

a look inside my
LIGHT BULB

Sam's design portfolio

my name is Samuel Lapp...

...but call me Sam. This is my design portfolio. It's meant to illustrate two points:

1. I HAVE A UNIQUE SKILL SET



2. I LOVE CREATING THINGS

speculating

debating

creating



What's In Here?

THINGS YOU CAN TOUCH

Helping Hand: Biomimetic Glove 1

Rotating Keyboard Stand 2

Winterized Bike Shed 3

~~THINGS YOU CAN'T~~

things only your mind can touch

Internet of Things Generic Parser 4

Modeling Intonation in Non-Western Music 5

Knowledge Transfer 7

Resume 8

Helping Hand

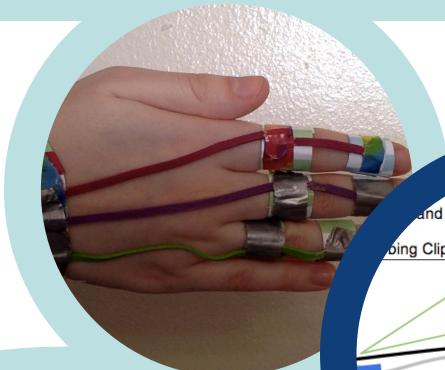


PROBLEM
Injured hand, cannot extend fingers

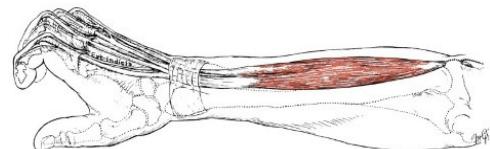


SOLUTION
Glove restores hand function by extending fingers

DESIGN



The fingers are extended when muscles on the top of the arm contract



These muscles were injured

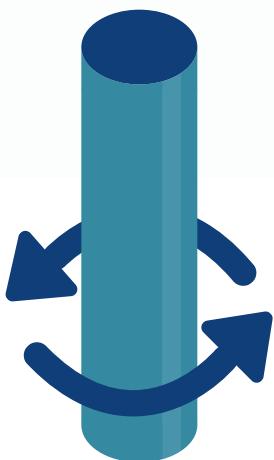


Our design used elastic bands to mimic the muscle function

Keyboard Stand

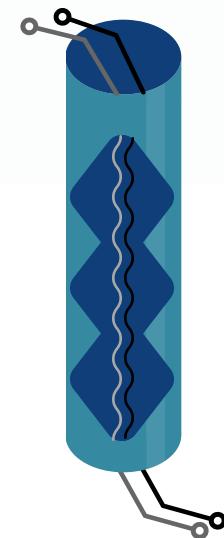
Design Challenge

Rotating Keyboard Stand



Solution

Pass chords through hollow central spine



Problem

Chords get wrapped around and tangled

Final Product



Bike Shed

Problem

Bikes are exposed to elements and break down



Constraints



6 Days



\$150

Solution

Winterized bike shed keeps bikes dry and safe



Key Features

Aluminum Roof

highly effective, low cost, low maintenance



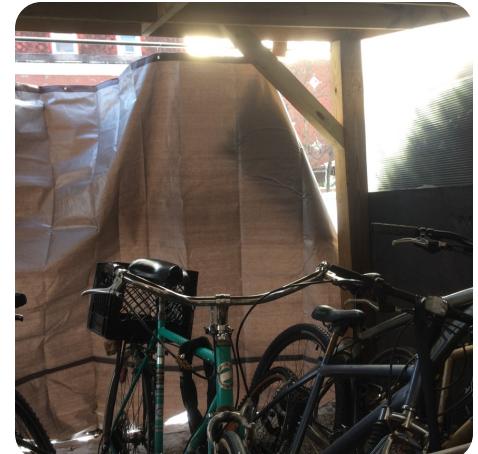
Sliding Tarp Door

easy access with bikes,
protects from wind



Plexiglass Windows

let light in and keep rain out



Internet of Things

Generic Parser



In 2020, **50 billion devices** will be connected to the **internet of things**.

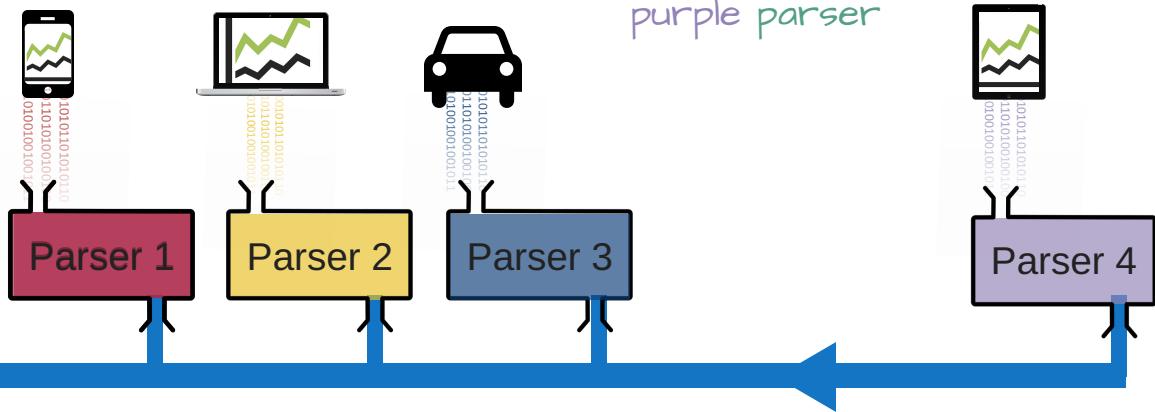
To use **real-time data** from 50 billion devices effectively, we need to put it all in **one place** in a **useful format**.

Olden Days

1 device

1 color data

1 parser

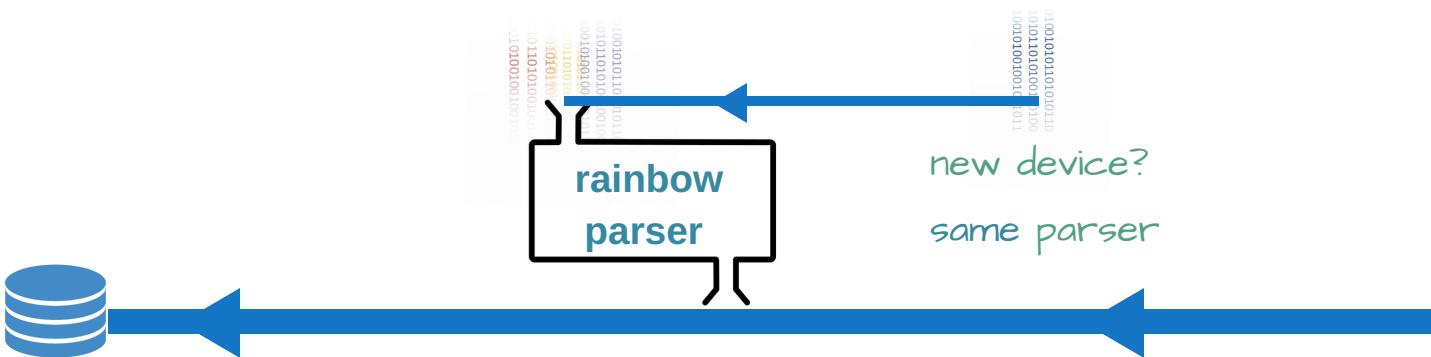


new device? You need a
purple parser

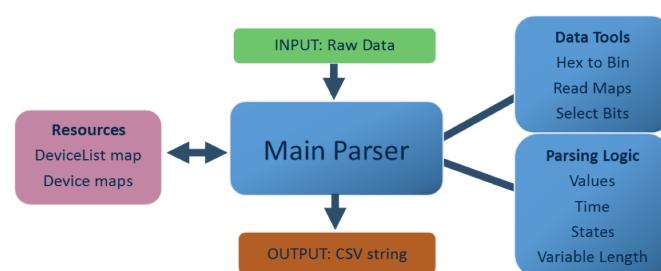


Parser 4

So I built a **rainbow parser** that understands all colors, and can even learn new colors



With 50 billion devices on the horizon, and new colors every day, it had to be very **flexible** and very **fast**. I used a modular design with replaceable parts



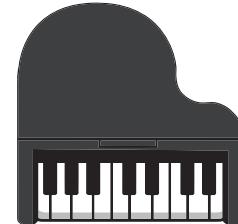
Modeling Intonation

in non-Western music

Problem



Western music is based on
mathematical rules



But....



Arabic music is based on
aural traditions
(NOT math)

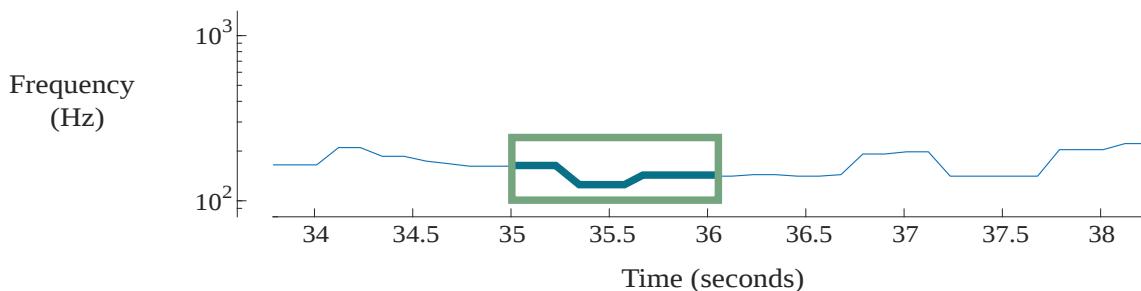


This makes it impossible to analyze Arabic music with methods developed for Western music.

For my undergraduate thesis, I designed, built and tested a method for computationally analyzing Arabic music.

Methods

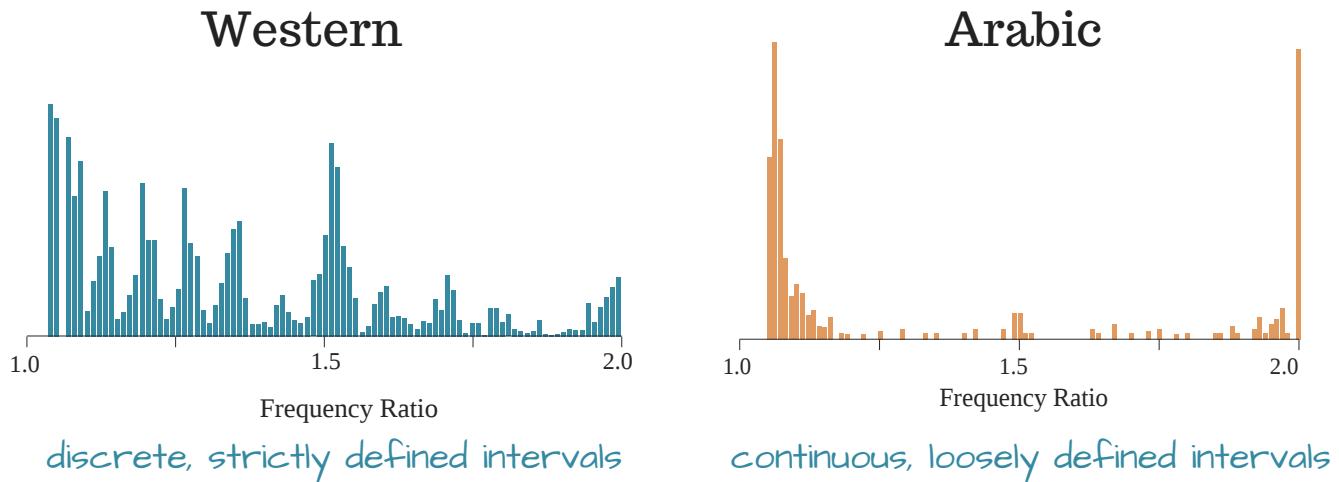
The method extracts frequencies from recorded music. It analyses repeating patterns



Results

The results demonstrate that Arabic and Western music use very different intonation.

The intervals used by Western music are rigid mathematical ratios, but the intervals used in Arabic music are flexible and fluid.



Here are the most common three-note patterns in both genres. The red notes are tuned slightly differently from the standard Western tuning.

The figure shows two musical staves. The top staff is labeled 'Western' and the bottom staff is labeled 'Arabic'. Both staves have ten positions numbered 1 through 10 above them. Each position contains a sequence of three notes. In the Western staff, note 8 is red. In the Arabic staff, notes 3, 6, 8, and 10 are red. The staves are in treble clef.

Both Arabic and Western music have red notes!

Outcomes

Sharing my code for use in further research

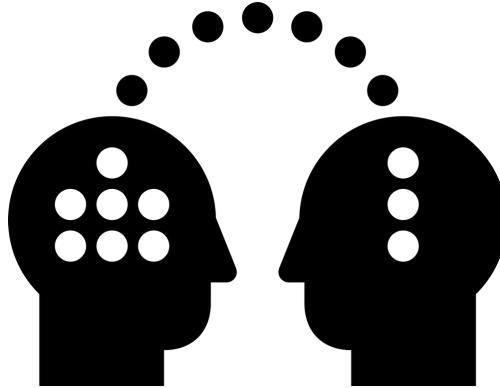
Outstanding Undergraduate Thesis Award

Engineering Science Symposium Poster Award

Preparing to Publish



Knowledge Transfer



PROBLEM

How do we transfer knowledge across fields and disciplines?

APPROACH

Crowdsourced pipeline for finding functional connections between research papers

Steps to Shareable Knowledge

- use crowd-workers*
1. Collect research papers ✓
 2. Extract the problems and solutions ✓
 3. Abstract the problems/solutions into broad functions ✓
 4. Find **functional connections** between papers ○

Example



Surface Connection

Functional Connection



You want to make a water bottle that's nice to hold

Statistics on water bottle production

Ergonomics of a baseball bat

Sam Lapp

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samlapp.com

Objective	Seeking a job where I can use my technical skills and hands-on project experience to help push the boundaries of human innovation and exploration		
Education	B.S. in Engineering Science The Pennsylvania State University, Schreyer Honors College GPA: 3.97		May 2017
Experience	Front-end Developer Human Computer Interaction Department Explored computational analogies for research papers Built user interfaces to explore research analogies		Summer 2016 Carnegie Mellon University
	Internet of Things Programmer Wipro Technologies Developed a flexible, generic parser for processing data Built a graphical interface to control the parser		Summer 2015 Bangalore, India
	Virtual Reality Remote Driving Researcher OPEN Design Lab Explored possibility of virtual reality for driving vehicles Integrated Oculus Rift virtual reality with remote driving systems		Summer 2015 Penn State University
Projects	Thesis in Engineering Science and Music Examining tuning systems of non-Western culture Evaluating computational models for predicting perception of dissonance Received Outstanding Undergraduate Thesis Award		2016-2017
	Helping Hand: Biomechanics Design Project Designed a glove to restore function to customer's injured hand Optimized mechanical and aesthetic properties for real-world use Chosen as best design by the customer		Spring 2014
	LightMood: Smart-home Design Project Smart-home lighting system to treat Seasonal Affective Disorder Awarded "Most Innovative Design" at Design Showcase		Spring 2014
Leadership	Founder, Vice-President President Founder	Music Therapy Club Jazz Club The Groove Room	2014-2015 2014-2015 April 2017
Honors	Matthew George Workman Scholarship in ESM Vernon H. Neubert Dynamics Award in ESM The Evan Pugh Scholar Junior Award The Provost Award for Academic Excellence		
Courses	Fluid Mechanics Thermodynamics & Heat Transfer Mechanics: Statics, Dynamics & SOM Electronic Properties of Materials Wave, Quantum & Particle Physics	Skills C++ Java MatLab HTML JavaScript	

The End.

Don't be a stranger!

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