

Plunged Into Chaos



Or, The Plumber's Friend Finds Its Voice

Components of the System:

Physical Interface:

- A plunger (hasn't been used)
- Wire-wrapped variable resistor
- Force-sensitive resistor
- X/Y accelerometer

Sound Generation:

- Three simple oscillator engines
- Bandpass filter

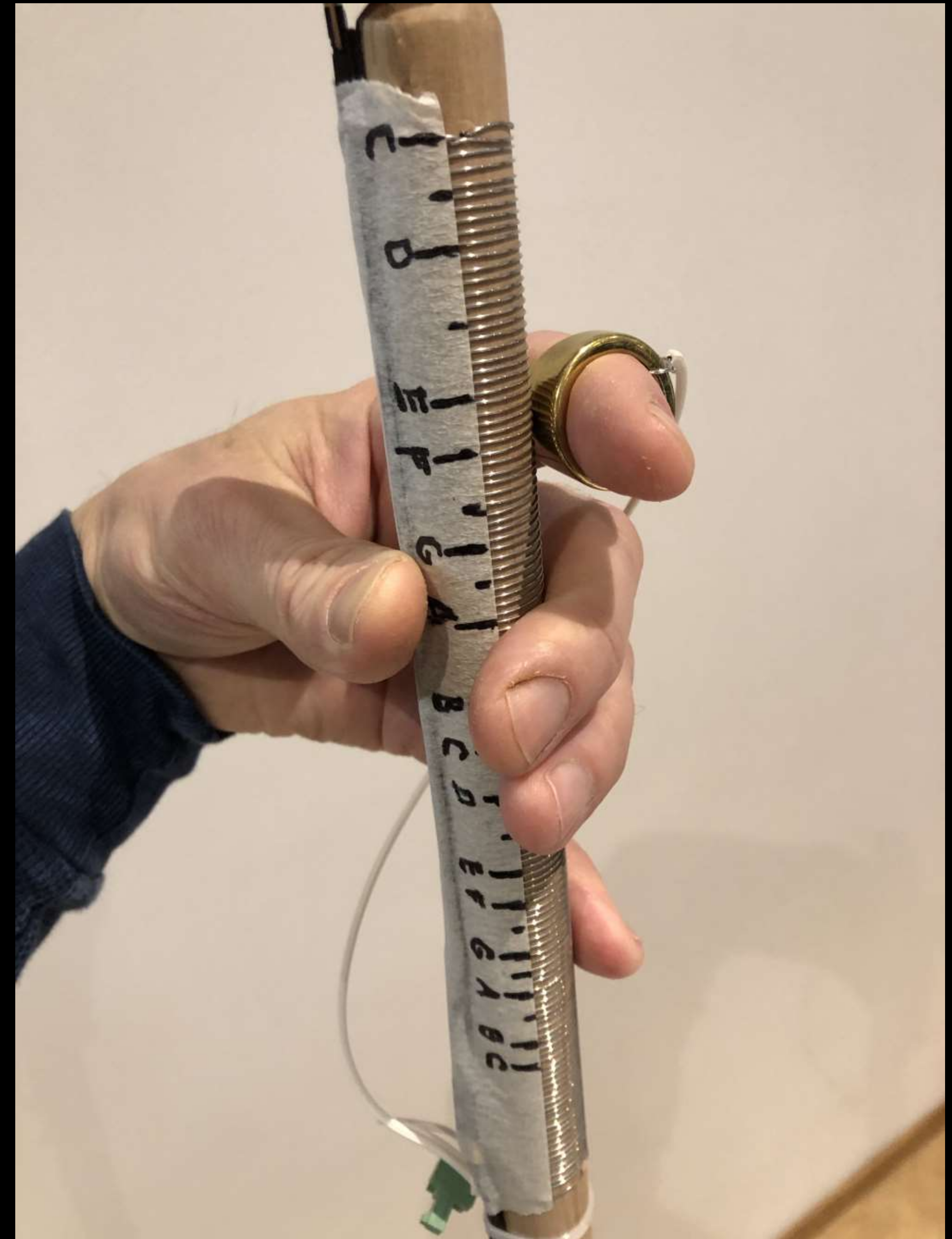
Mapping:

- Pitch: variable resistor
- Volume: force-sensitive resistor
- Accelerometer:
 - y-axis, bandpass
 - x-axis, volume of tenor voice

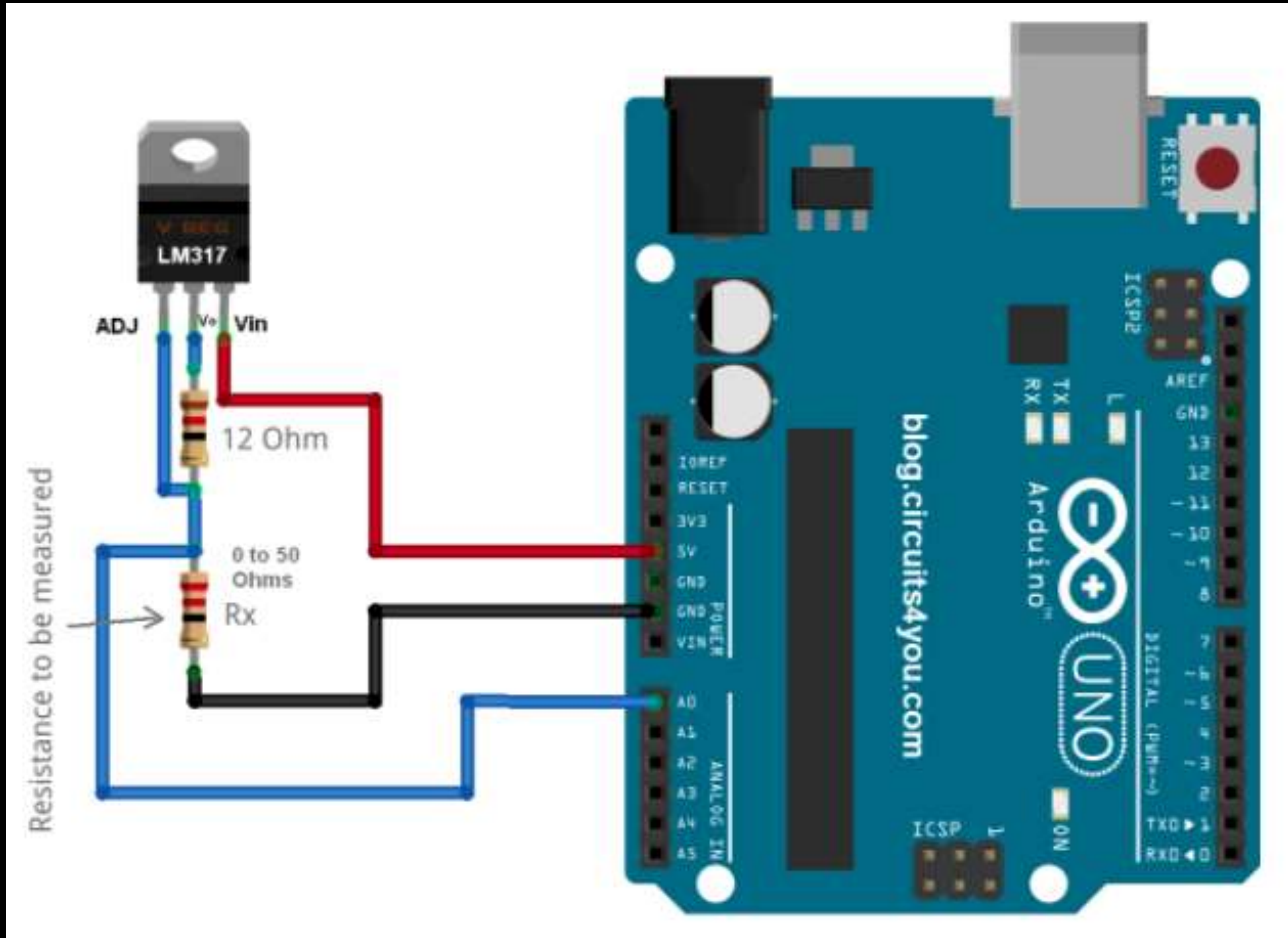
Pitch Control

Wire-wrapped variable resistor with brass wiper

- 24 meters Nichrome resistance wire, approx. 1-50 ohms range
- Brass ring acts as “wiper”, which changes the effective length of the wire (and therefore resistance)
- LM317 Voltage regulator (component) used to read values without short-circuiting the Bela with excessive current



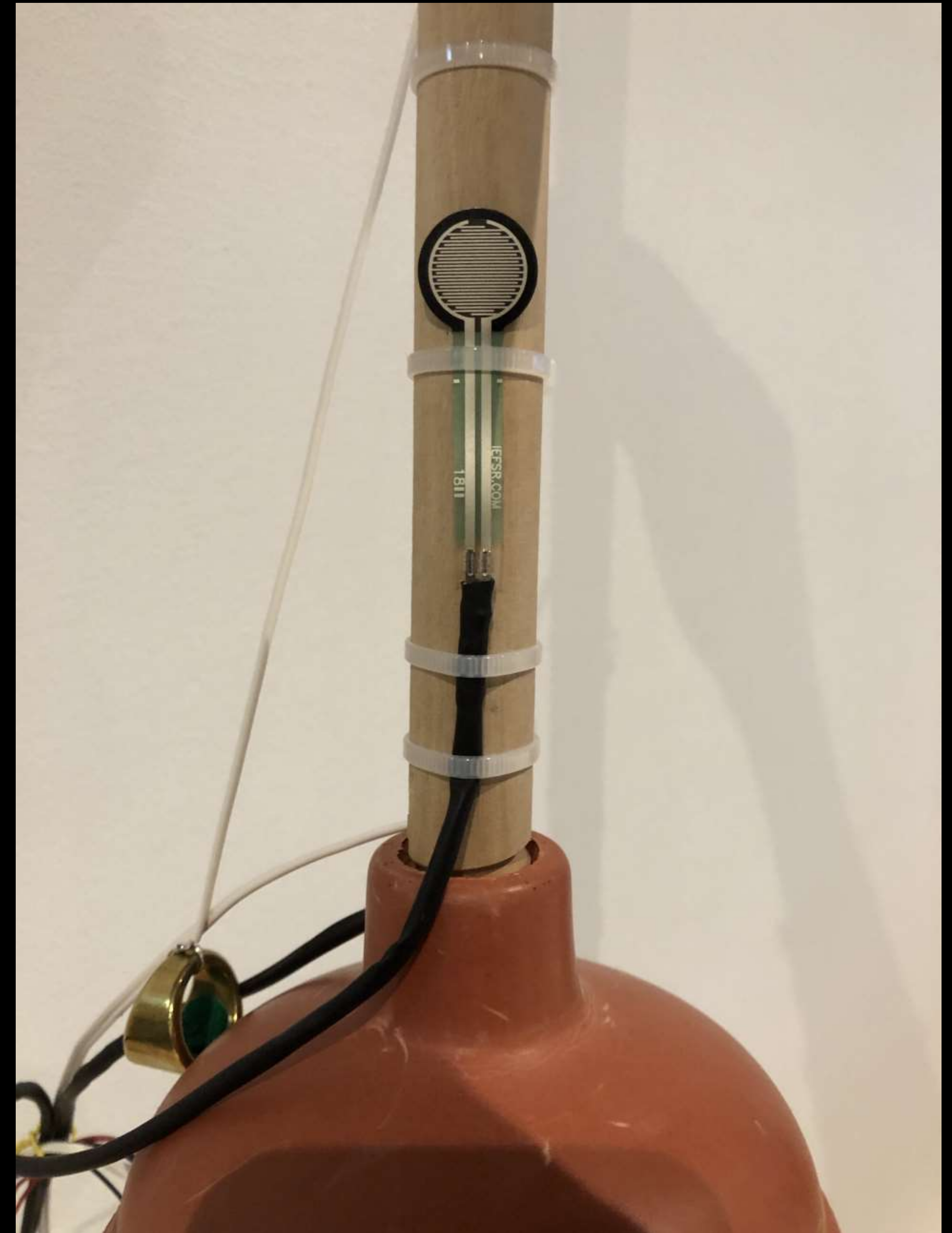
Low-value resistor measurement with LM317



Main Volume

Force-sensitive resistor

- A few notes:
 - It's very sensitive
 - A light touch is best for expressive volume control
 - Player can control onsets, volume swells, and tremolo-like effects



Bandpass filter, secondary volume control

ADXL337 Accelerometer

- Y-axis controls bandpass filter on primary synth voice, FM frequency on second voice
- Frequency sweeps are inversely proportional
- X-axis controls volume of second voice



Design Goals and Inspiration

- a playable instrument requiring some expertise to master
- able to play note-based music
- physical interaction with “natural” materials like wood and wire to control expressive parameters, in the way of an acoustic instrument. See Madrona Soundplane (Jones et al, 2009)
- NIME creation principles 3, 13, and 13b (Cook, 2019).
- Maywa Denki Art Group, absurd yet seriously playable (Yin, 2018)
- Engage the player in an understandable way, with some surprising elements (Hunt et al, 2010)

Playing the Plunger

- Initially conceived as a kind of large joystick to be attached to a surface
- More freedom afforded if detached from the base
- Pitch wanders a bit
- Mappings and sound engine could use more work (always)

Evaluation

The ergonomics of the interface are well-thought-out, giving the player easy access and a sense of agency.

It “really feels like an instrument”.

Joystick or hand-held: attaching instrument to surface may limit expressivity.

Interface affords spontaneous expression. Allows sound to follow bodily movements to a degree.

Well finished and robust interface.

Overly-simple mappings (but have been changed)

Conclusion

Future work

- Proof-of-concept for a multi-voice system using variable resistor design
- Original concept more like a lap-steel guitar
- The plunger provided some surprising affordances and insight

References:

Cook, Perry R. “Re-Designing Principles for Computer Music Controllers: A Case Study of SqueezeVox Maggie,” n.d., 5.

Hunt, Andy, Marcelo M. Wanderley, and Matthew Paradis. “The Importance of Parameter Mapping in Electronic Instrument Design.” *Journal of New Music Research* 32, no. 4 (December 1, 2003): 429–40. <https://doi.org/10.1076/jnmr.32.4.429.18853>.

Jones, Randy, Peter Driessen, Andrew Schloss, and George Tzanetakis. “A Force-Sensitive Surface For Intimate Control,” *Madrona Labs*, 2009, n.d., 6

Yin, Tingyun. “The Critical Spirit in Everyday Object Design : A Study of Maywa Denki’s Creative Method.” Thesis, Massachusetts Institute of Technology, 2018.

<https://dspace.mit.edu/handle/1721.1/118499>.