



Dynamic Audio

For Apps and Games

slides: is.gd/dynamic_sound_android

code: github.com/thillerson/dynamic-sound-android

[slideshare.net/thillerson/
dynamic-sound-android](https://www.slideshare.net/thillerson/dynamic-sound-android)

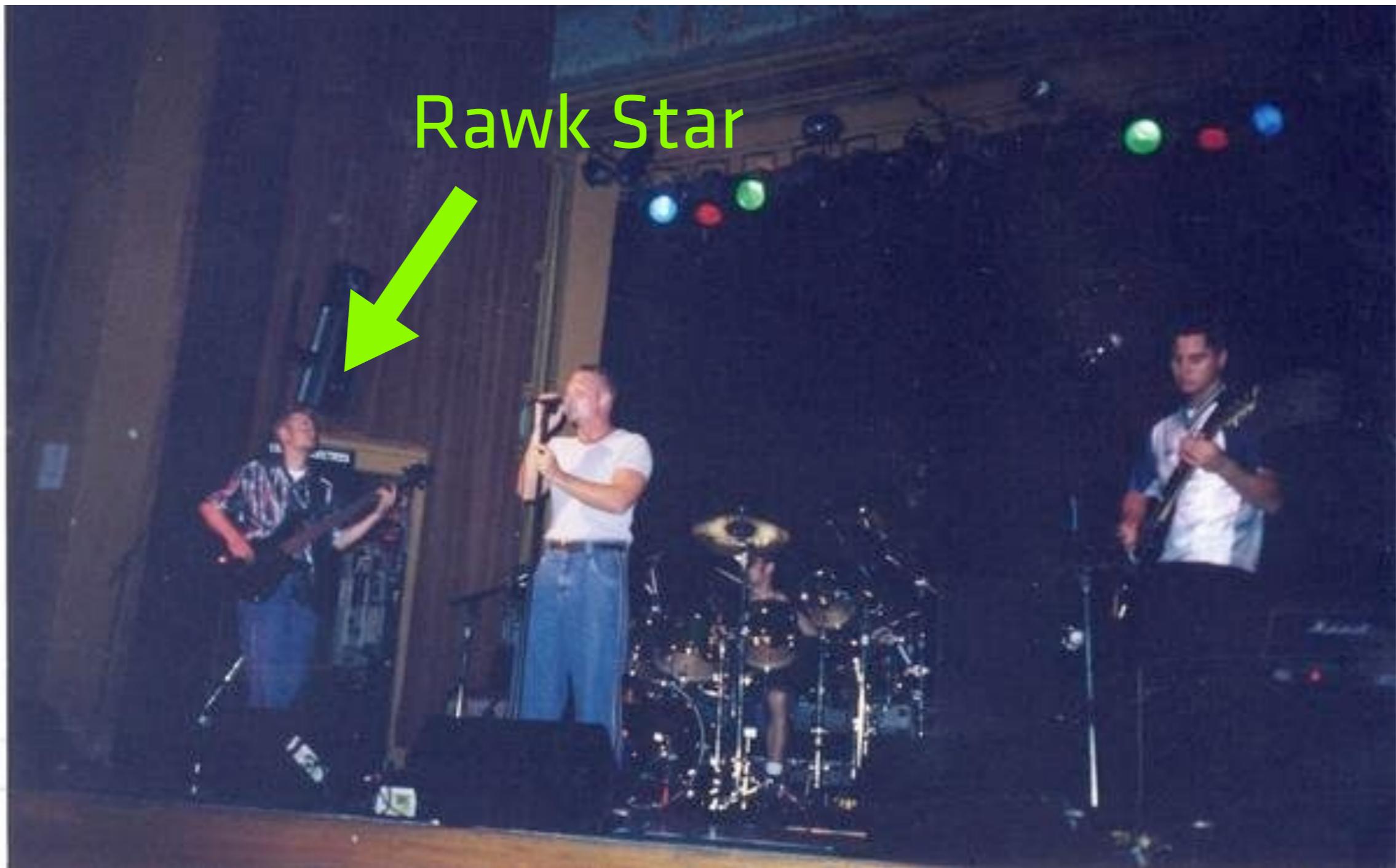
[github.com/thillerson/
dynamic-sound-android](https://github.com/thillerson/dynamic-sound-android)

About Me

- @thillerson, +thillerson
- Developer at Tack Mobile
(tackmobile.com), @tackmobile
- Android, iOS, and Mobile Web
- Rails, Node, maybe Elixir (one day)



About Me



About Me

- Bass
- Electronic Music
- Some day I hope to play this thing

----->



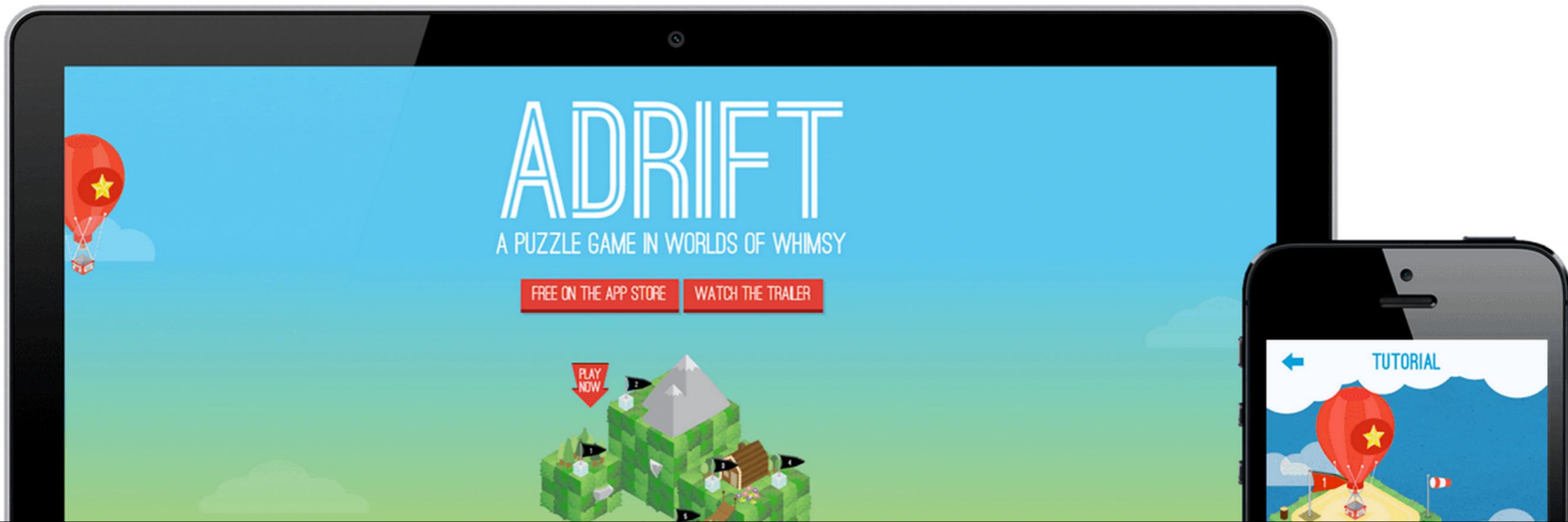
Sound Design Work: Start

- Alarm App
- Alarm Sounds
- Play Store: “tackmobile”

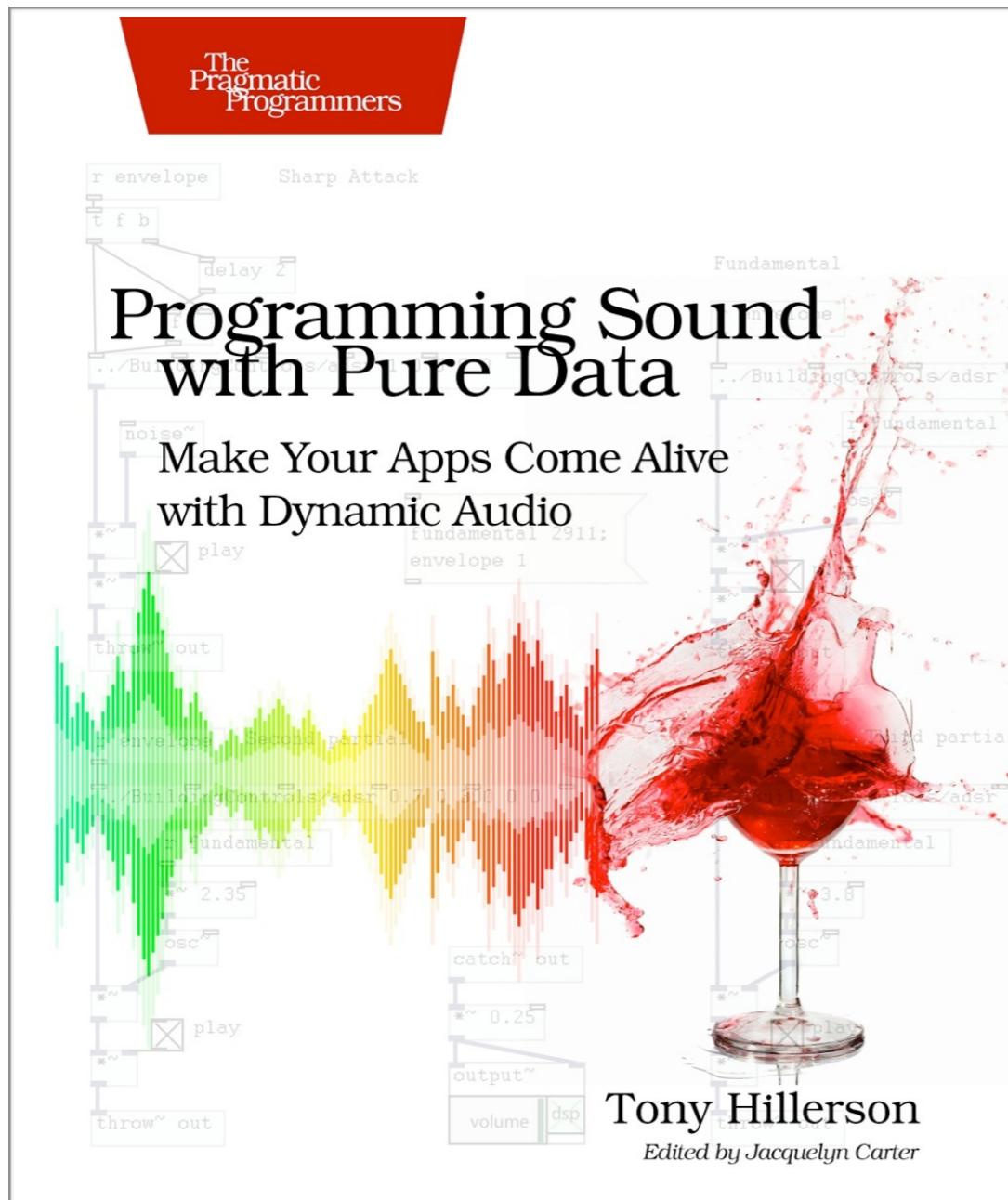


Sound Design Work: Adrift

- Puzzle Game - “Adrift” in App Store
- Background Music
soundcloud.com/tackmobile
- Sound Effects



Programming Sound



- <http://pragprog.com/>
- In Beta
- What we're talking about today...
- ... and much more

What We're Going To Do Today

- Answer: What Is Sound Design?
- Discuss UX Principles of Sound Design
- Introduce Pure Data
- Introduce libpd
- Tour Two iOS Apps Embedding Pd



When We Are Done, You Will

- Understand Sound Design
- Understand Procedural Audio
- Know what Pd is, and how libpd makes it awesome
- Be excited about Dynamic Audio in your apps and games



What is Sound Design?



A Sound Designer



Ben Burtt

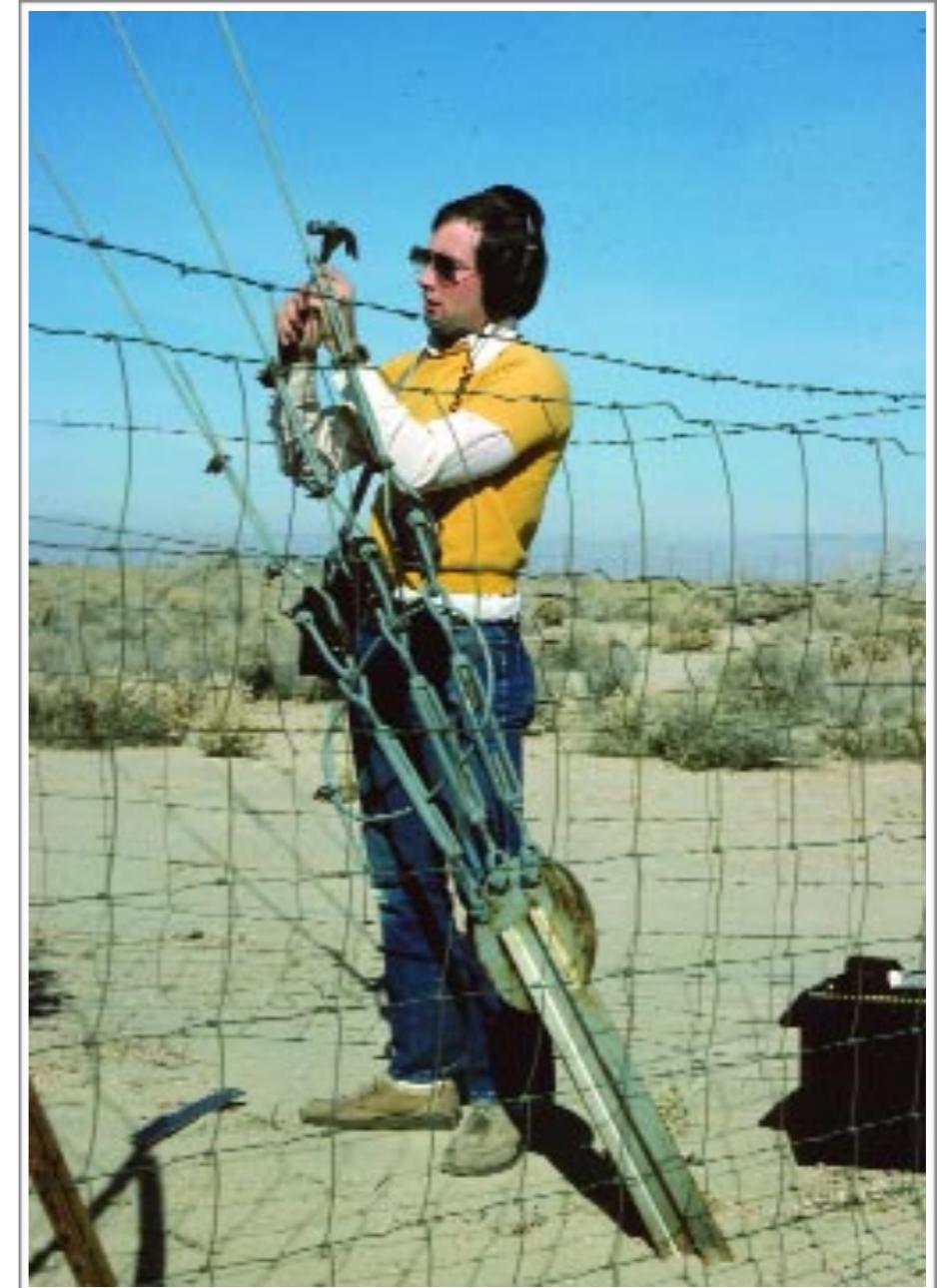
A Sound Designer...

- Conceptualizes
- Captures or Designs
- Records
- Engineers
- Produces
- ... the sound for
an experience



Sound Designer Skills

- Understand Sound
- Intuitive vs. Theoretical
- Music vs. Sound
- Audio Engineering



Sound Design in Mobile Apps

- Developers/Designers wear lots of hats
- Control
- Efficiency
- Asset size



Sound Design Principles



A Sound Designer's Goals

- Audible Feedback
- Fulfill Expectations
- Immersion
- Emotional Response



Sound Design and Good UX

- Your app doesn't need sound
- Expect to be turned off
- Don't make me listen to you
- Listen on lots of devices/environments
- Engineer for small speakers
- Make your sound mean something!

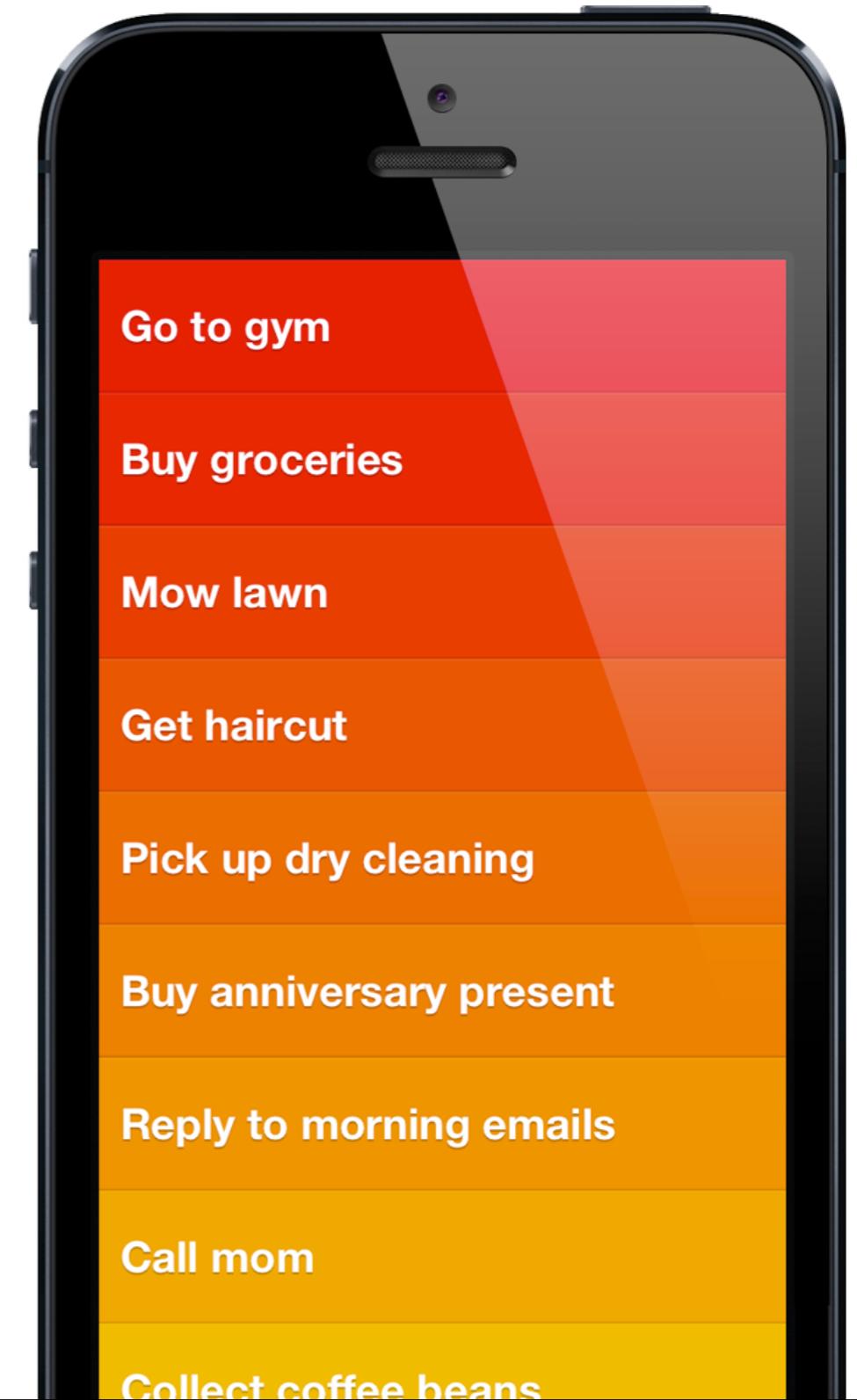
Always

- Test with phone calls
- Test while playing music
- Have fallbacks - e.g. No music, just effects
- Provide control to the user



A Good Example: Clear

- Realmac Software
- Josh Mobley
- Meaningful Sound
- demo



Sound

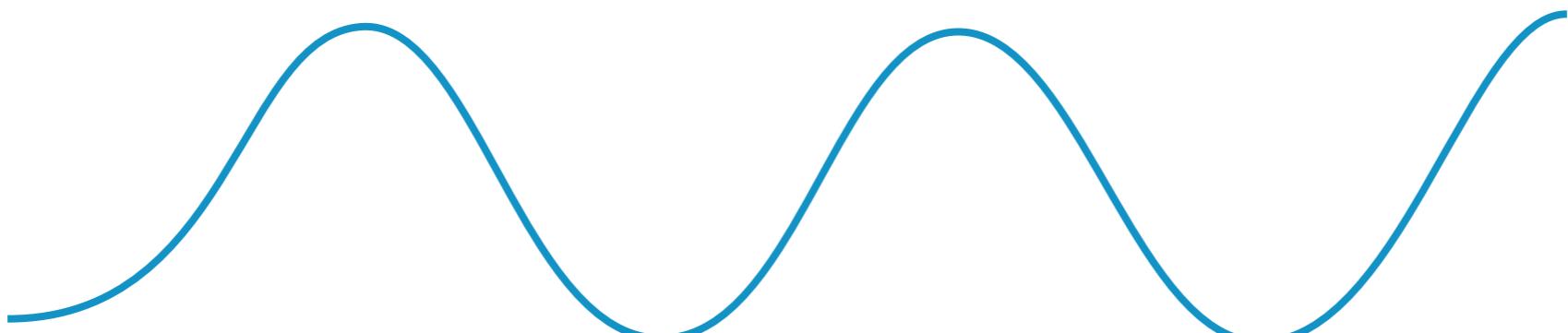


Longitudinal Waves

Of Pressure



Through A Medium



Transverse Wave

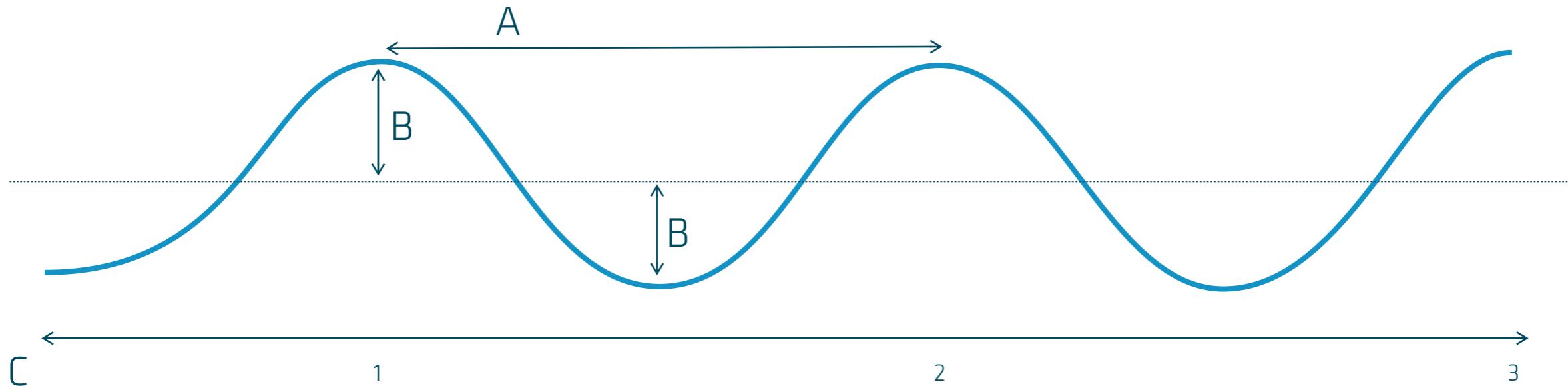


Longitudinal Wave

Sound

- Longitudinal Waves
- Of Pressure
- Through a Medium

Properties of Waves



- A - Wavelength (Distance), Period (Time)
- B - Amplitude
- C - Frequency - 1/Period (measured in Hertz)

Fourier Series

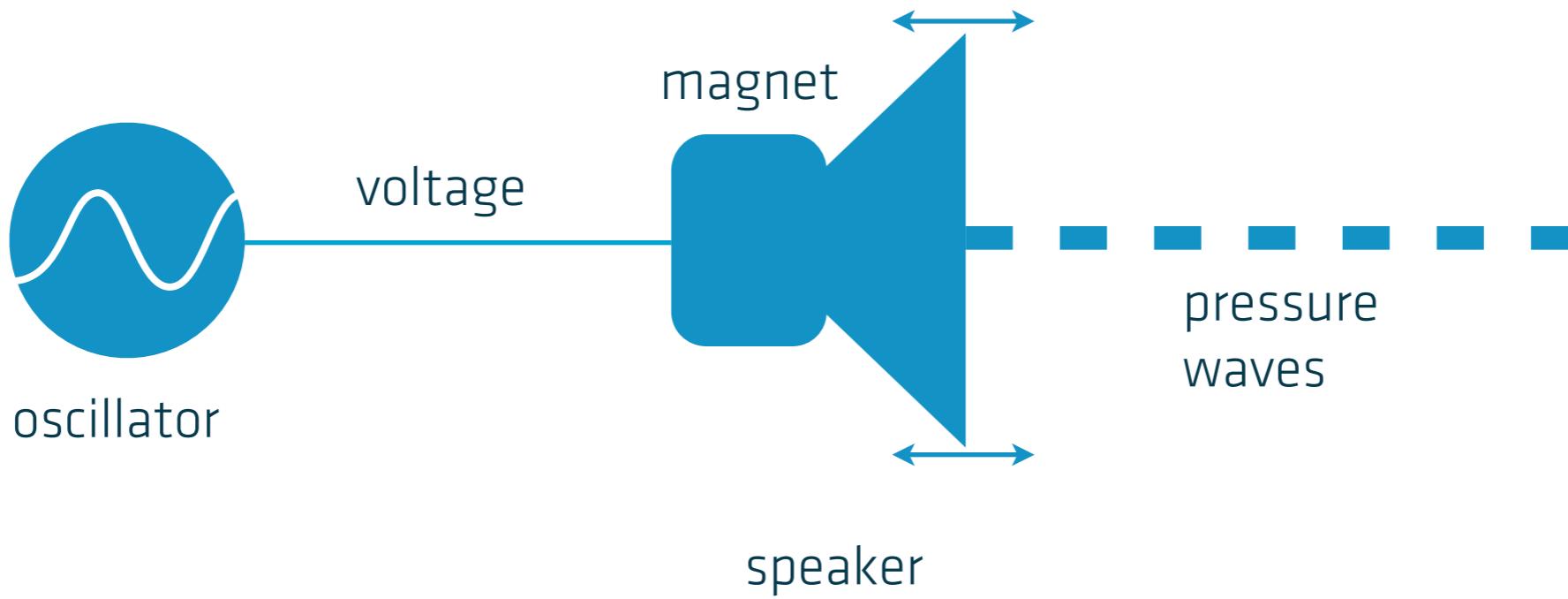
- Based on his work ----->
- Periodic signals composed of simple oscillating functions
- Sine/Cosine waves are fundamental



Oscillators

- Something that moves according to a periodic function
- A physical body
- An electronic device

Basic Electronic Sound



Digital Audio

- Stream of Numbers
- Signal
- Frequency and Amplitude
- DAC - Digital to Analog Converter

Dynamic Audio



Procedural Audio

- Functions
- Objects
- Controls and Components
- Produce a Signal
- “Building Sound from First Principles”



Pure Data

- Procedural Audio
- Visual Programming Environment
- Free and Open Source
- pure-data.info



Pure Data 101



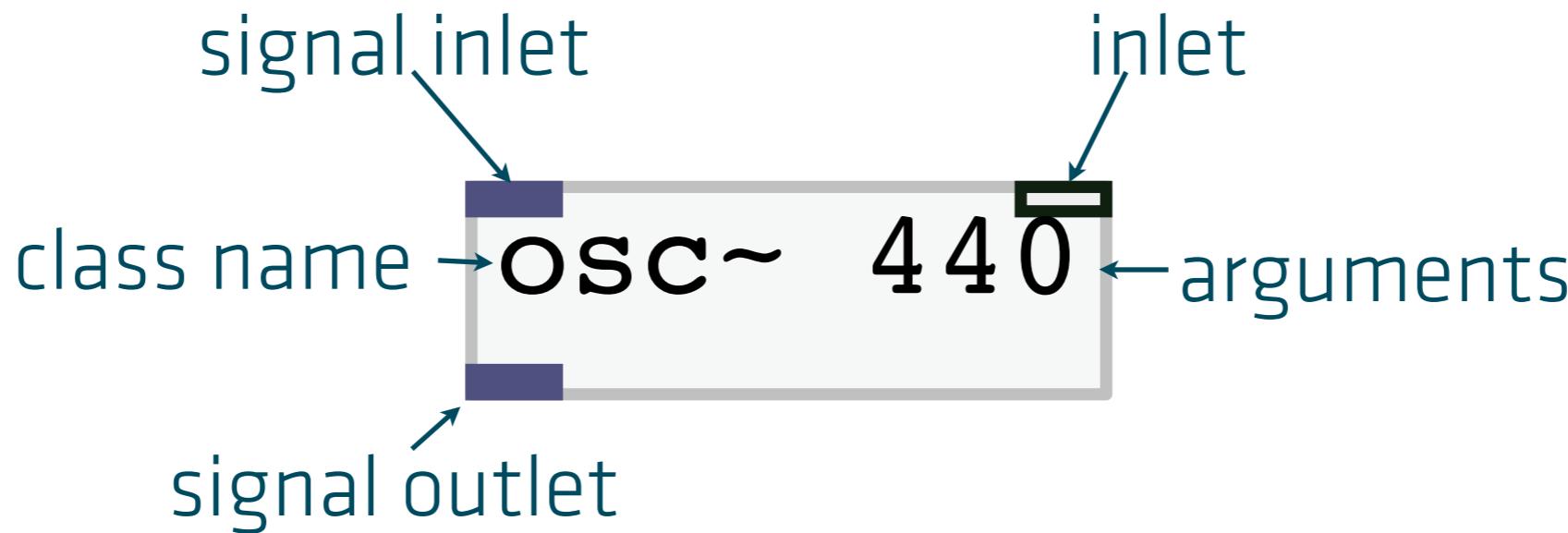
Signals and Values

- Signals are streams of numbers, usually audio data
- Values are numbers or symbols



Objects

- Pd's class
- or, kind of like a command line tool



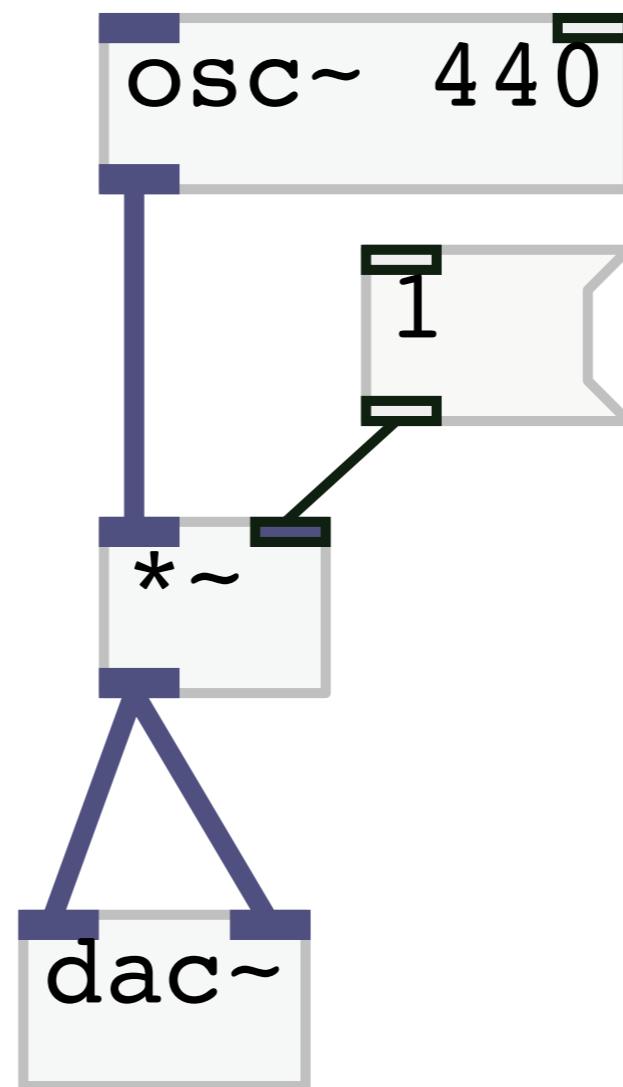
Hot vs Cold Inlets

- Hot inlets make objects immediately act
- Cold inlets usually store a value
- Execution is right to left



Connections

- Signal connections are thick
- Others are thin



Messages

- Used for sending values without a connection
- [send] and [receive] objects
- Message boxes

libpd

- <http://libpd.cc>
- Peter Brinkmann - Google Engineer
- Enables you to embed an instance of Pd in your app
- iOS and Android

libpd for Android

- Patches should be compressed raw resources
- Utilities for dealing with patches
- Provides interfaces for audio management
- PdBase bridges to Pd
- Pass messages, floats, and lists
- Provides PdService for long running audio



Examples



Source Code

- github.com/thillerson/dynamic-sound-android
- Examples of capabilities, not necessarily the best architecture
- Goal: understand capabilities, have a place to start

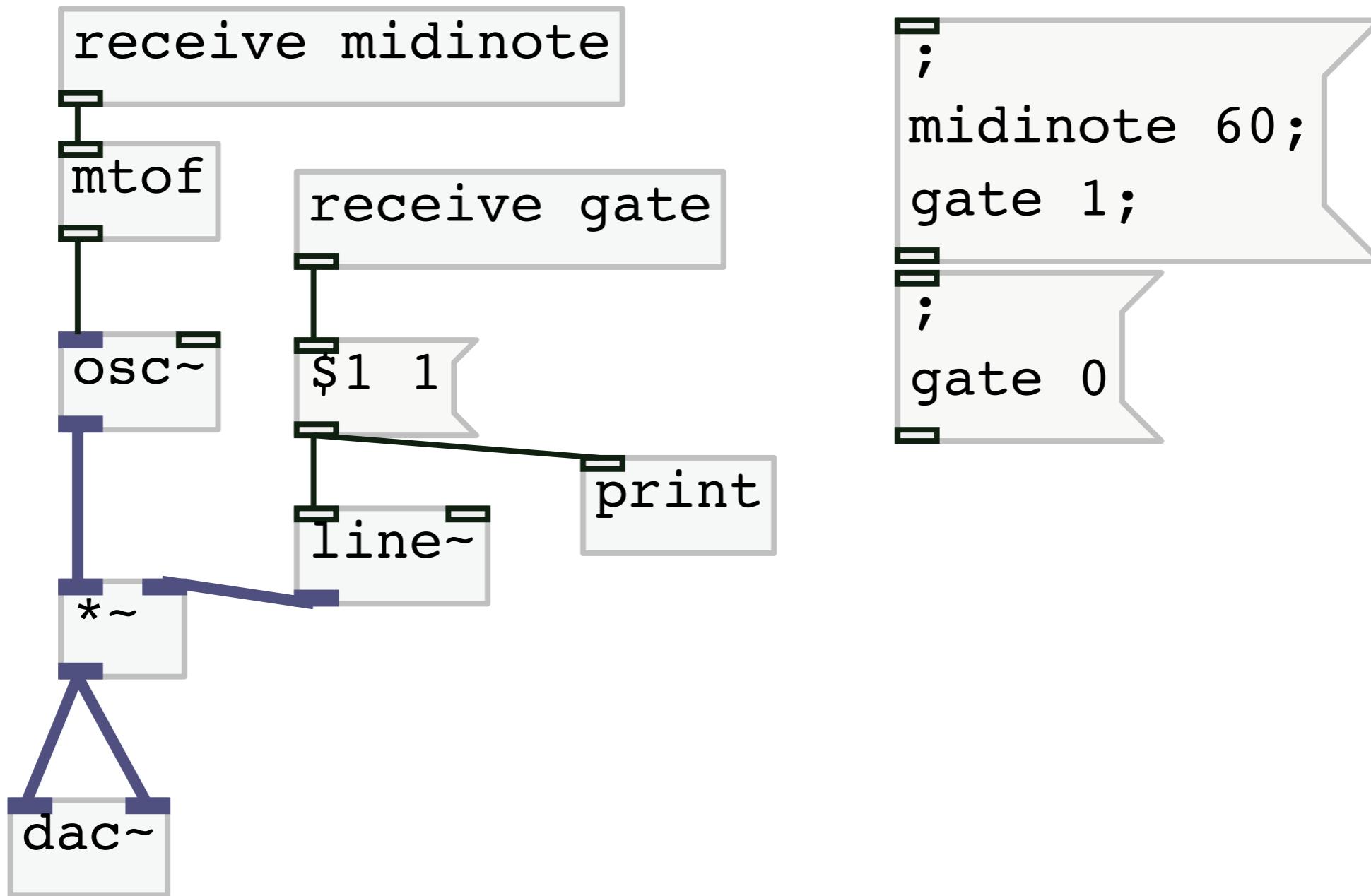


Example 1: A Simple Keyboard

- Sine wave oscillator
- Single voice
- Note on/off
- Great example of Android screen latency!



Example 1: A Simple Keyboard Patch



Example 2: Space Rocks

- Side scroller space shooter
- Very simple implementation - not production ready game code
- With dynamic sound!



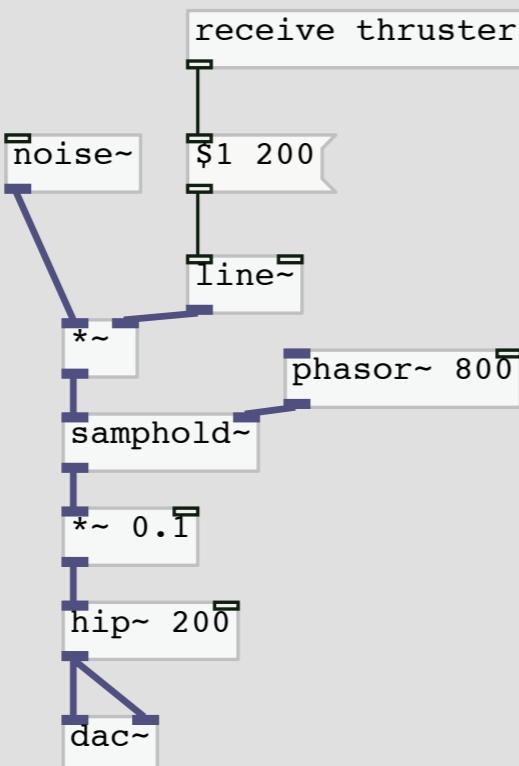
Example 2: A Game Patch

```
pd wavesetup load a square wave  
at startup
```

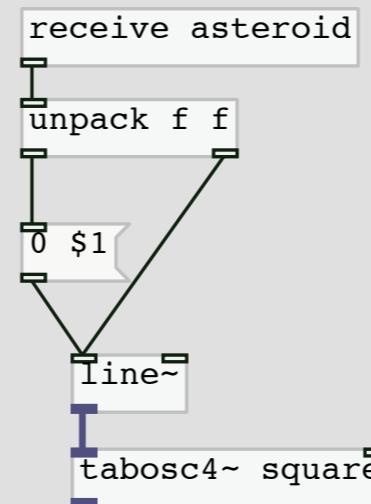
Test_Messages

```
; bullet 25 200;  
;  
; asteroid 200 100;  
;  
; ship 1000 50;  
;  
; thruster 1  
;  
; thruster 0
```

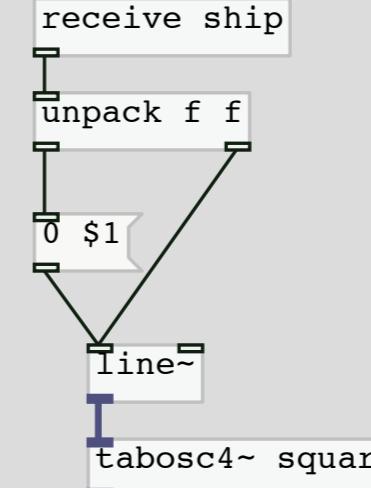
Thruster



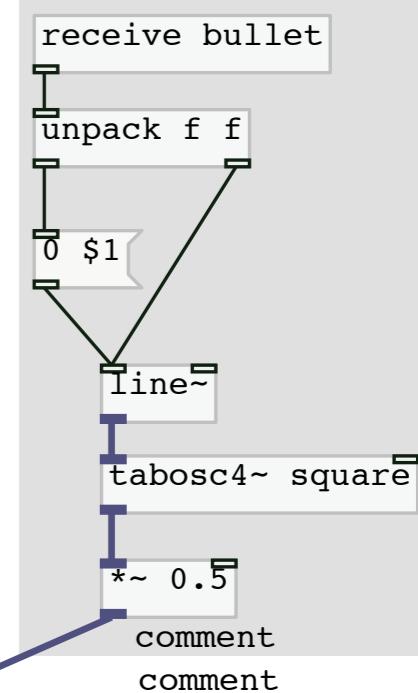
Asteroid_Hit



Ship_Hit

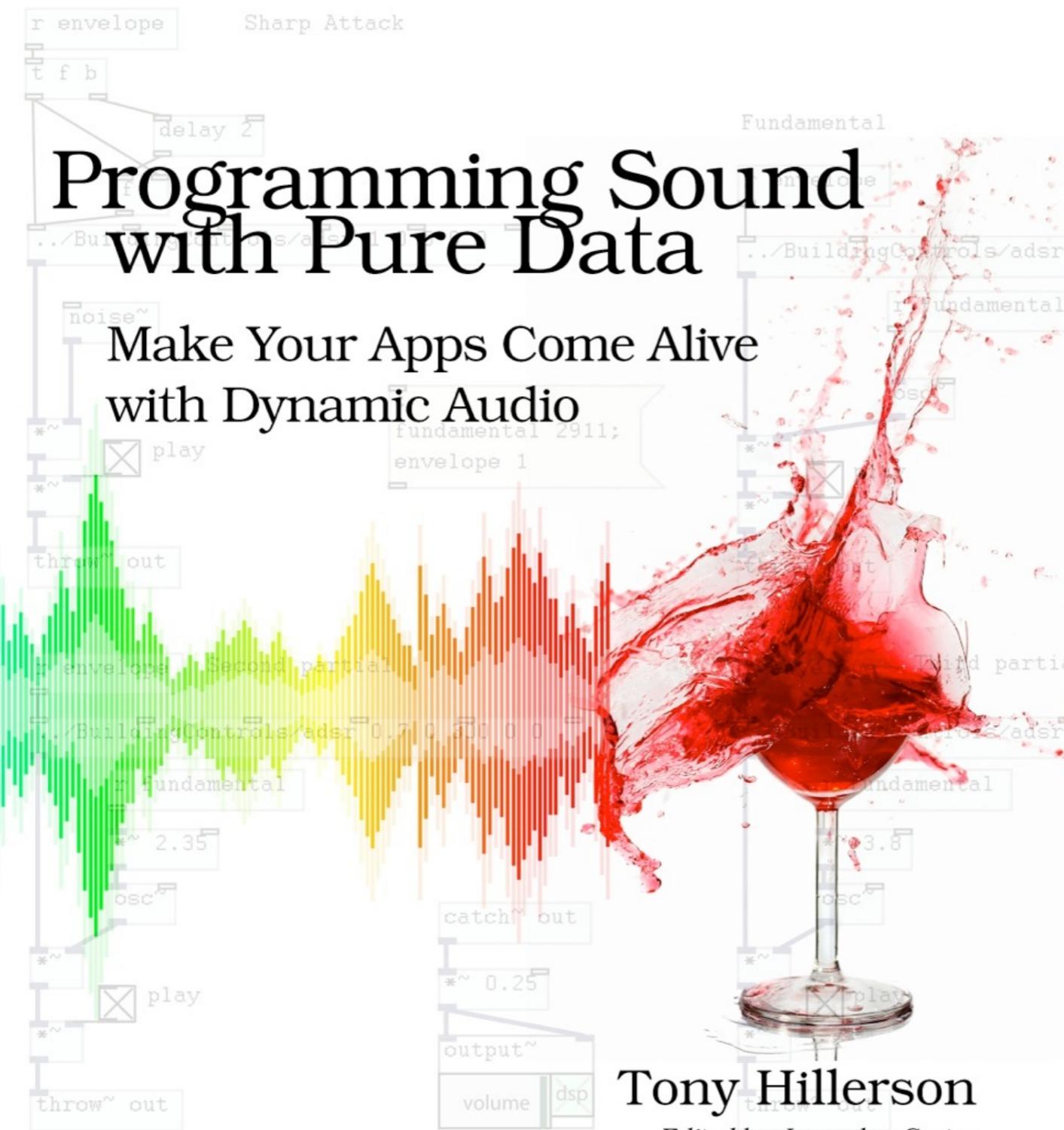


Bullet



phasor~ 8000
8-bit-ify
these sounds

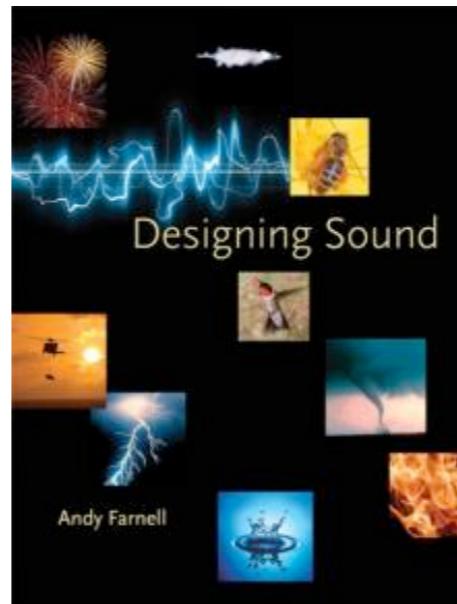
hip~ 1000 cut low frequencies
dac~



- [http://pragprog.com/
book/thsound](http://pragprog.com/book/thsound)

Further Reading

- puredata.info & libpd.cc
- [youtube.com/user/cheetomoskeeto](https://www.youtube.com/user/cheetomoskeeto)
- <http://designingsound.org>
- mitpress.mit.edu/books/designing-sound



Questions



Thank you!

Dynamic Audio • Tony Hillerson

- We're Hiring!
- [careers@tackmobile.com](mailto:ccareers@tackmobile.com)
- Excellent Team
- Awesome Projects
- Great Office