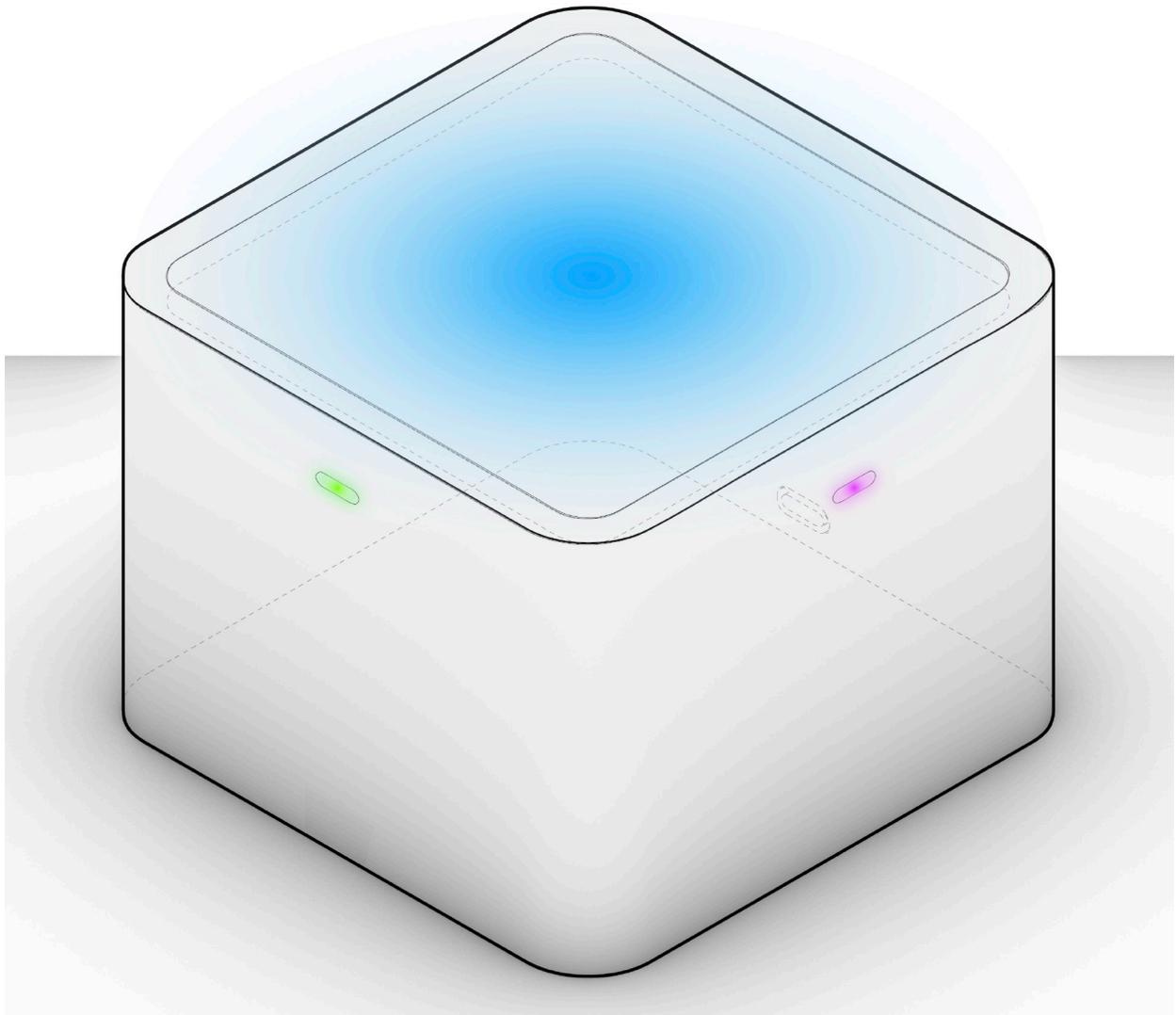


colorWAVE

connecting people through play



Urban Informatics II - Spring 2020
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Columbia University GSAPP

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Master of Architecture / Master of Science in Urban Planning, 2020

Can an **at-home** sensor create new methods of meaningful **person to person** as well as **person to technology** interaction in a world where texts and screens have overtaken our everyday experiences?

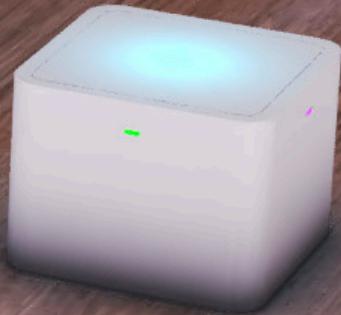
How might we employ **light** and **sound** to make interactions with non-human objects feel intimate, personal, and meaningful?

1 / Executive Summary

colorWAVE is a user-oriented home device designed to connect us with our friends in novel and fun ways. colorWAVE connects users across distributed global digital networks through local physical interactions. The device connects to a local wifi network, and transmits touch commands into musical messages of up to five seconds using force-touch sensors. Through simple touch commands, users can send a receive sound and light-based messages to up to three individual friends, or all three at once.

Users control and create their own 'syntax and language' through collective use. Jingles, melodies, and random progressions become messages coded like words and phrases.





2 / Context

As the prevalence of urban data-based surveillance has risen, so too have concerns over individual agency in the creation, control, and use of such data. Passive and active sensing have permeated physical urban space, and often personal space, as infrastructure and personal devices track movement, use, activity, density, directionality, and infer intention, belief, desire, and more from the data they collect. These data collectors provide great utility and affordance to those who collect it, but often not to those whom it describes. Herein lies the great challenge and fear of 'big' data.

Yet, removed from the grasps of large governments or corporate interests, there is an opportunity to explore how data collected about us can help those around us learn who we are, and to empower our relationships with them.

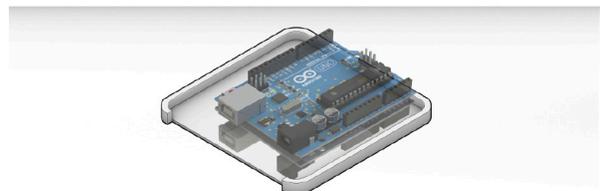
The idea behind colorWAVE is to engage with this opportunity, and to explore the idea that when we are given control over the data we create, and given agency in the definitions and values we ascribe to that data, then we become empowered by our data, and not subject to it. By providing modalities for direct agency in the creation and collaborative experience of data, colorWAVE can provide users with the opportunity to define their own role in the conversation between people, technology, data, and society.

3 / Technologies

colorWAVE connects six primary components to allow users to send and receive audio and light messages. The Wifi module connects colorWAVE to your local Wifi network, and force sensitive resistors allow for users to interact with the device. Four addressable LEDs, one for the user's device and one for each of the three corresponding devices display their respective colors (blue, purple, green, orange). When a message is recorded or received, a thin 40mm piezo speaker plays the sounds, and the corresponding LED blinks.



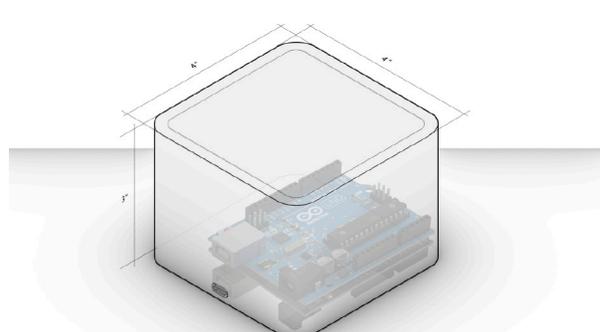
Base



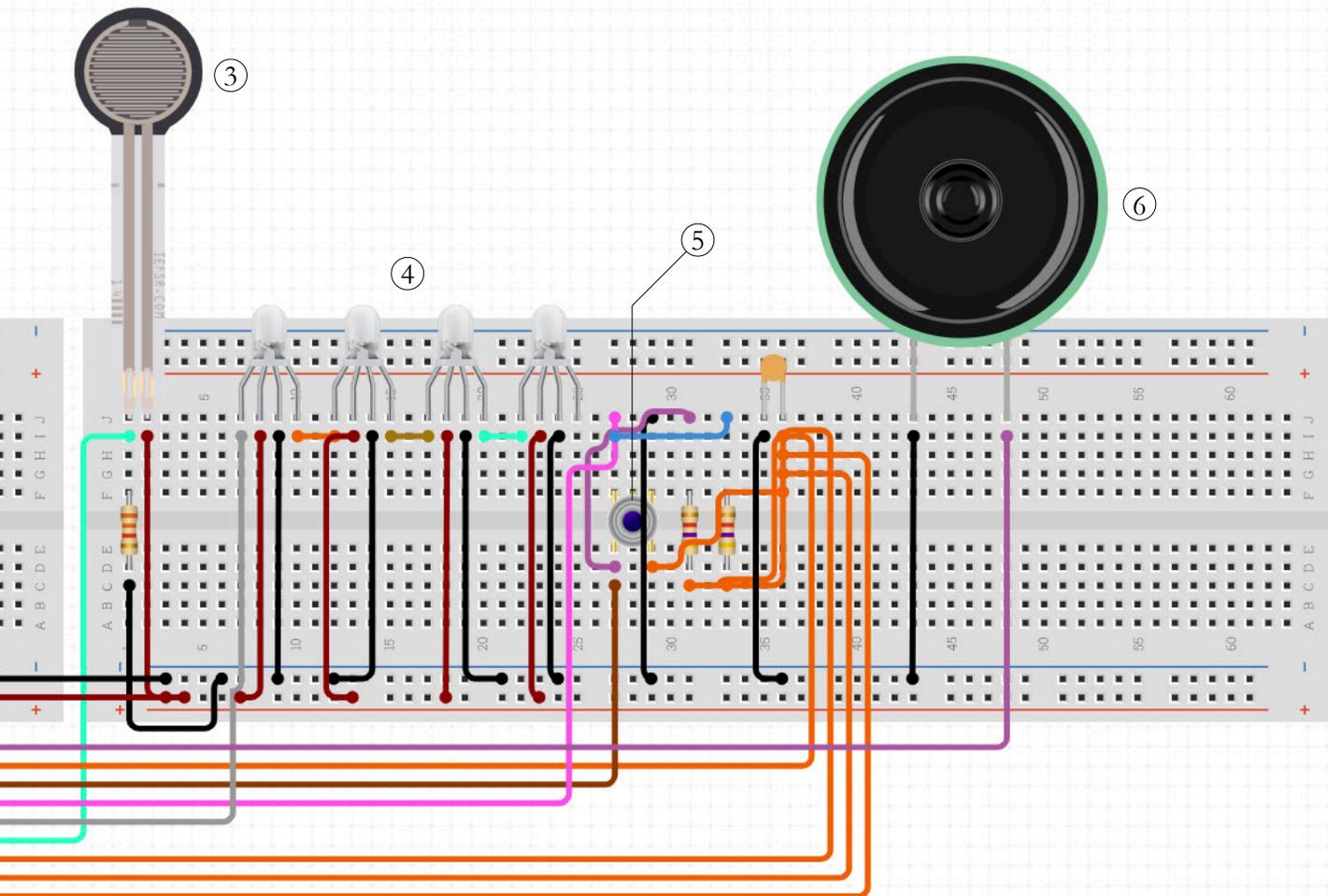
Arduino Uno



Box



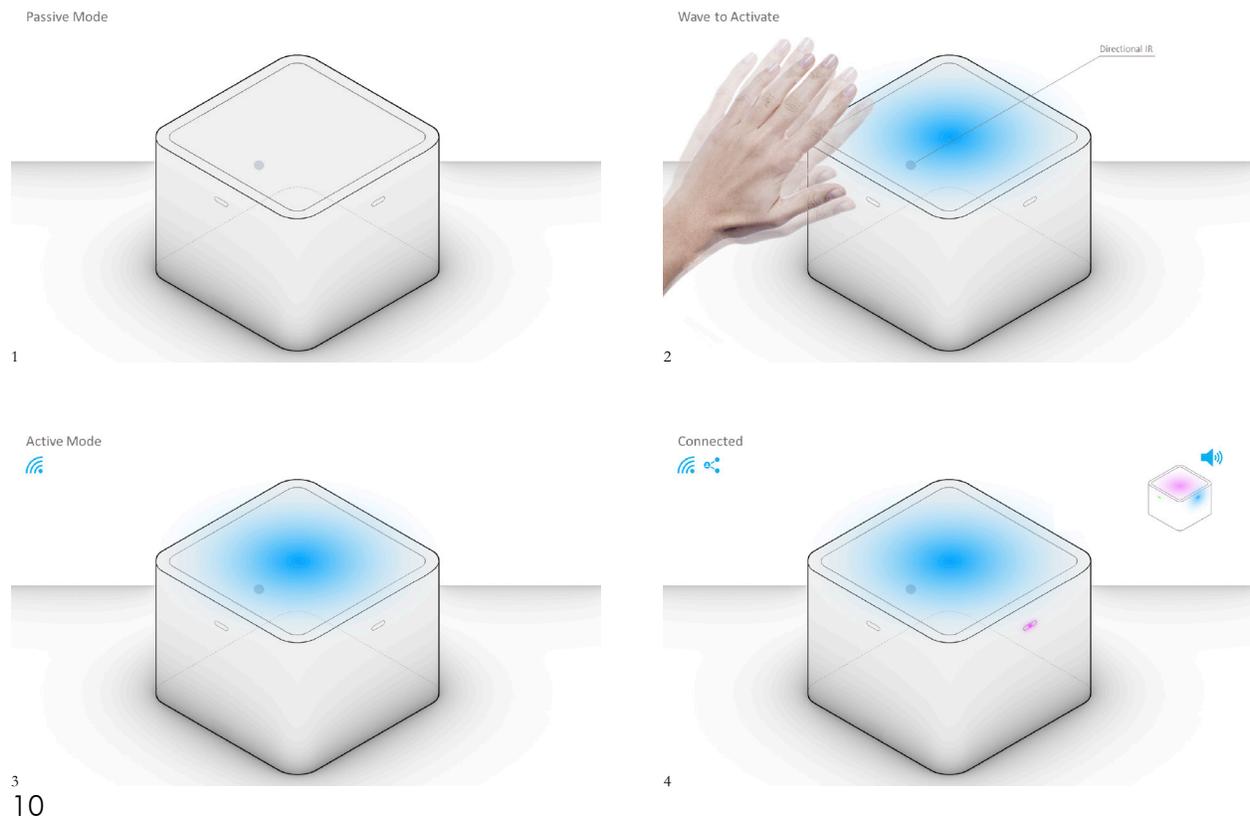
Cap



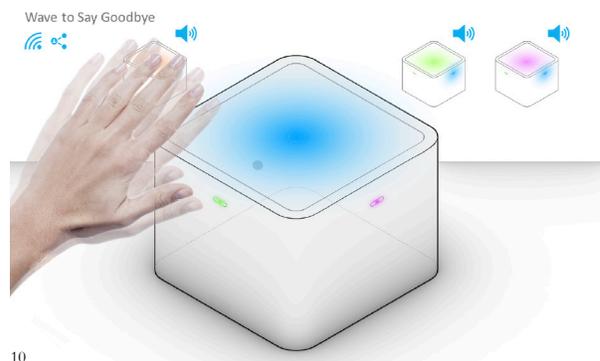
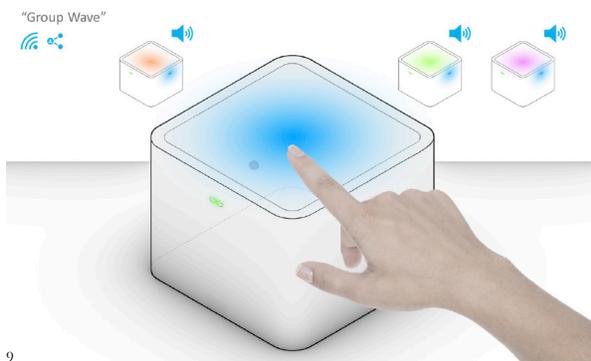
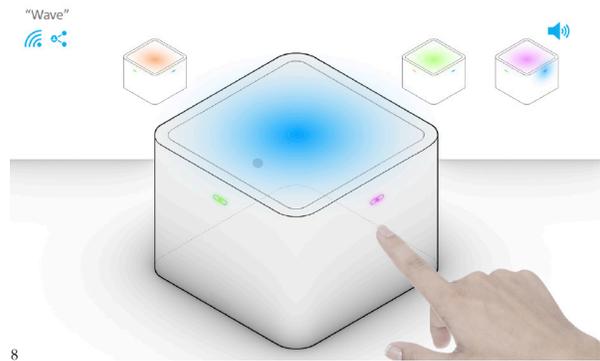
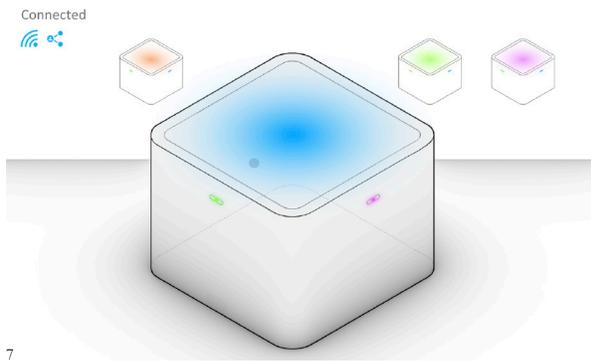
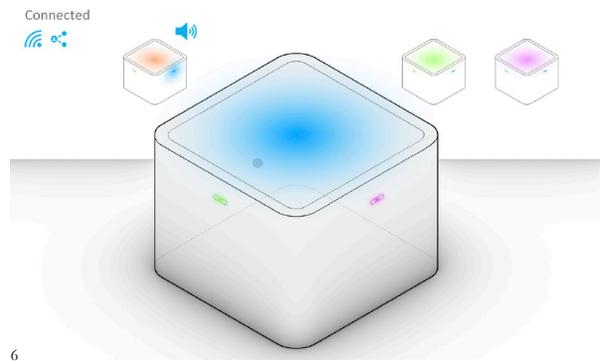
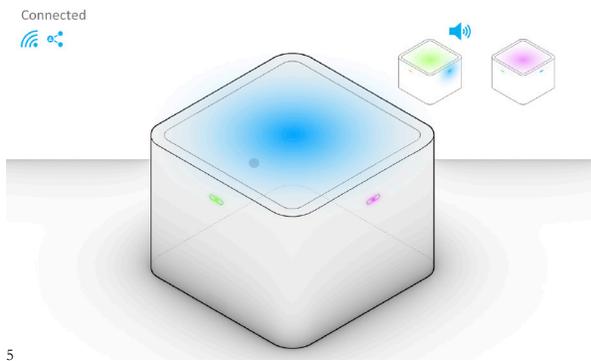
- ① ESP8266-01 - Wifi Module
- ② Force Sensitive Resistor - Square (x3)
- ③ Force Sensitive Resistor 0.5"
- ④ LED - RGB Addressable, PTH, 5mm Diffused
- ⑤ MLX90614 - Infrared Thermometer
- ⑥ 0.25W, 80hm Thin Speaker - 40mm

4 / Use

colorWAVE is activated by waving at its top-facing infrared thermometer. Once activated the unit will connect to your Wifi, and indicates whether your friends have also activated their colorWAVEs. Force-sensitive resistors on three sides and the top allow a user to send 5-second audio messages to one or all three of their friends. The harder one presses on the sensor, the higher the pitch, allowing for the flexible, intuitive, and playful production of jingles, melodies, and other messages.



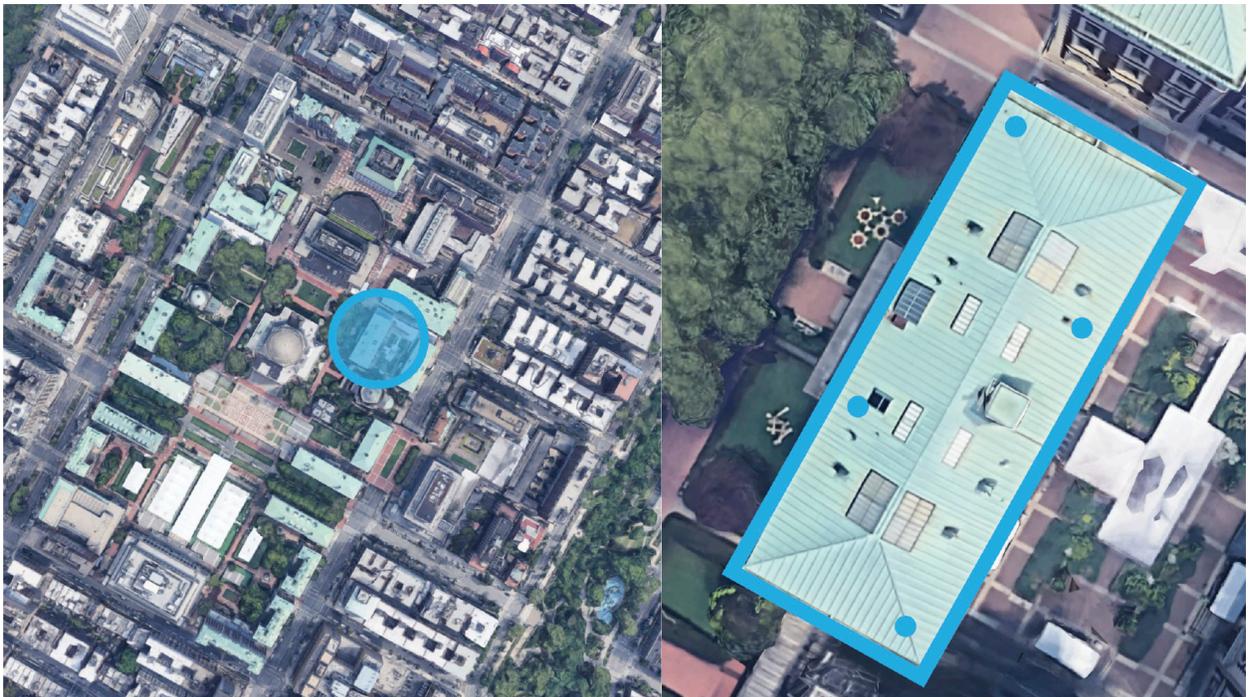
4 / Use



5 / Pilot

The original pilot for colorWAVE was intended to take place throughout Columbia GSAPP, connecting various public and semi-public spaces on the campus. The four units were initially planned to be stationed across four different architecture studios, but this subject area was extended to include the urban planning lounge and Brownie's cafe.

However, due to the unexpected campus, and eventual city-wide stay-at-home mandate caused by the COVID-19 pandemic, this became infeasible. Instead, the project was re-conceived as an at-home, personal desktop device.

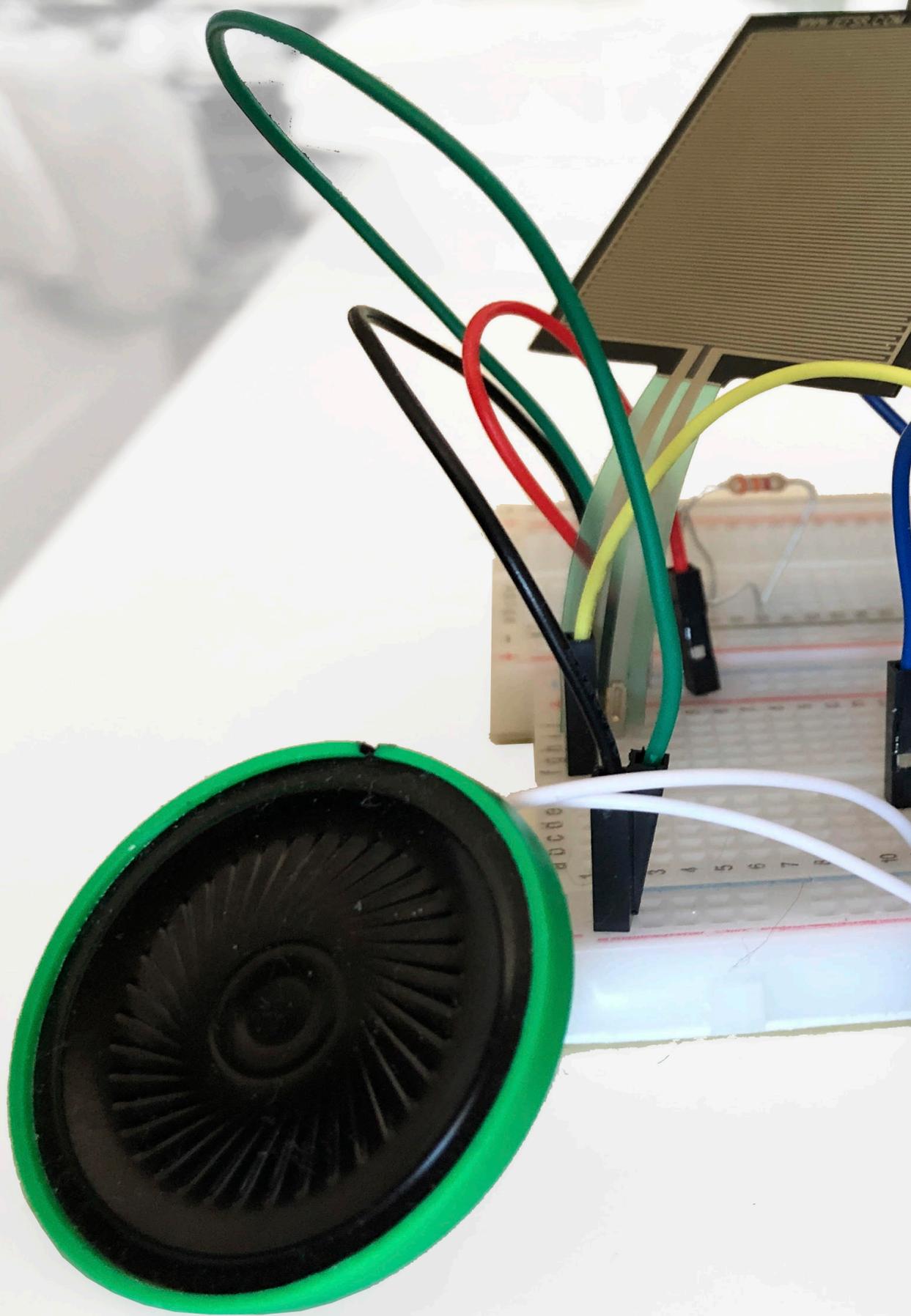


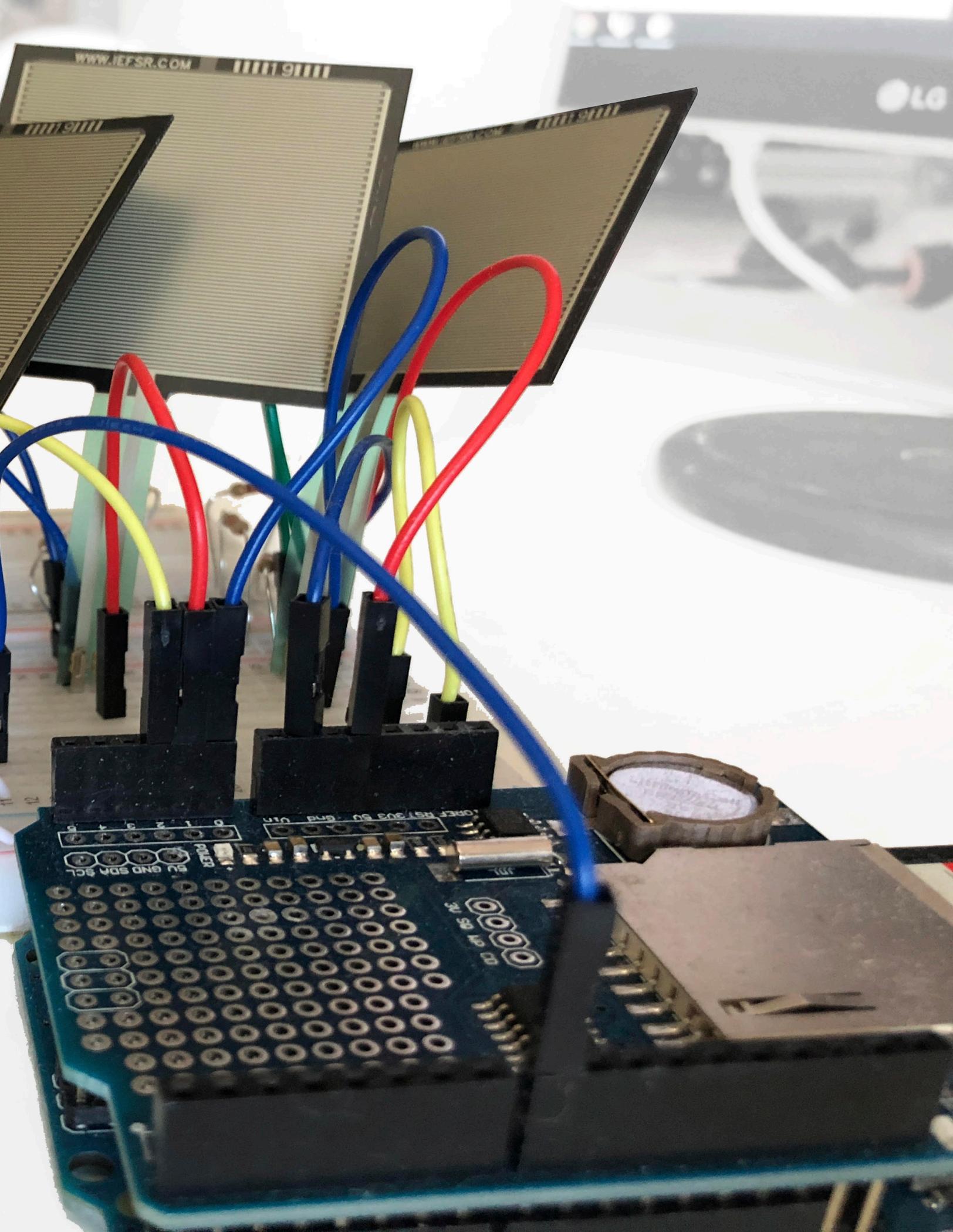
5 / Pilot

Due to isolation requirements, only one set of sensors could be developed at home. The conceiving of the design of the colorWAVE unit paralleled the development of the internal logic of the sensors and user interactions.

An portion of the code used to describe the user interaction is below. This code determined the audio output from the piezo speaker based on a user's touch input. Due to the sensitivity of the speakers, a minimum force threshold was set at 100, ranging up to a maximum force input of 1023. These were mapped to output audio frequencies of 523 to 2093, corresponding to two octaves (C5 - C7).

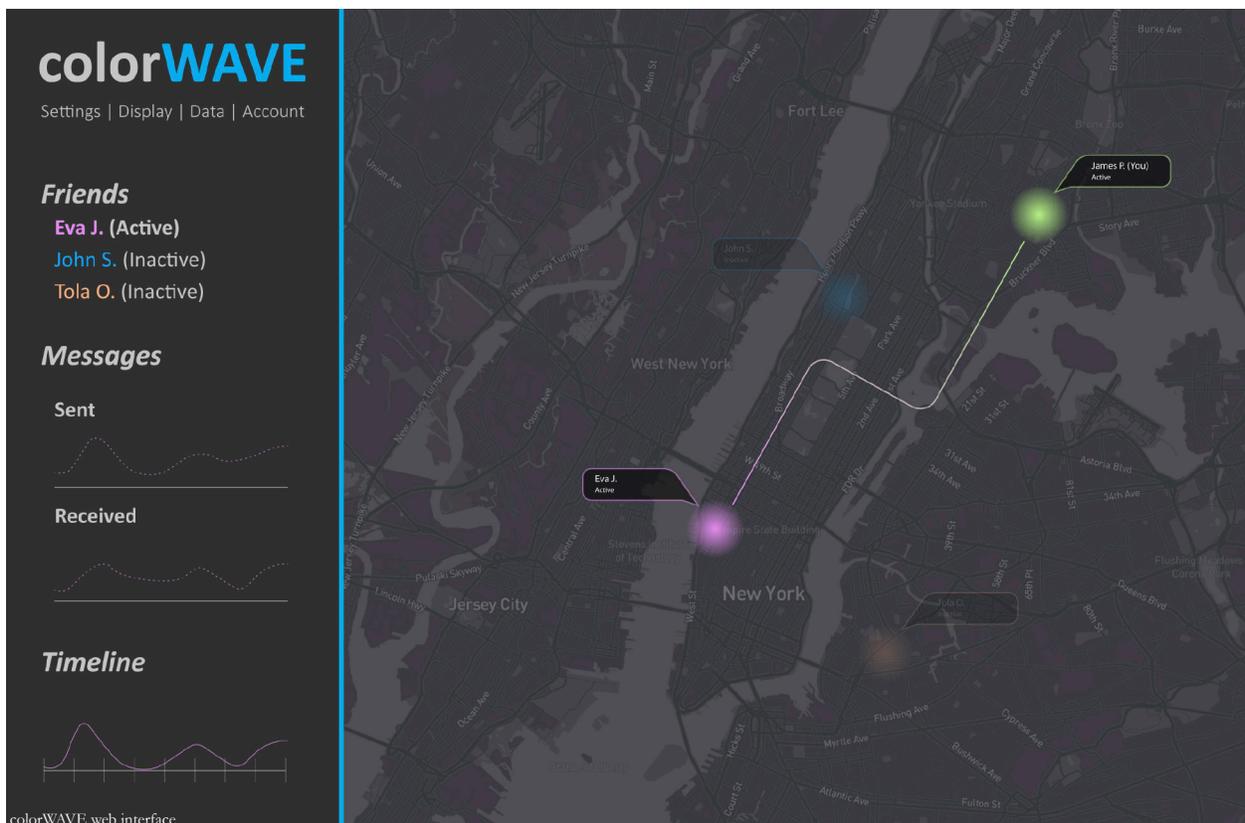
```
1  #include "pitches.h"
2
3  const int threshold = 100;    // minimum reading of the sensors that generates a note
4
5
6  void setup() {
7      Serial.begin(9600);
8  }
9
10 void loop() {
11     for (int thisSensor = 0; thisSensor < 3; thisSensor++) {
12         // get a sensor reading:
13         int sensorReading = analogRead(thisSensor);
14
15         int thisPitch = map(sensorReading, 100, 1023, 523, 2093);
16
17         // if the sensor is pressed hard enough:
18         if (sensorReading > threshold) {
19             // play the note corresponding to this sensor:
20             tone(8, thisPitch, 20);
21             delay(50);
22         }
23     }
24 }
```





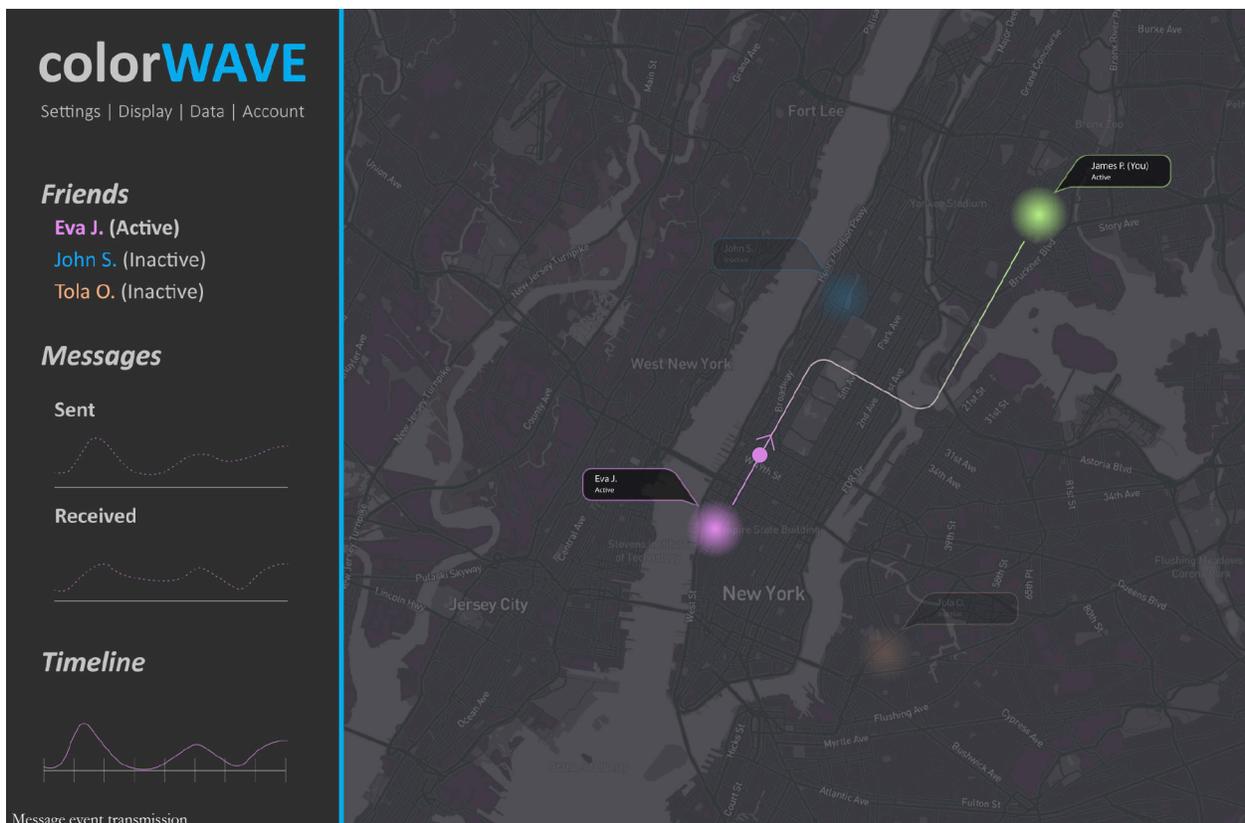
6 / Data Visualization

The nature of the project suggests data visualization designs focused on the messages in relation to their geographic distribution. However, due to the inability to deploy multiple units, the visualization models are hypothetical. These visualizations would live through an online platform where users could track theirs and their friends' data.



6 / Data Visualization

Live and historical trackers display when messages are sent, from and to whom, as well as allow a user online to click the event to listen to the message sent. The live map indicates which of your friends is online, and stores all the relevant data in real time.



colorWAVE

Settings | Display | Data | Account

Friends

Eva J. (Active)

John S. (Active)

Tola O. (Active)

Messages

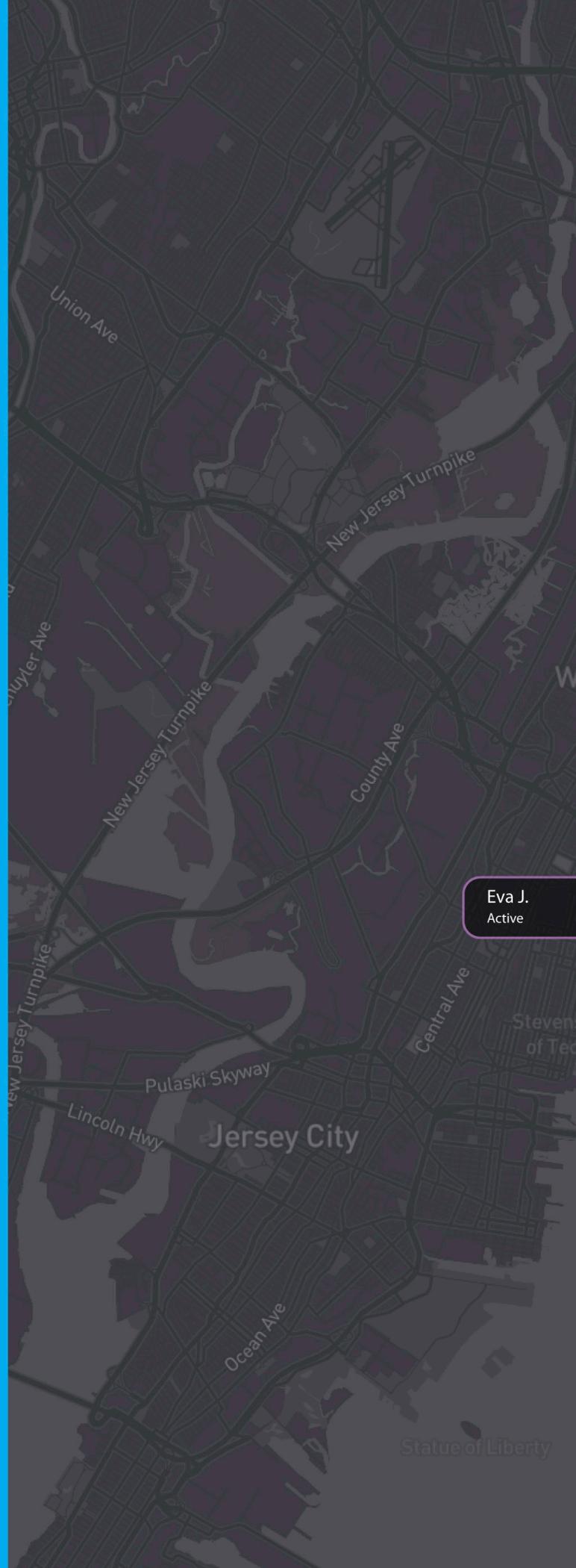
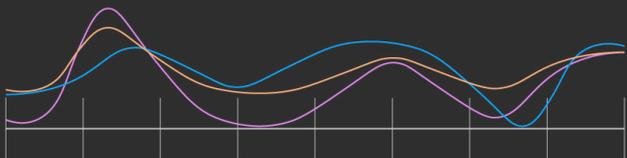
Sent



Received



Timeline





John S.
Active

James P. (You)
Active

Tola O.
Active

Fort Lee

Yankee Stadium

New York

Empire State Building

Flushing Meadows-Corona Park

Grand Ave

Grand Concourse

Burke Ave

Broadway

5th Ave

2nd Ave

Park Ave

21st St

31st St

31st Ave

34th Ave

Astoria Blvd

34th Ave

81st St

Queens Blvd

80th St

58th St

65th Pl

Flushing Ave

Cypress Ave

Myrtle Ave

Bushwick Ave

Atlantic Ave

Fulton St

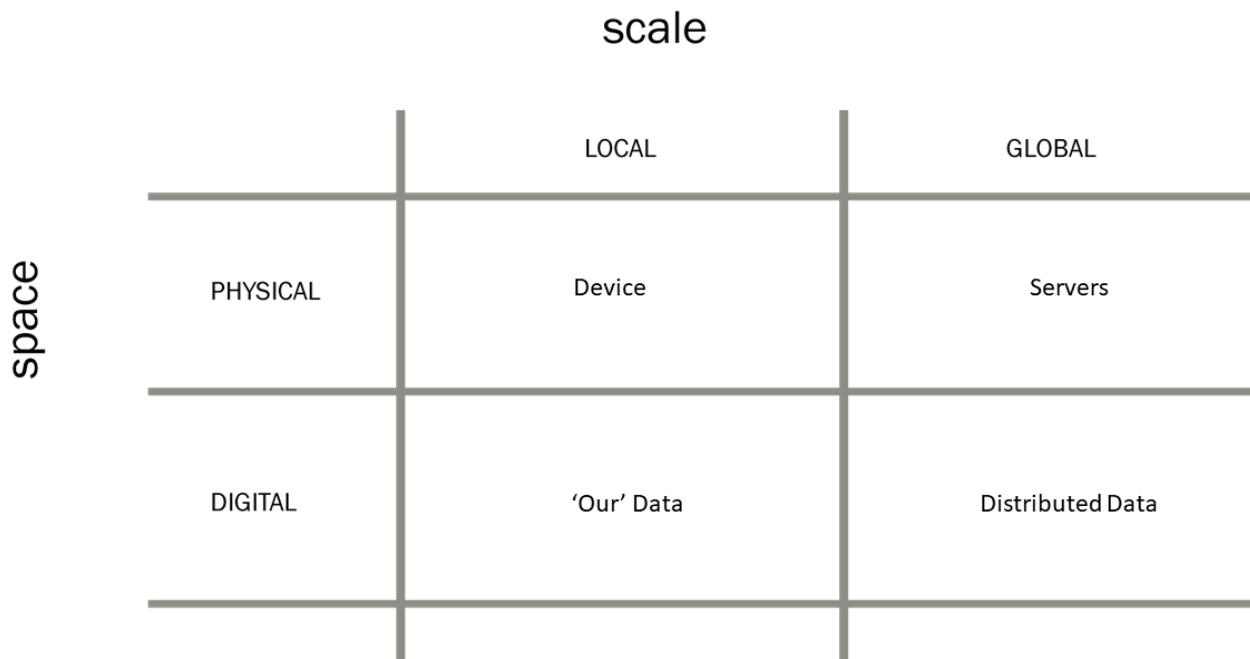
Hicks St

Court St

7 / Discussion

The inspirations underlining the development of colorWAVE are twofold: First, providing individuals with the power not only to consciously create their own data, but also to control how that data manifests and who gains access to it can help to re-define how person to person and person to technology interactions occur, and what their values are. Second, that 'big' data can be fun, and the creation of data can also be in service of play.

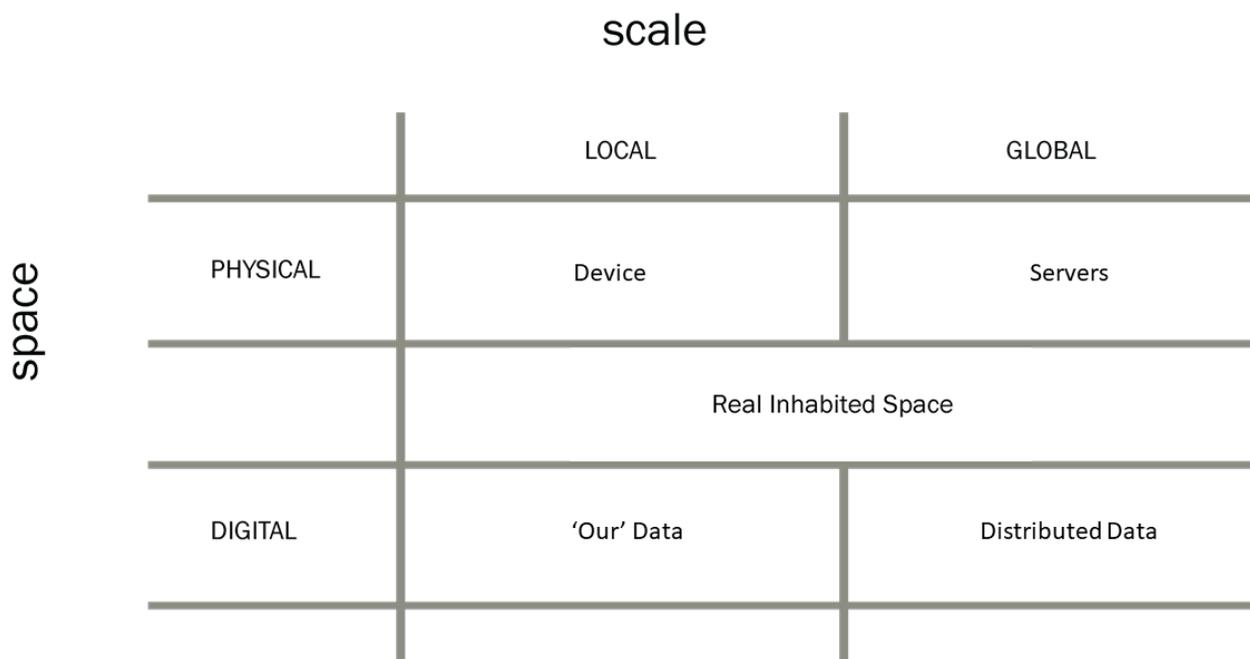
Both of these concepts rest upon an understanding about how we exist in the world today, and how the physical and digital worlds have become entangled.



7 / Discussion

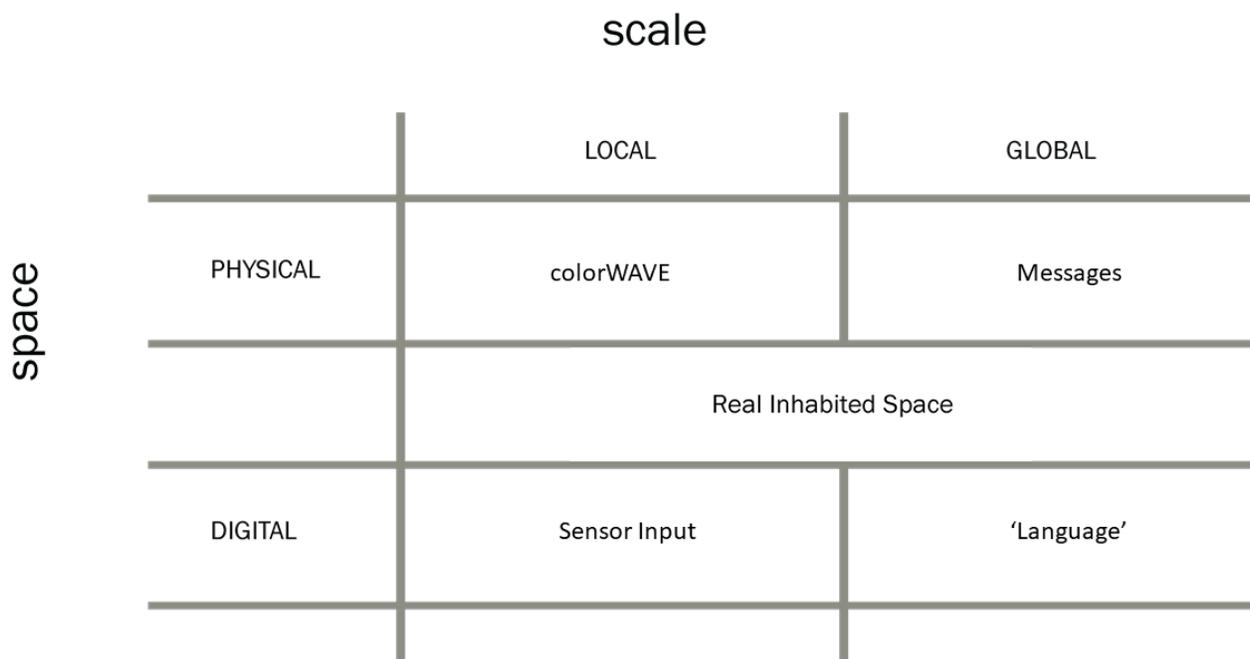
While the distinction between the physical and digital - both in their literal and scalar functions - was once more clear, today these two worlds have become so intertwined that it is near impossible to separate them. Our real inhabited experiences are simultaneously physical and digital at all times, with our local actions and interactions necessarily interfacing with global digital networks and infrastructures.

It is this understanding that frames how person to person and person to technology interactions have blended, and how colorWAVE seeks to engage one through the other.



7 / Discussion

This is true not only of individuals and their friends at home, but also groups of individuals across various geographies, from campus communities to urban environments. colorWAVE encourages discovery and play by providing its users with a limited toolset that provides unlimited interactive possibility. The initial conception of the project encouraged uncoded, anonymous or near-anonymous interaction with other users, and intended to explore how these experiences might form meaningful relationships between two people or groups of people across physical space through the interface of a digital message.



7 / Discussion

The second iteration of the project, as an at-home device, encouraged a different, but no less significant form of communication, wherein users can create their own memetic vernaculars, their own coded experiences with friends or other collaborators.

In either case, the message is the data, but the message takes on another, meta role as an indicator of meaning, action, and collective experience outside the user of the colorWAVE device. Whether pre-determined or intuitively developed, the coded meanings of a given audio message, a given melody or beat, could produce person to person interaction, or communication that supercedes the device itself.

In this way, colorWAVE is both an actor in the creation of data, but also a digital and physical vessel through which users can transmit their larger ideas. All the while, the simple UX, and underlying use of musical sound and color seek to promote elements of fun, play, and discovery.

colorWAVE converts person to person interactions into person to technology interactions, and vice versa. It provides a playground wherein people can create intimate, personal, and meaningful interactions with one another, and with the technology itself.