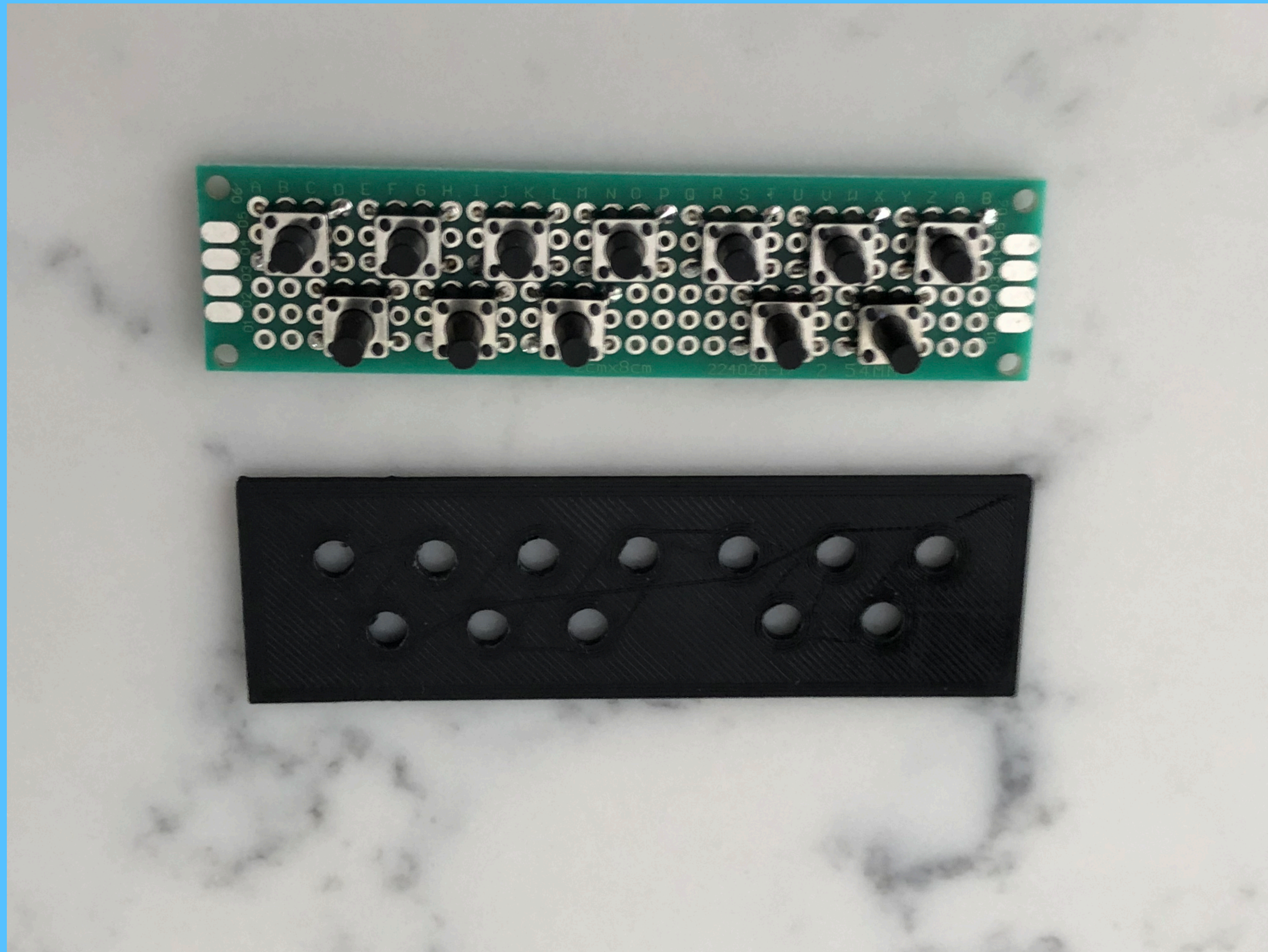
Rotary Encoders



Some Buttons



Too small and flimsy or too big and clunky...

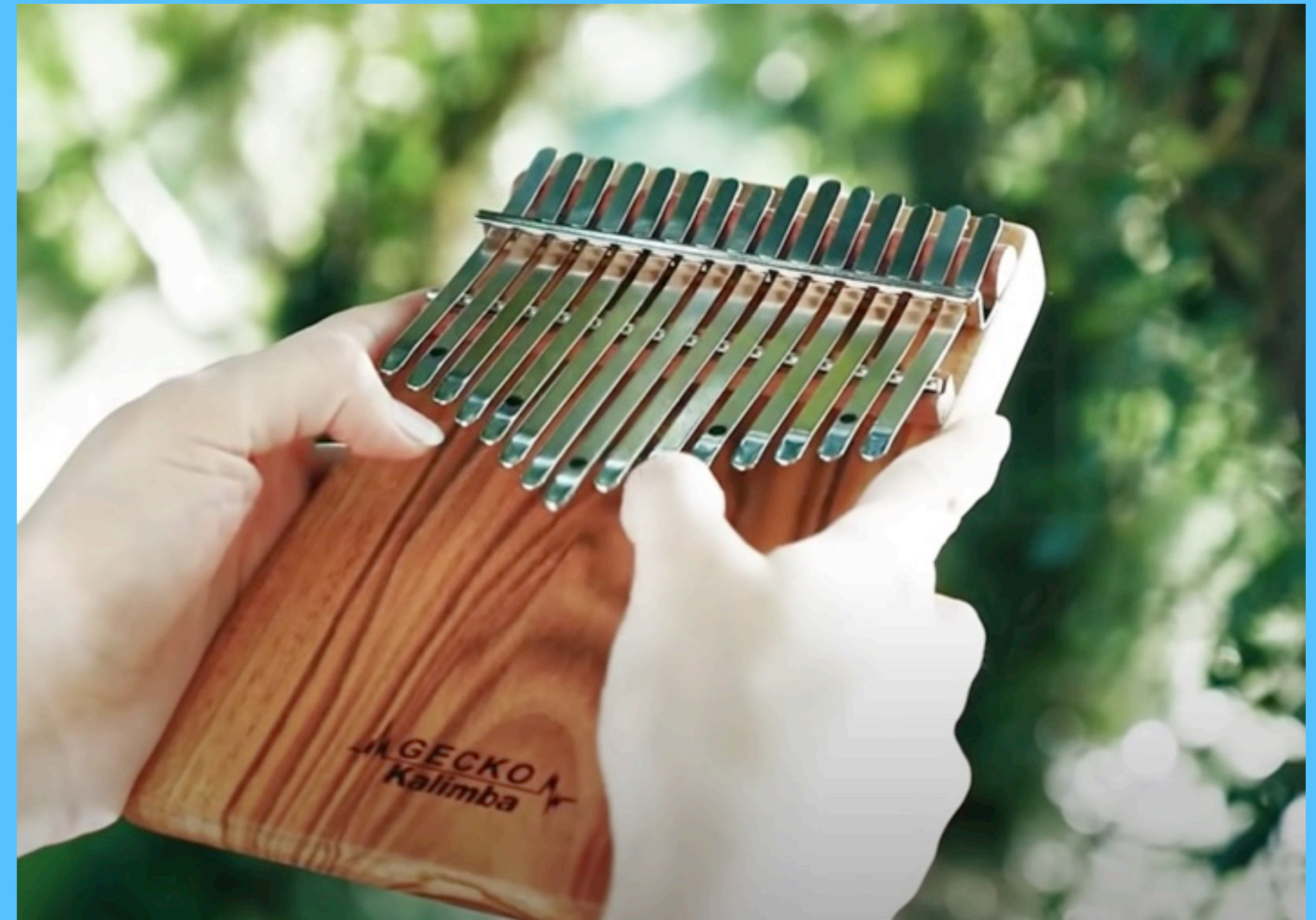


Oh oh...

- This wasn't really going the way I wanted it to.
- Out of the blue while watching something on YouTube one day, it was suggested that I look at a video about the Kalimba which I had never heard of.
- That is how I discovered the Kalimba and April Yang.

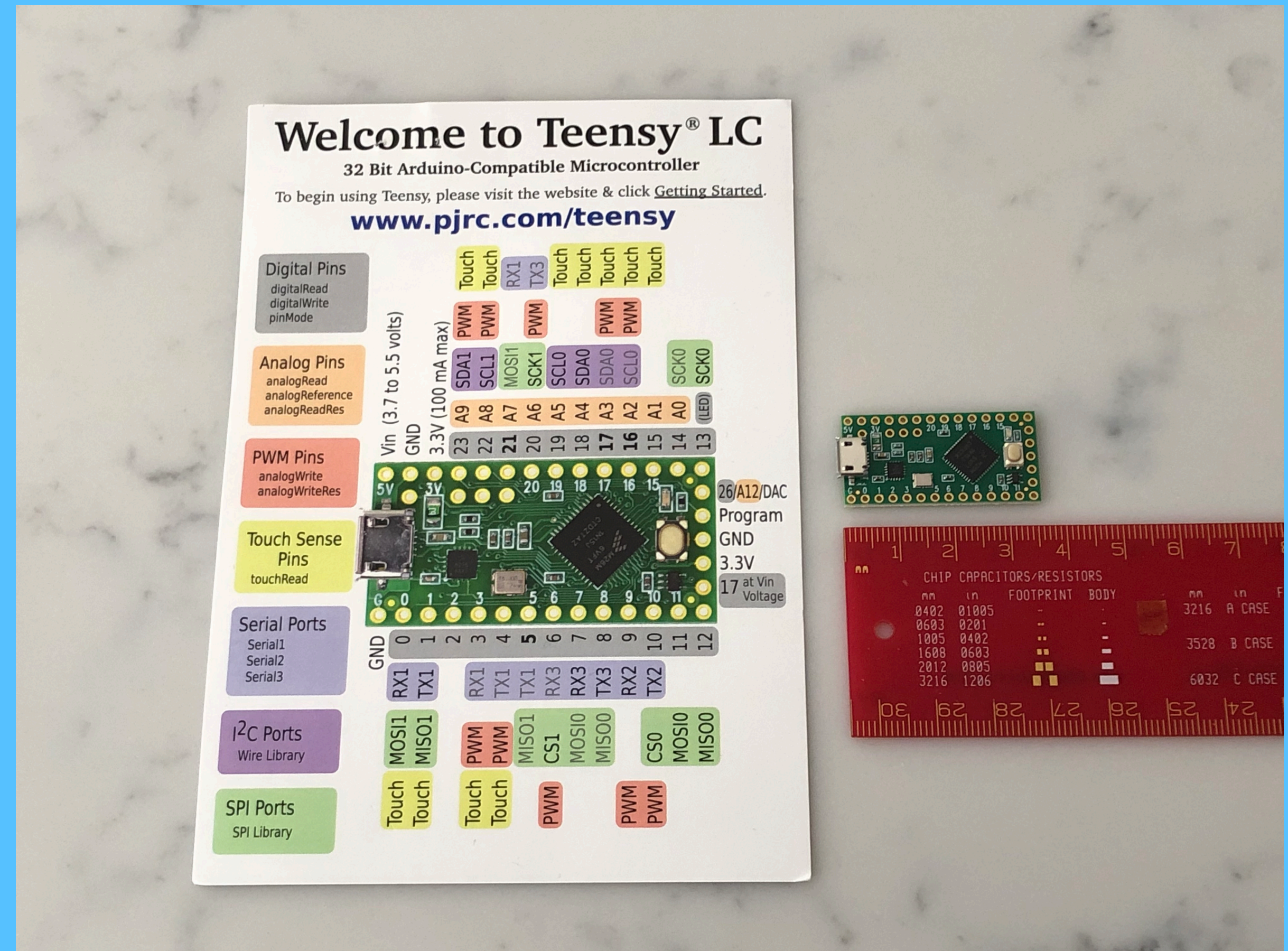
The Kalimba

- This is the perfect layout for an electronic keyboard.
- It is pretty easy to play with a bit of practice.
- Thanks to April and others there are lots of instructional videos and even a tablature notation.
- Could use touch keys instead of buttons.



A Concept Emerges

- It's time to think about a microcontroller and there are lots of choices.
- The Teensy LC brings it all together and it is very low cost (< \$20).
- It can handle 11 touch keys and produce USB MIDI with multiple software libraries available for both.
- We need to worry about latency however and we still need a case.

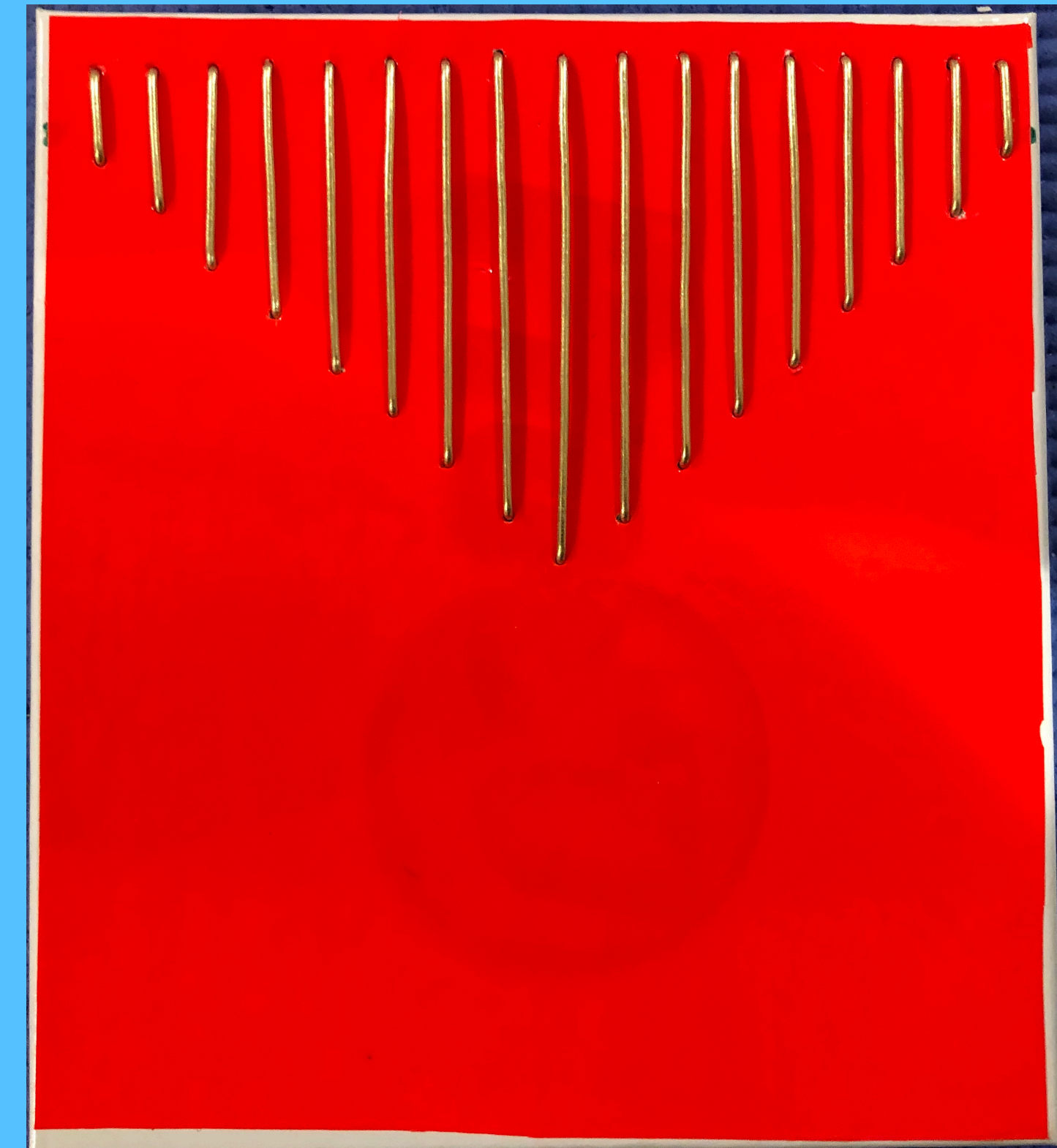




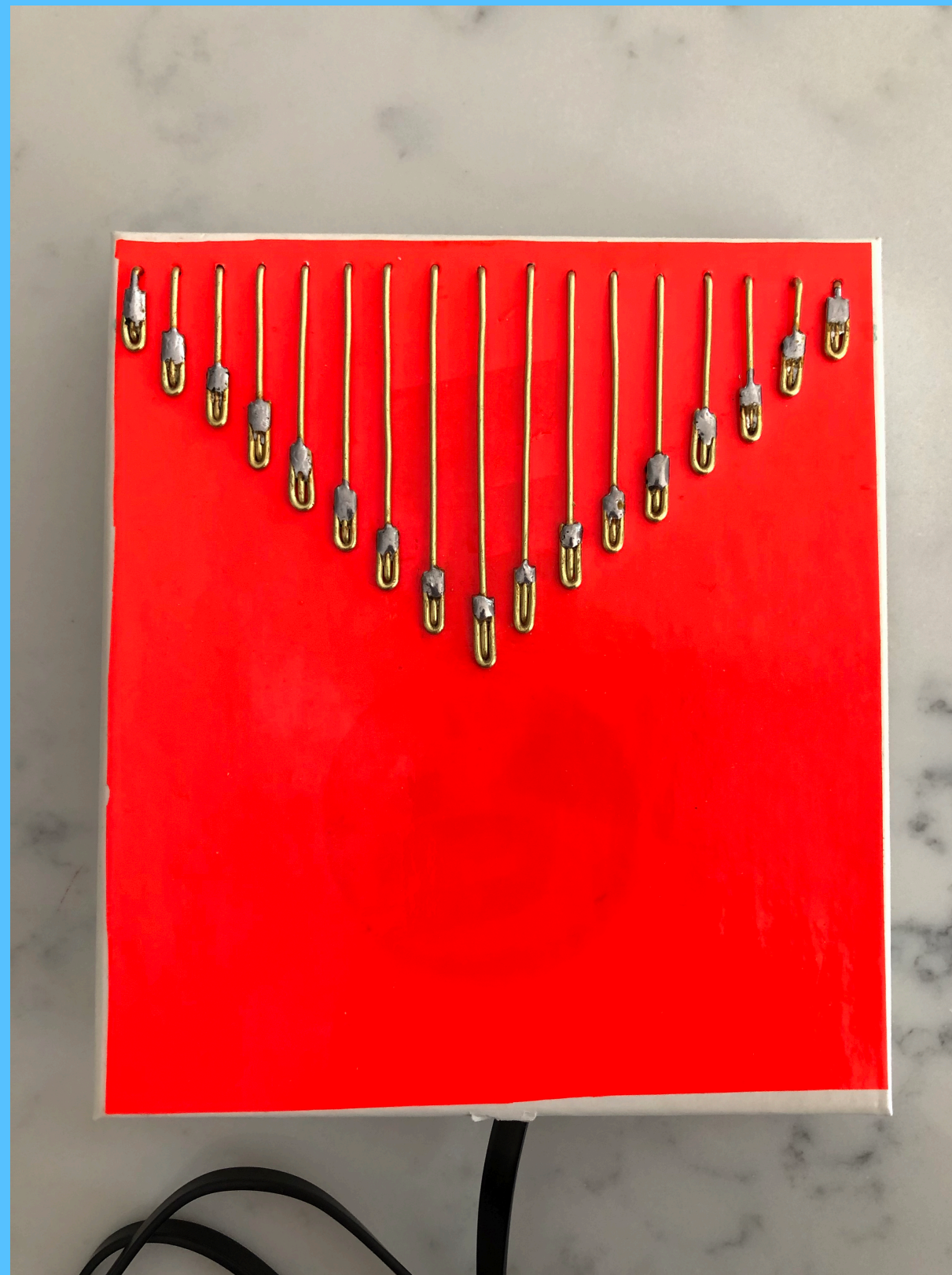
(touch pin demo)

It's Coming Together

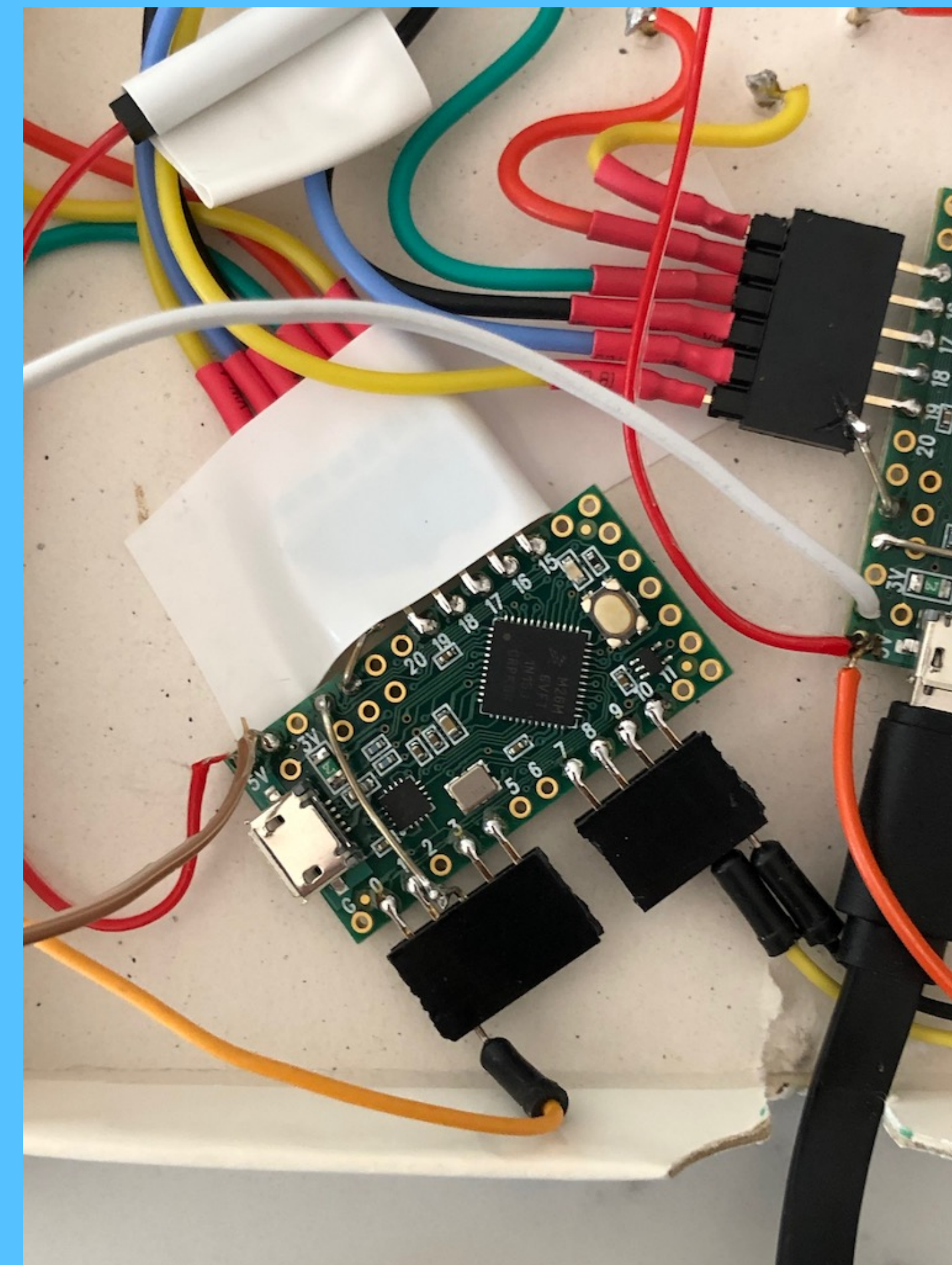
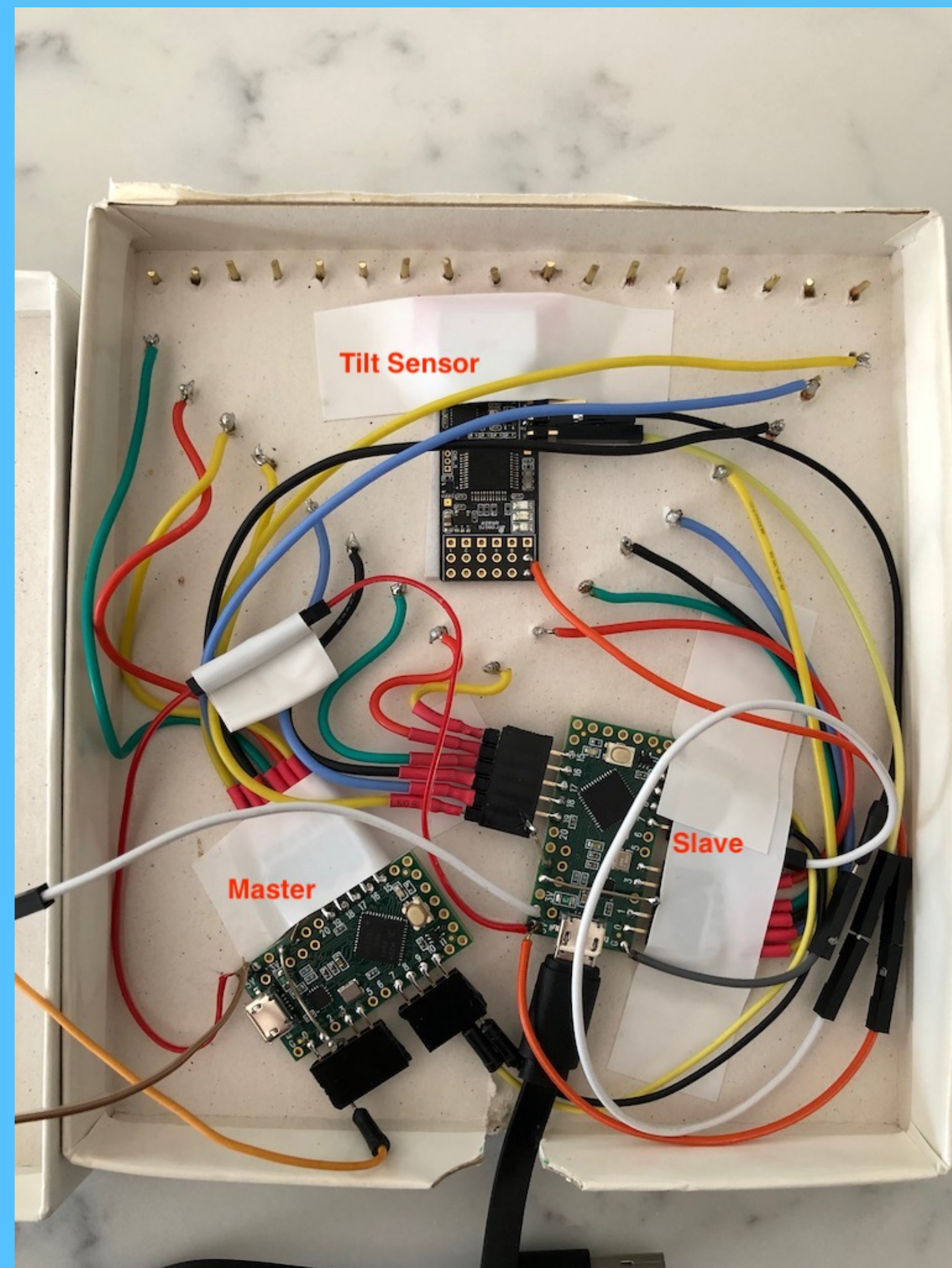
- Brass wires stuck into a cardboard CD case from the previous century.
- I wired up a few of the wires to begin with just to try it.
- The performance was a bit disappointing however as it wasn't sensitive enough and a bit unreliable.



The Final Solution



Finishing Up



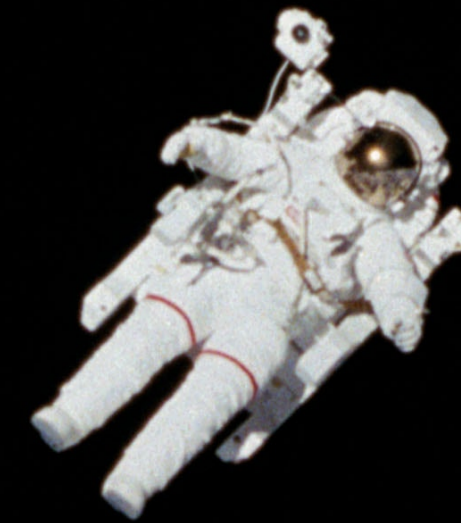


The COVID-19 Connection

- I had the first fully working version of the EMMMA-K completed on March 19 just as we started to enter lockdown for COVID-19.
- I started wondering what the battle between the virus and your antibodies might sound like from a musical perspective!
- By the time our State of Emergency was enacted on March 22 I was well on my way to a 14 day obsession that resulted in an album on SoundCloud called Antibodies...



(demo)



Questions?