

OpenPipe

“freedom for your fingers”

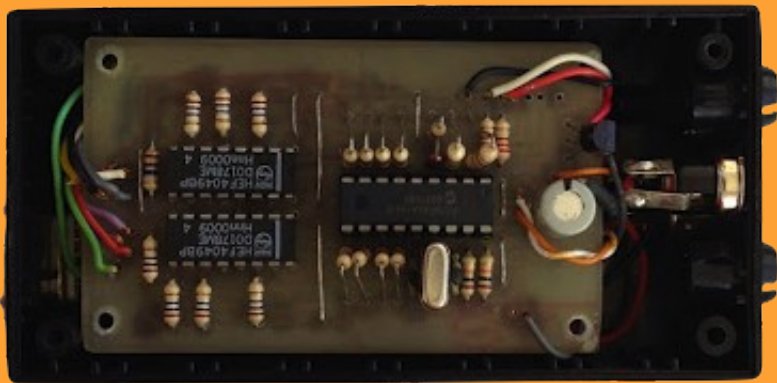
OSHW bagpipes & beyond...



FOSDEM '13

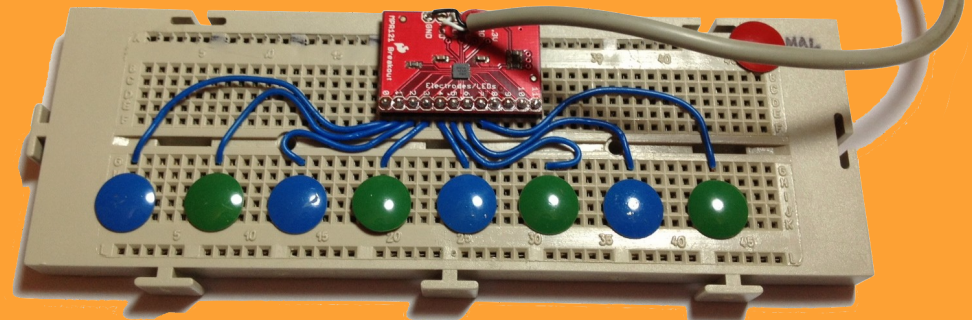
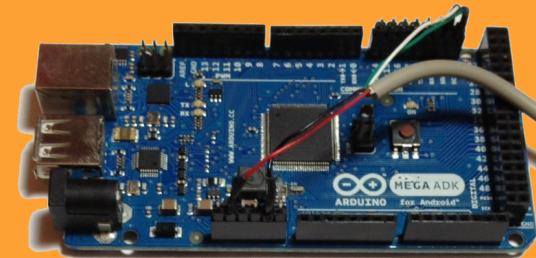
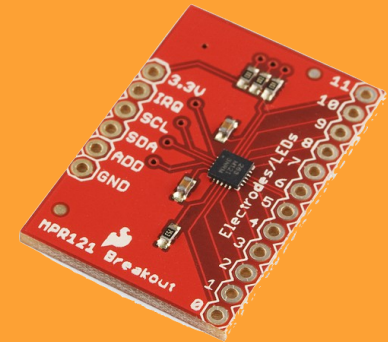
A bit of history

- Back in 20th century (year 2000)
- Galician Bagpipes MIDI controller
- PIC16F84 μ C (code in ASM)
- Resistive interface (ON/OFF) (pins & screws)
- 5 pin DIN MIDI connector (standard MIDI)
- Only one unit produced (2 HMI)
- OSHW was not mainstream



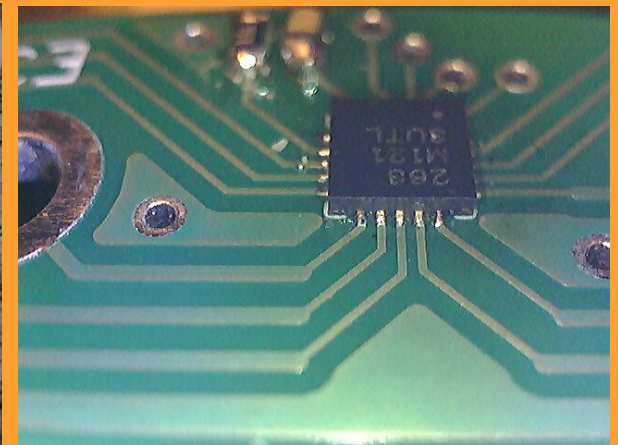
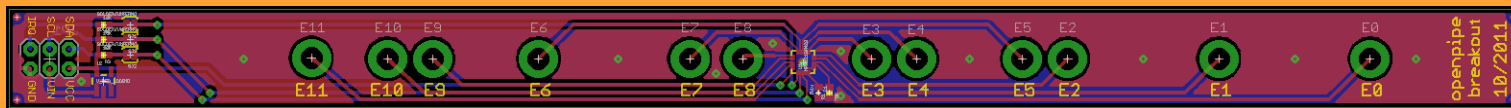
Back to the present

- Winter 2011
- Arduino & DIY & MAKER & OSHW
- MPR121 Capacitive Touch Sensor Controller
- SparkFun Breakout Board
- PWM sound generation
- VIDEO

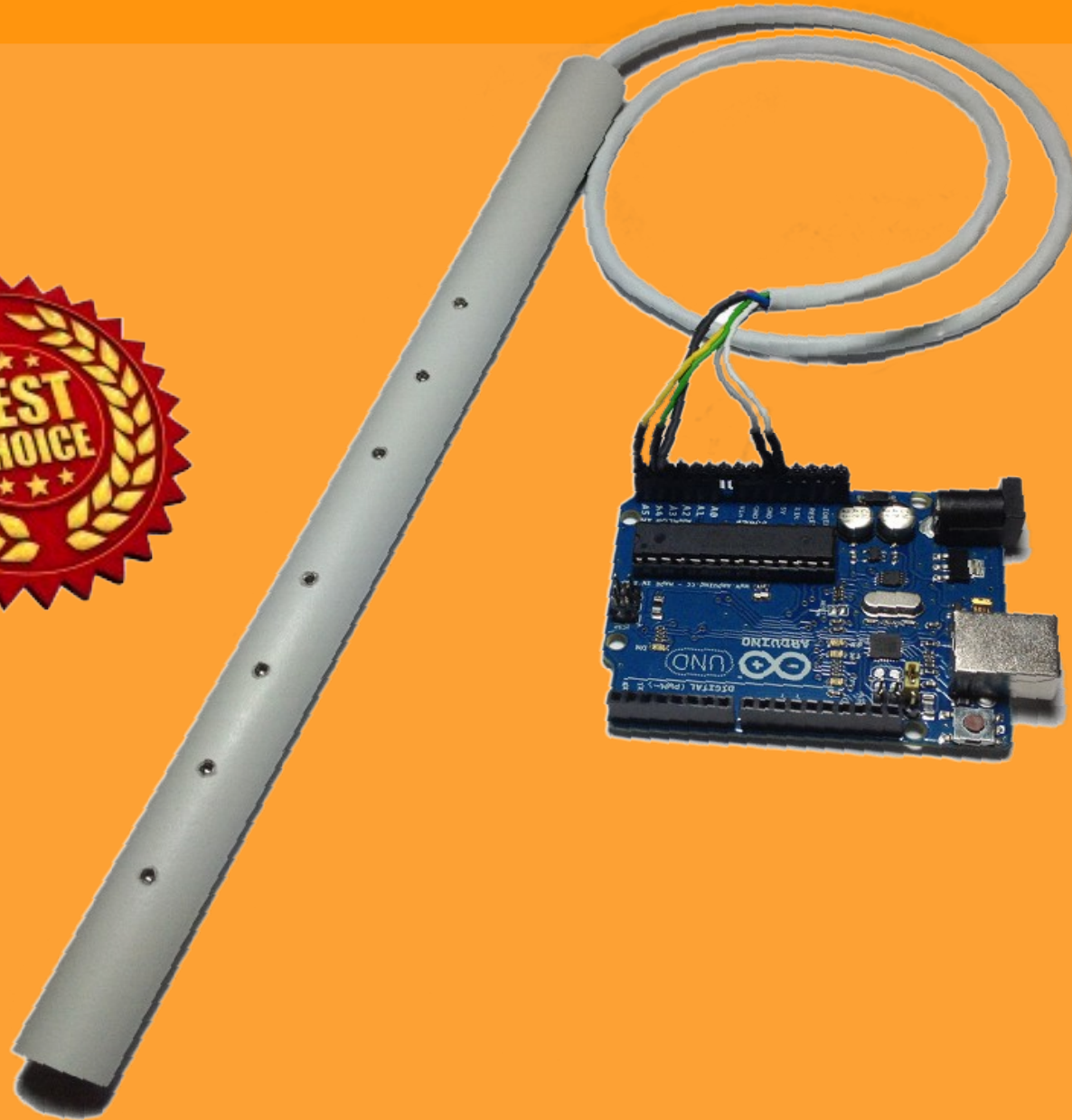


The OpenPipe Breakout

- MPR121 works great! (low latency, continuous sensing, easy, ...)
- We would like to learn Eagle PCB, assembly process, etc., from a DIY approach
- SMD homemade soldering (toaster reflow station)
- RESULT: The OpenPipe Breakout Board layout works!



The OpenPipe Breakout



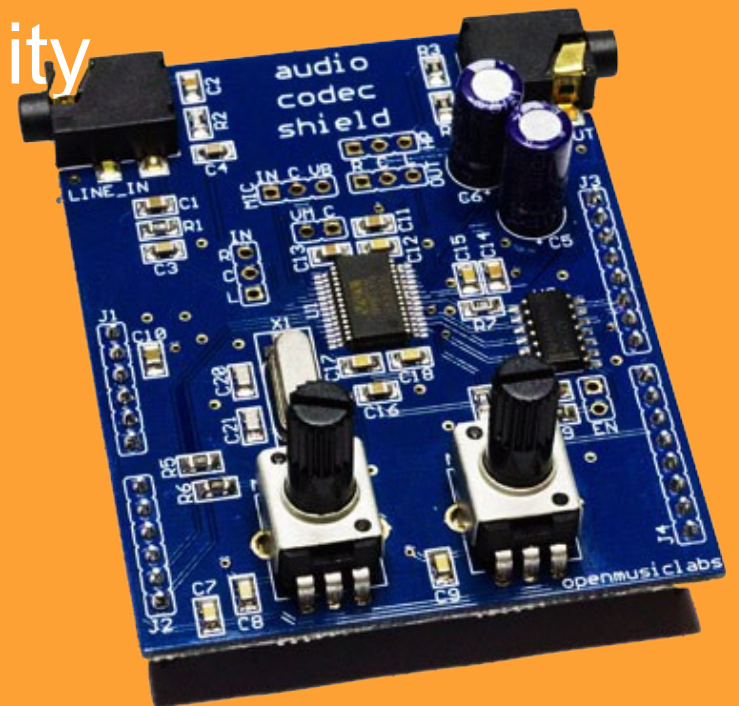
OpenPipe Breakout & Arduino PWM sound

- WaveTable Synthesis 44100 Hz @ 8bit
- Additive Synthesis (more later...)
- PROS: Easy setup
- CONS: “Low” sound quality
- VIDEO, VIDEO with RC LPF



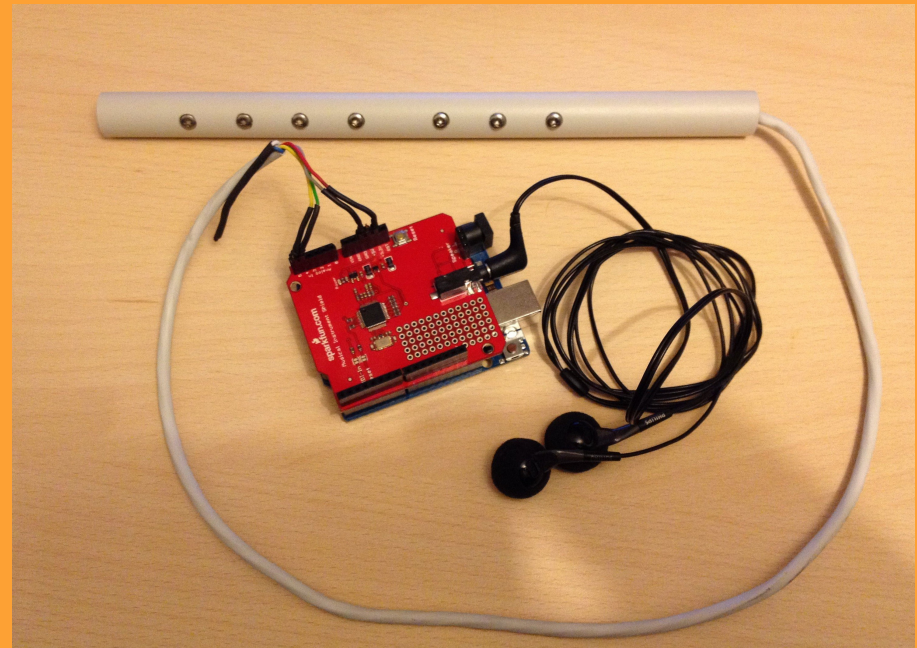
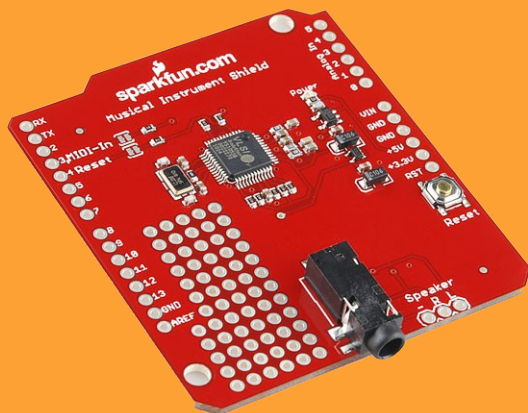
OpenPipe Breakout & Arduino Audio Codec Shield

- PWM sound is not amazing :(
- How to improve sound quality? Audio Codec
- OpenMusicLabs Wolfson WM8731 Shield
- PROS: Improved sound quality
- CONS: Still “short” samples
- VIDEO



OpenPipe Breakout & Arduino Music Instrument Shield

- Arduino based samples too short
- How to improve sound quality? MIDI Synthesis
- Sparkfun Music Instrument Shield (VS1053)
- PROS: Simple Arduino code, multiple instruments
- CONS: Still “low” bagpipes sound quality
- VIDEO



OpenPipe Breakout & MIDI output

- How to improve sound quality? Connecting to a “computer”
- Arduino & MIDI choices:
 - Arduino MIDI Shield
 - Serial to MIDI conversion
 - MIDI over USB
 - Tweaking Arduino
 - **OpenPipe USB-MIDI Shield !!!**
 - LUFA, OpenMoko USB ID, DFU, HW compatible
 - **Compatible with iOS & Android !!!**
- VIDEO, VIDEO



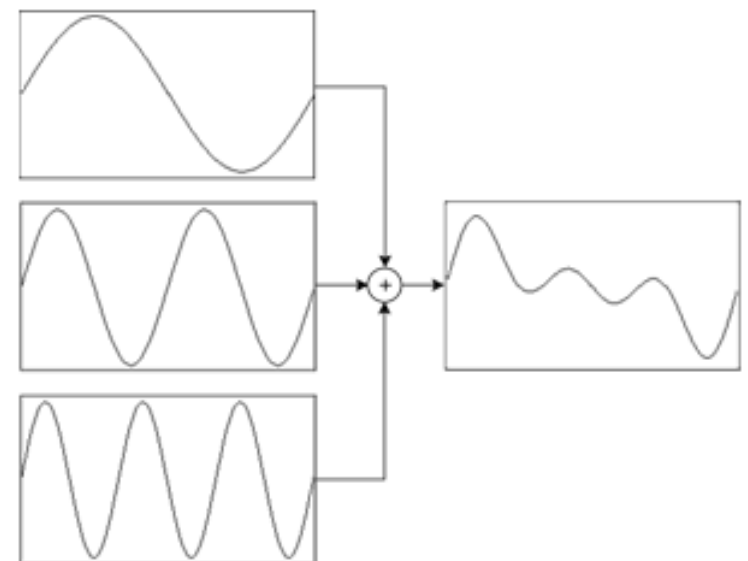
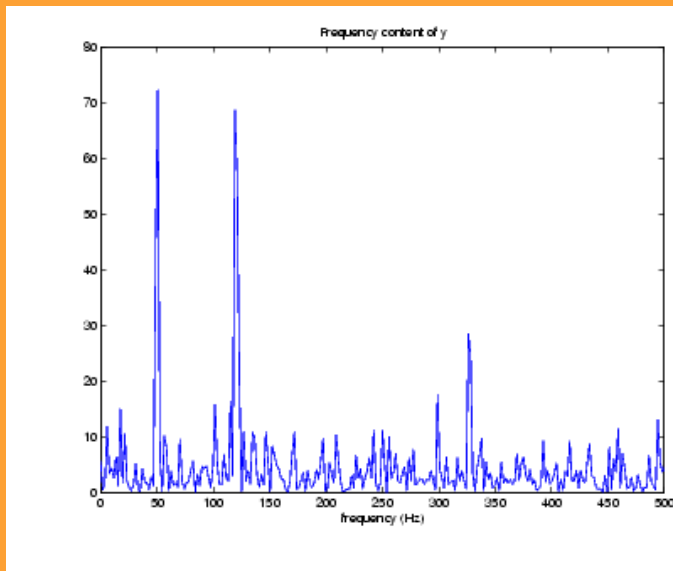
The APPS

- Synthesizers
 - GarageBand (Mac), FluidSynth (Lin,Win,Mac), any MIDI synth.
 - Keyboard Sounds (Android) & bs-16i (iOS)
 - UPiper (Mac, Win, iOS)
 - bs-16i with Bagpipes SoundFonts
 - Latency, Jailbreak and Lightning issues
- WIP Custom xplatform desktop app (FluidSynth + RTMidi + QT)
- WIP Custom mobile app (FluidSynth for iOS and Android)



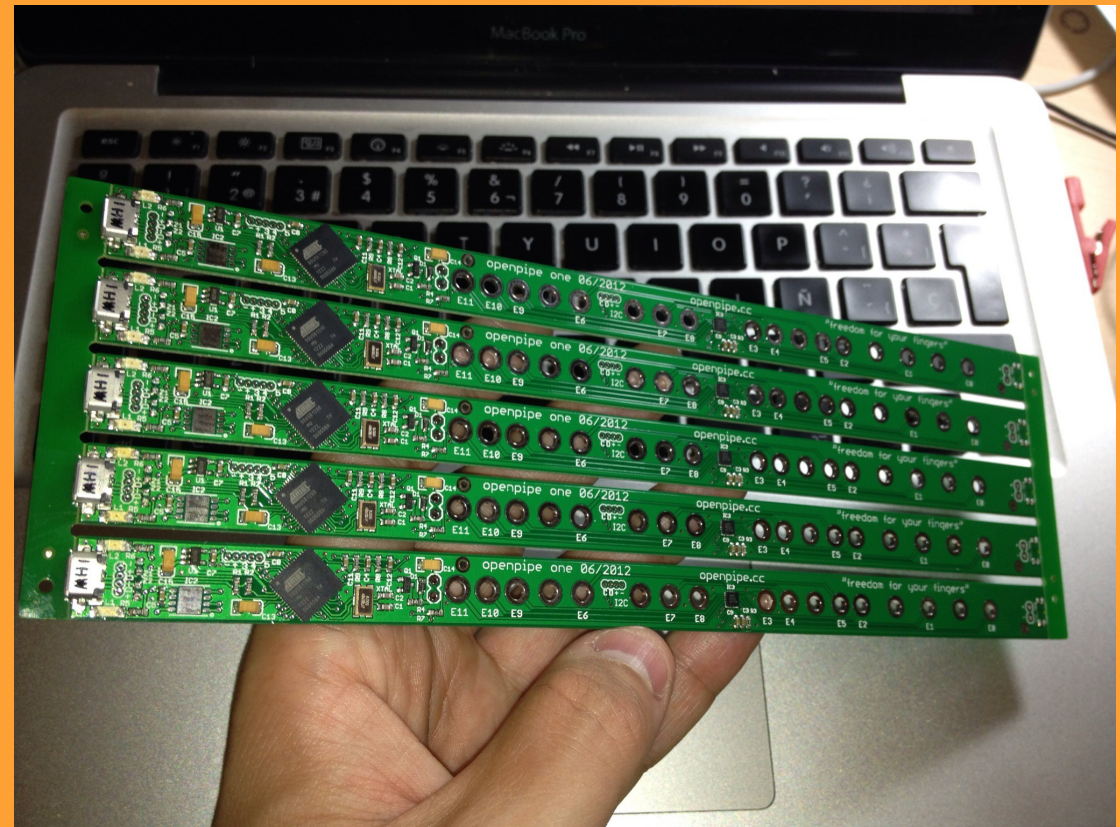
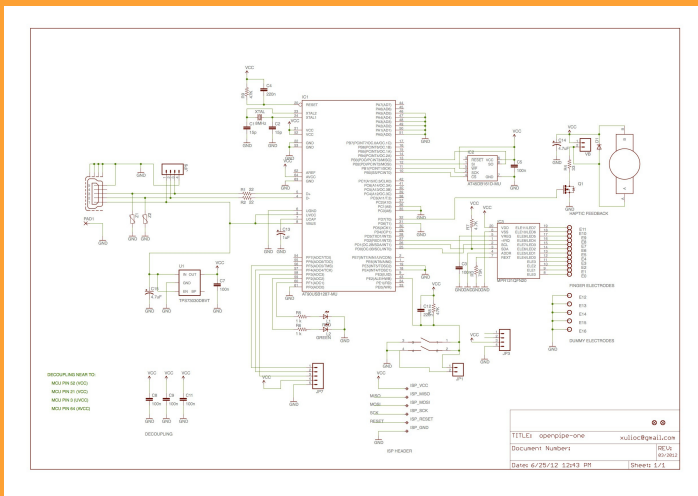
OpenSource Bagpipes Samples

- We need good sound samples for feeding hungry Synthesizers
- Good samples are expensive or require hard studio work
- Let's take a simpler approach and see what happens...
- FFT for partial power measurement of medium-quality recorded samples
- Additive Synthesis for virtual sample generation
- Python powered




The OpenPipe ONE

- Everything inside the pipe
- AT90USB1286 (128K FLASH, 8K RAM)
- MPR121 Capacitive Sensor Controller
- MICRO USB
- I2C & ADC expansion
- Haptic feedback



The OpenPipe future

- Several OpenPipe Breakouts all over the world
 - Some early contributors
 - Some people interested in musical aspects
 - Some people interested in educational aspects
 - More Arduino shields (integrated RAM or FLASH?)
 - OpenPipe ONE Work In Progress
 - Currently beta-testing
 - Planning first production
 - OpenPipe Apps for desktop & mobile
 - OpenPipe TWO?
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Thanks & Happy OpenPiping!!!



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