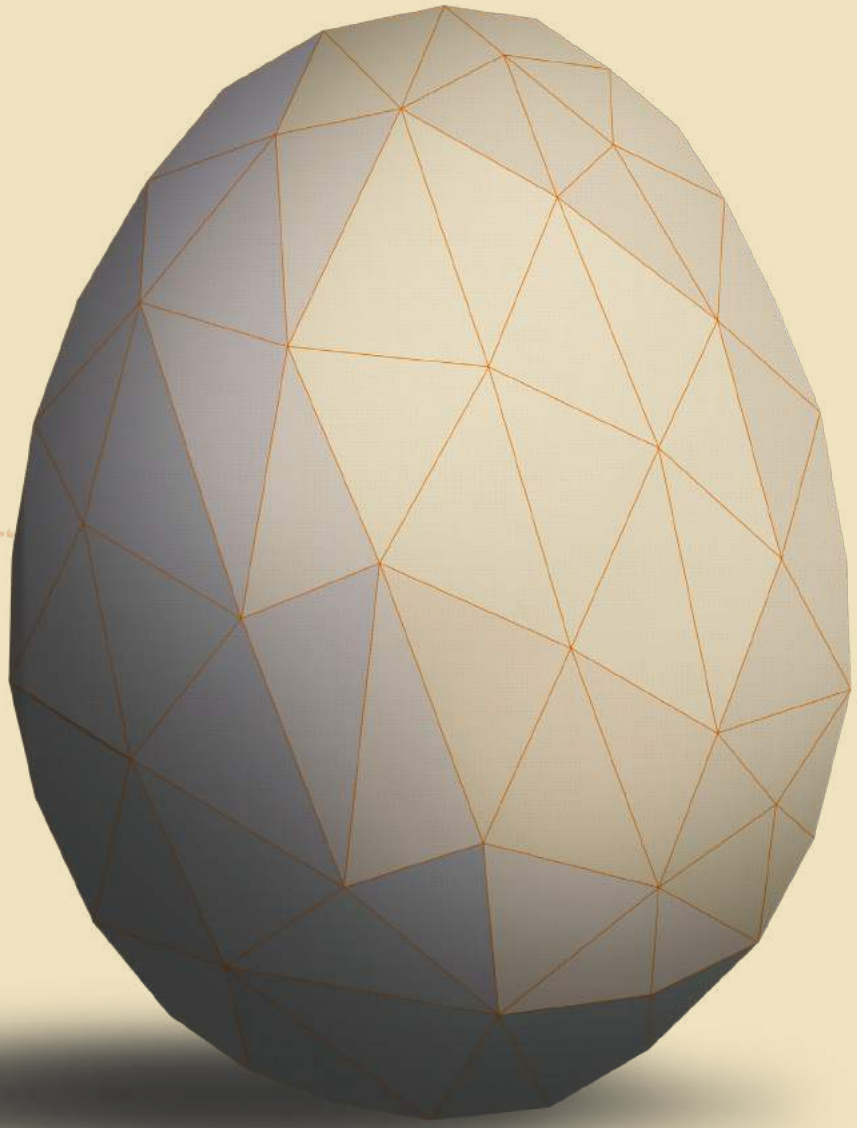
Playground Pulse

Sensing Playground Activity Intensiveness



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Executive Summary

In the midst of Covid-19, playgrounds are closed. However, one day they will reopen. Yet when will social distancing end and when will we pick up our trust again? What kind of information would the public need to go back to the playground? This urban sensing project focuses on detecting public movements using a Human Presence Sensor. At the playground level, the project's audience are children. Playful LED displays will stay engaged and interactive with kids, presenting a sense of wondering. At the city level, information collected by the sensor will be aggregated and used for parents who need to know whether a playground is busy. The information would also be helpful to Department of Park and Recreation, who manages these parks.
Playground Pulse, a name and a project inspired by Rafael Lozano-Hemmer's Pulse Room, translates analog to digital and facilitates the public activities on children's playgrounds.

Contents

Introduction

Defining play

Play, seen as an essential human activity, was hardly defined. Its lack of definition contributes to its social and spiritual application in childhood development. Scholars across the fields have studied this behavior extensively but could not land on a single definition of it. Sociologist Roger Caillois suggested that play has characteristics of being " free" separate", "uncertain", "unproductive", rule-bound, and/or "make-believe", and constructs his classification of games into four main categories: competition, chance, simulation and vertigo. While .The essential feature that defines "play" is "unconstrained". In a way, the phrase --defining "play", itself is already paradoxical. While a more philosophical approach taken by psychologist Scott G. Eberle argued that "play" encompasses anticipation, surprise, pleasure, understanding, strength, and poise), and other emotional, physical, and intellectual dimensions.

Fascinated by the concept of "play", I am interested in capturing this very uncertain behavior and quantifying it using sensors--converting actions to analog signals and digital readings.

Public playgrounds, places provided by the city where citizens can enjoy play freely, are now closed. As an important part of urban life as well as public infrastructure, these facilities are facing crucial challenges now and will be after the pandemic. Would people feel safe again to use the playgrounds? How to practice social distancing on the playground? The pandemic presents challenges and opportunities to densely clustered city life. This project embraces both and provides an alternative urban sensing option that is both informational and playful.


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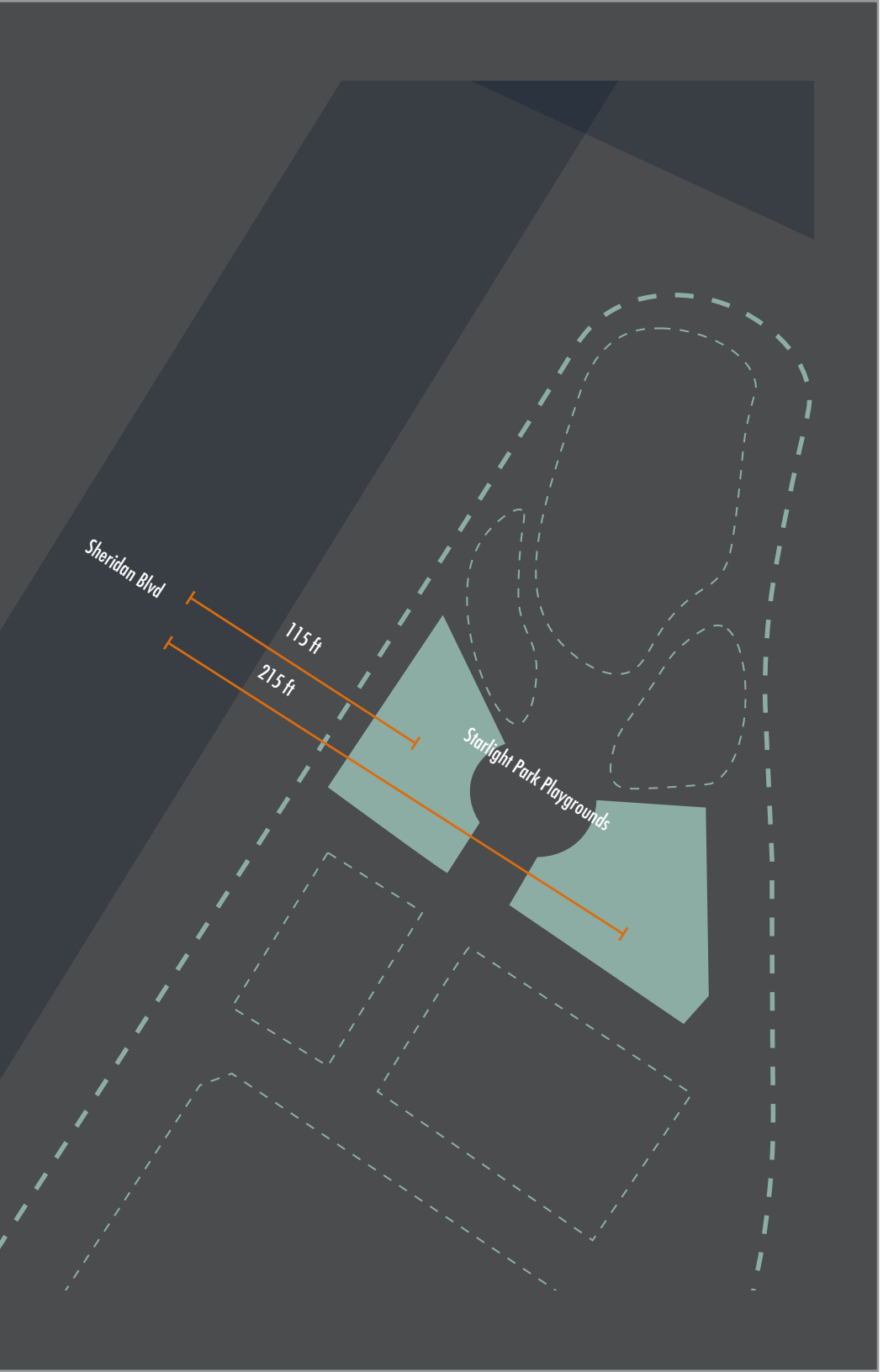
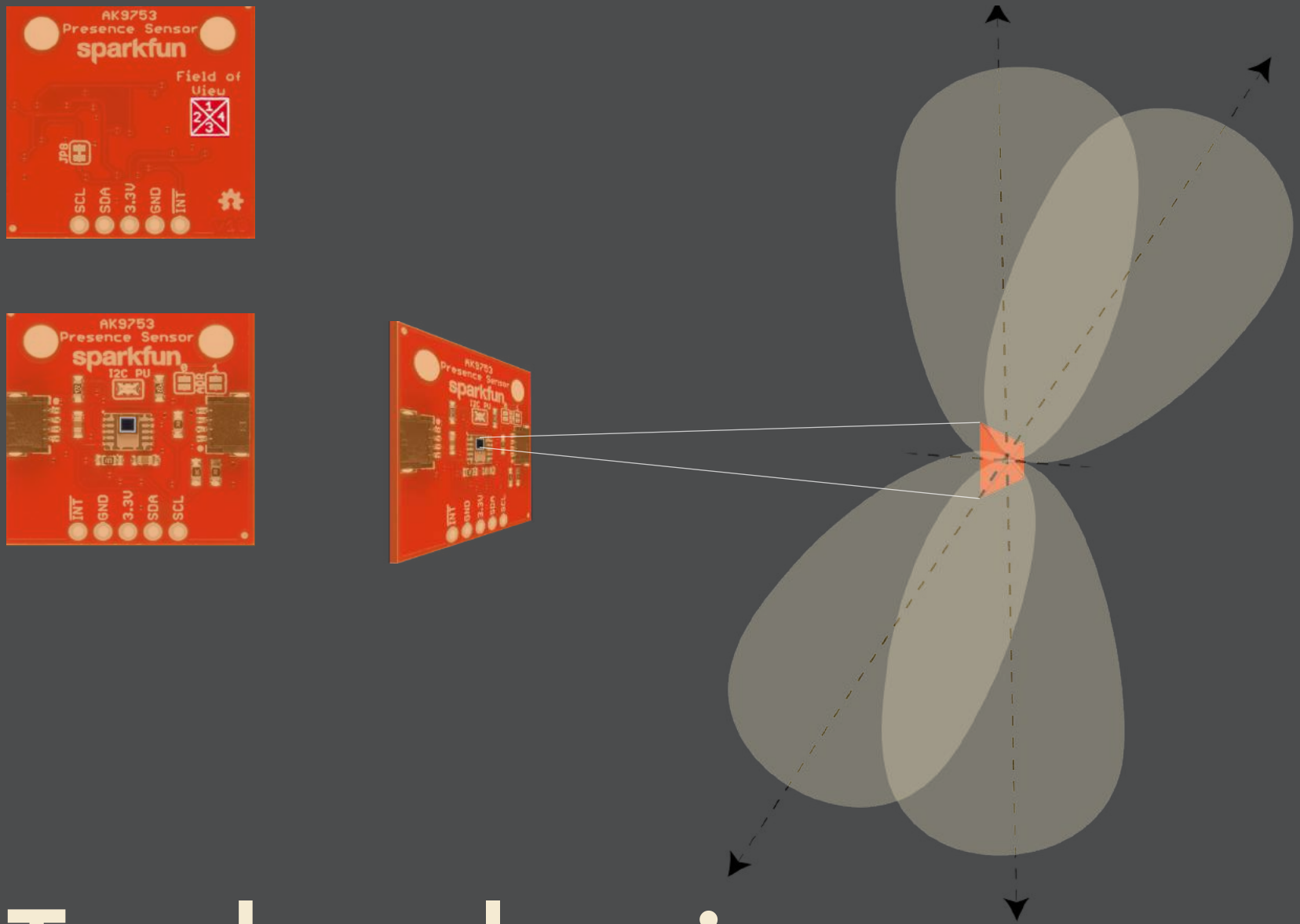


Starlight park

The original for this project is Starlight Park in the Bronx. As a class, we visited the site in February, 2020. During our site visits, we noticed that next to the park was a busy highway connecting Hunts Point Produce Market. Many trucks were passing by the park when we were there. The fact, that the Bronx has the highest asthma hospitalization rate compared to other boroughs, led me to think whether this was a good location for playgrounds. To explore this issue and hopefully connect information that would facilitate future site choices for playgrounds in these historically disadvantaged communities, the initial proposal focused on comparing the time of activity on-site and how air quality changes over time of the day. However, things have changed, and the project pivoted in order to be more relevant while the idea of sensing play stayed the same.



Technologies

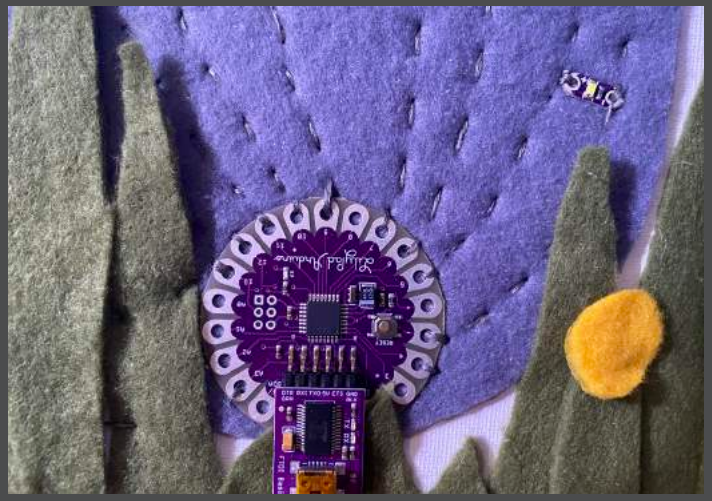
Human Presence Sensor (AK9753)

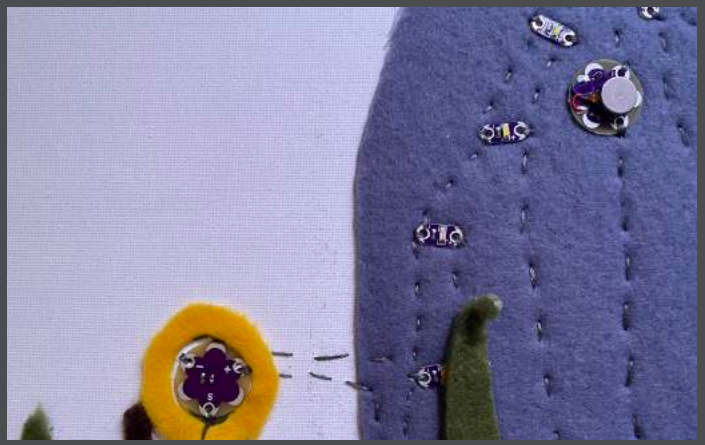
Compared to the normal IR sensor, this specific one has four IR components and a temperature sensor. Each IR has its own readings. The graph on the right shows what one IR reading looks like when it senses one movement. While the sensor encompasses the ability to detect actions and directionality of the movement, it does not measure the number of people on the playground nor how long they have stayed. Yet the measurements of the actual number of people is not the only answer for measuring playground activities. The questions -- whether there are activities on site, when and how often they appear? could be speculated without accurate account of specific numbers of people on the playgrounds.

Depending on where the sensor is, theoretically it is feasible to measure long were the equipments occupied. With more understanding of what this sensor is capable of, I decided to focus on measuring how frequently the playground was used and challenging myself to explore this specific sensor's ability of indicating the directionality of the movement.

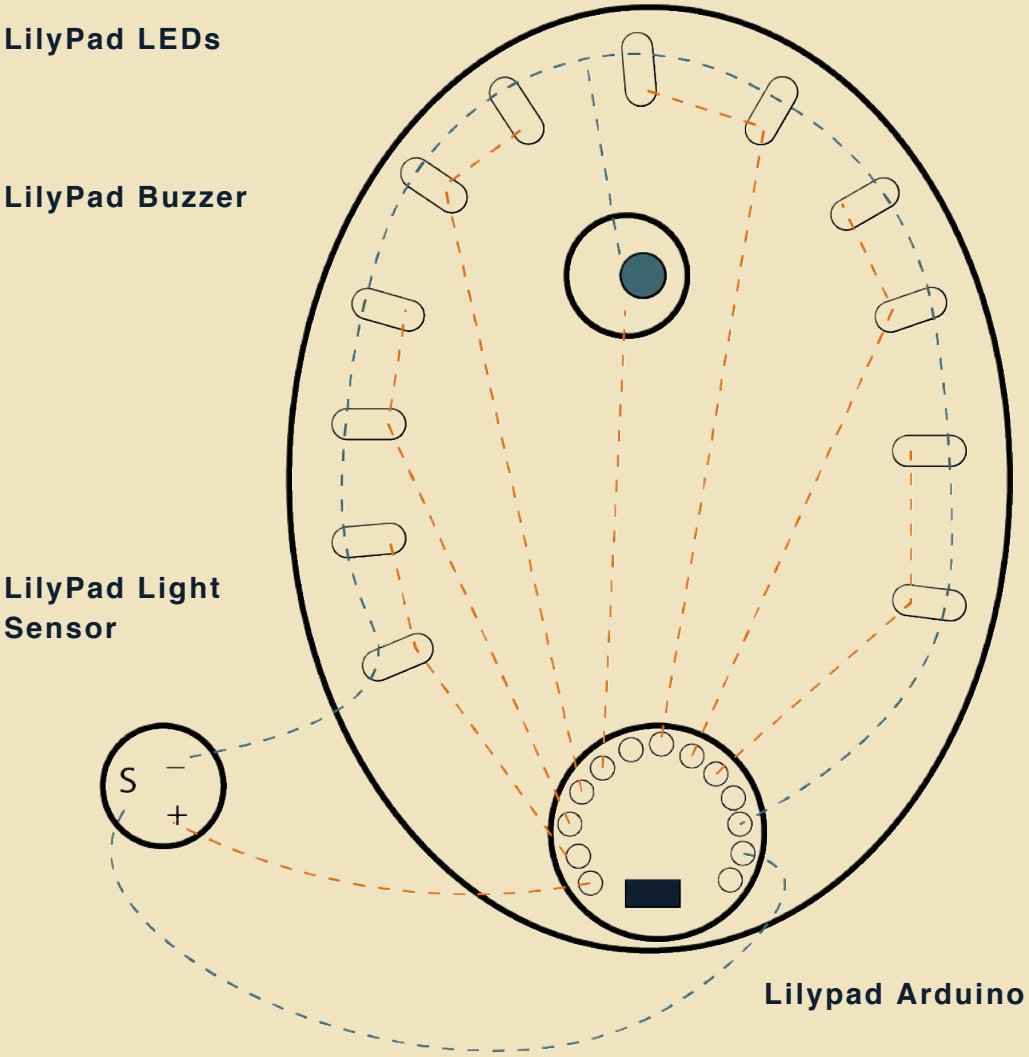
LilyPad products

To prototype, I used a LilyPad Arduino Main board, one LilyPad Light Sensor, 12 LilyPad LEDs, and one LilyPad Buzzer.





Design

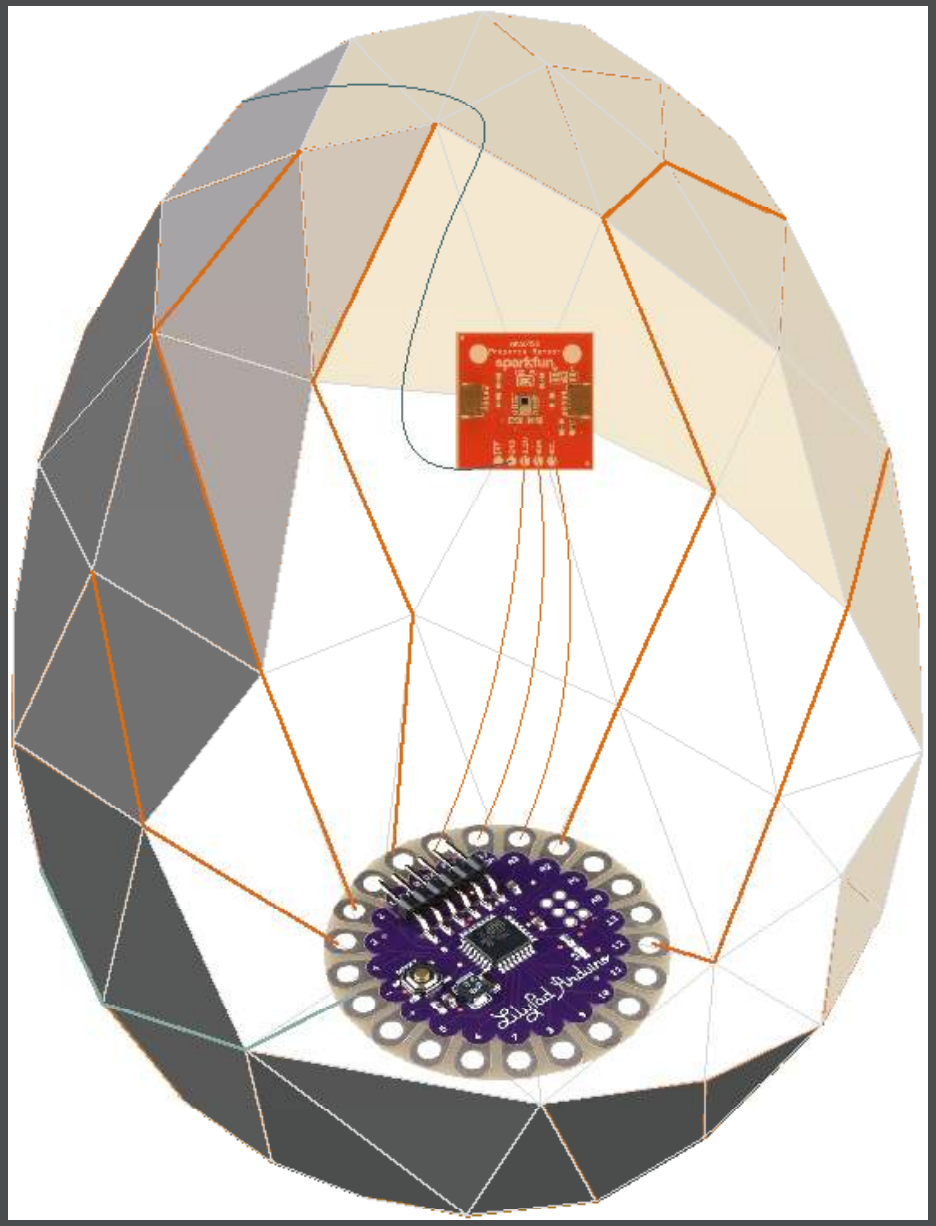


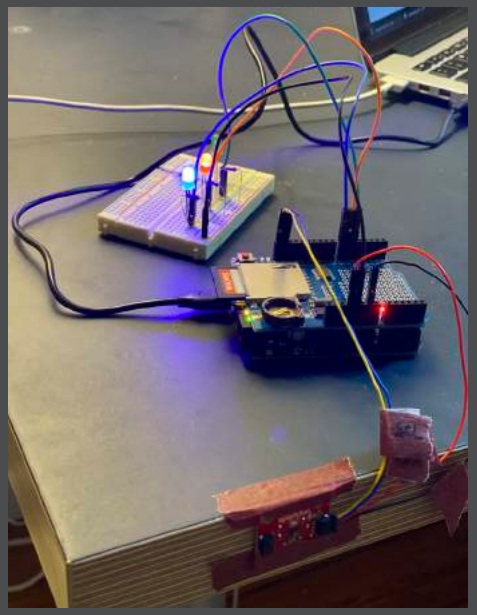
A playground sensor should really fit to its environment. In short, the form factors of the sensor need to be site-specific.

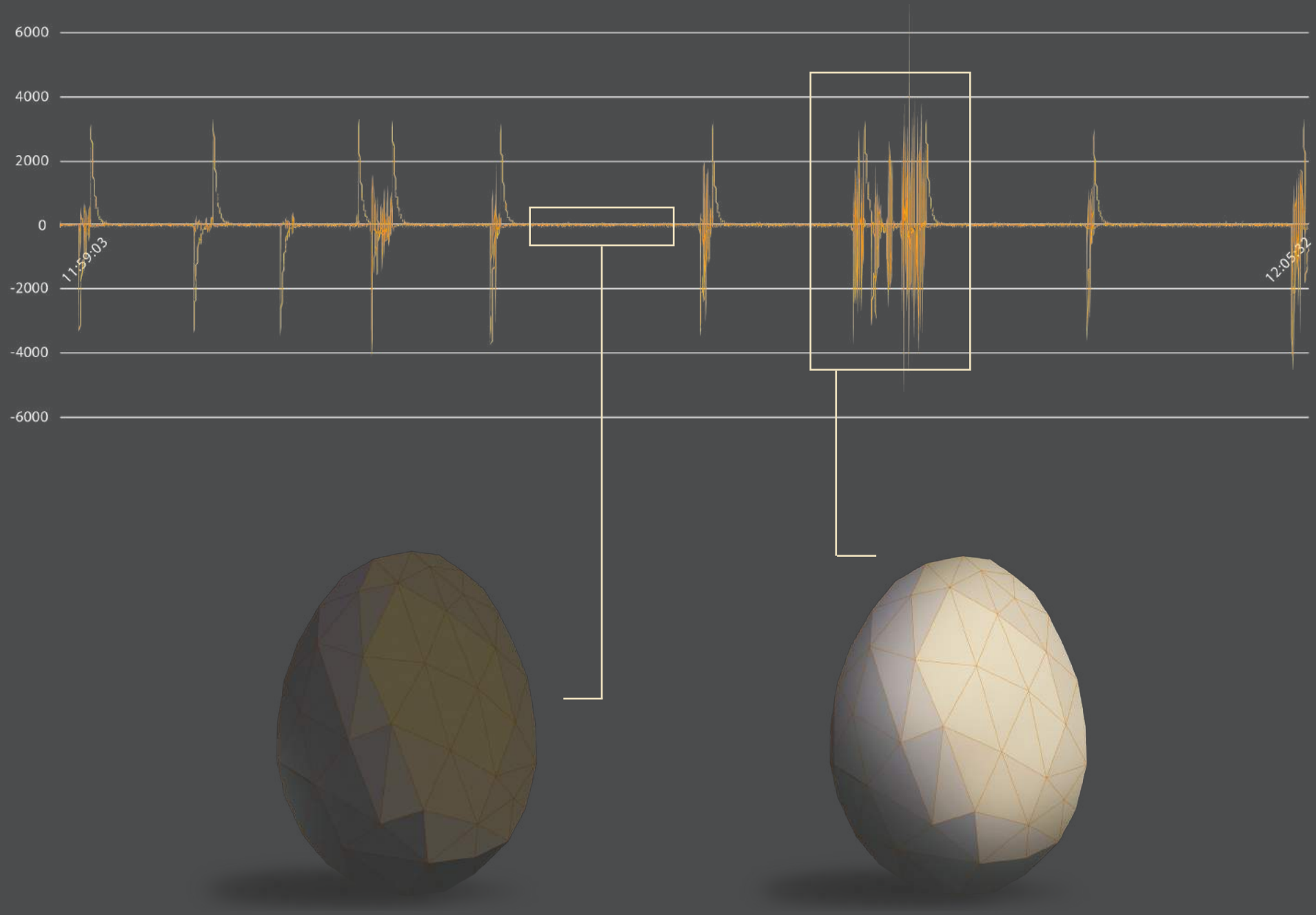
Thinking the most fun way to interact with kids and provide meaningful interaction, I designed an interactive dimming dinosaur egg for a park nearby -- the dinosaur playground, in a riverside park, on the 97th street. The playground features dinosaur sculptures that kids can interact with.

This is a diagram of sewing


12
inches


sparkfun
LilyPad Arduino

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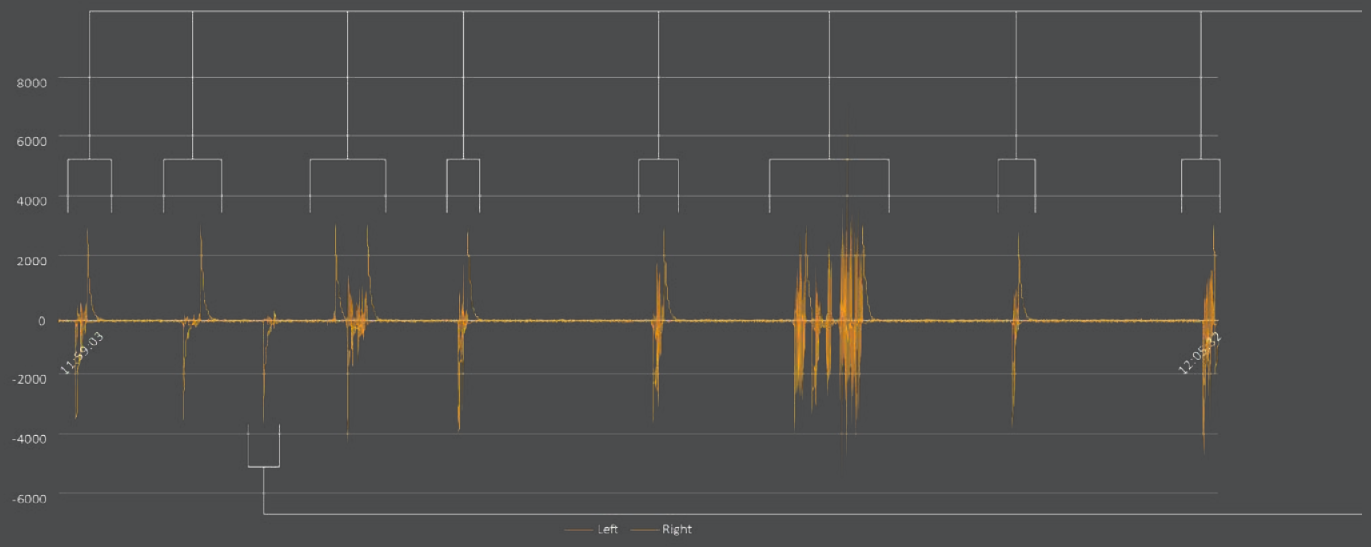
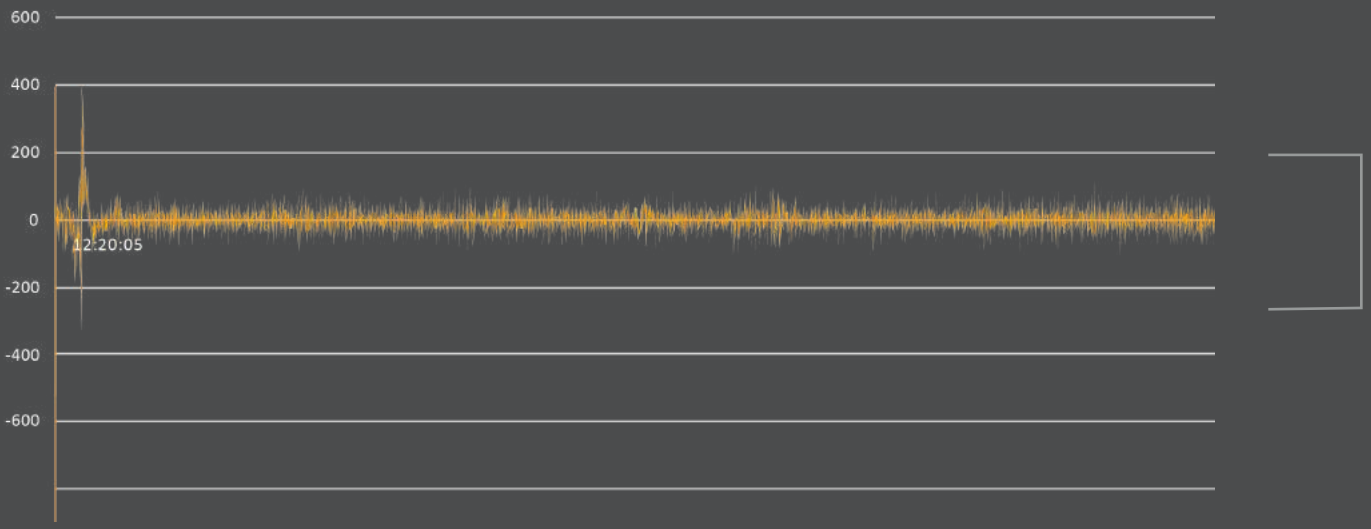


8 Movements
Detected Over 6 minutes

Incomplete Movement
Detected



No Movements
Detected over 5 minutes

Data

One “Movement” is defined as left IR and right IR both detected “in” and “out” of the range.
An incomplete “movement” is when at least one condition described above not being satisfied, yet there is a plateau

Movement: could be passing

Incomplete movement: could be some back and force movements that never crossed the entire spectrum, or a kid staying in front of the sensor but never went across

Preliminary Data Analysis

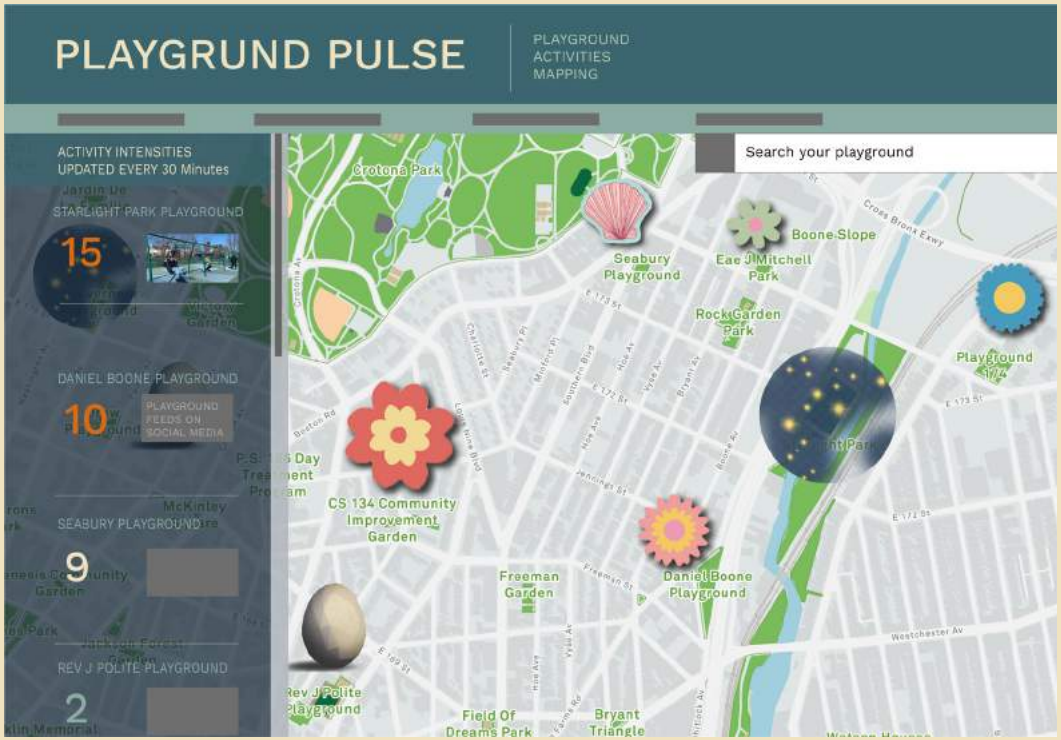
The data I want to collect are movements on the playground. This graph shows people walking along the riverside park. These are the readings I collected within 5 minutes. this data can provide a general idea of whether the equipment was used and during what time of the day. There may not be accurate headcounts, but if a playground was crowded, the sensor data would be able to show that.

Processing sensor data is hard, what’s the best usage of a specific sensor is depended on the situation. Some sensor has broader range but less accurate vise versa. Also, the biggest problem was telling the directionality of a movement. As I mentioned briefly, theoretically I could do something, but in reality, it might have 50 % accuracy. The data may require further computation, even machine learning in order to reach higher accuracy. However, does this project need that accuracy? A general idea of whether there are movements and how often the events are happening would be more enough for the scale and purpose of this project. In the way, I think there are value and beauty in both cases.

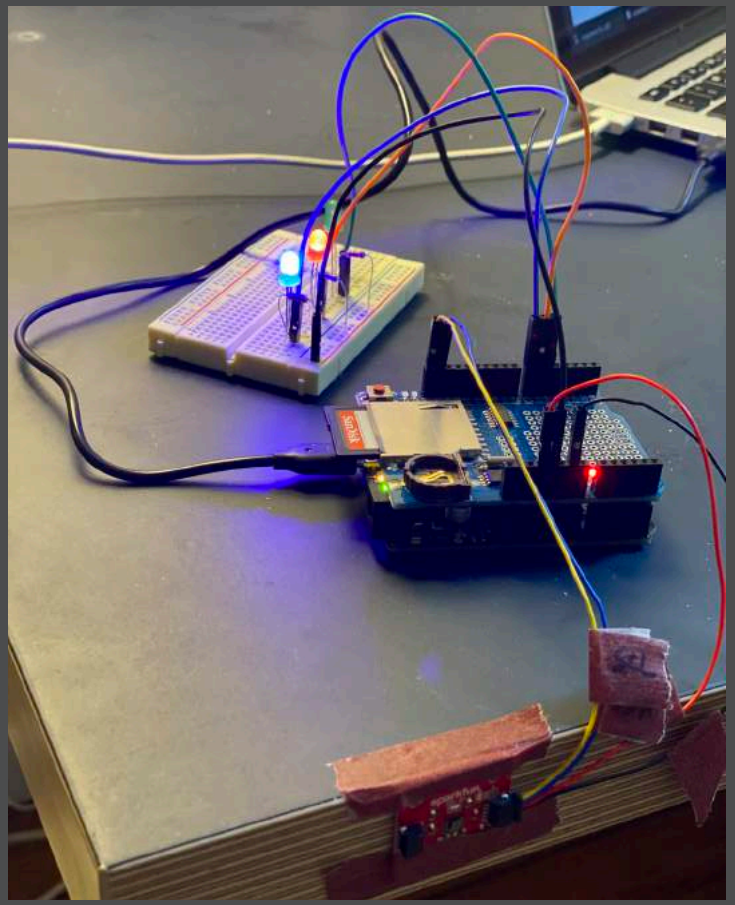
Urban Interaction

A score for busyness on the playground

Most image posted on social media that either located at the playground or had the #playground name



Relating that to the current covid situation and a prolonged social distancing policy. I think this information would be particularly useful for parents to choose which playgrounds to go to and when to visit these playgrounds in order to avoid the crowd. For example, writing code that aggregates the number of events during that certain time period and displays it by simply changing the frequency of blinking at the park. For example, an example of a frequently used playground would blink in high frequency signaling the busyness, and the quieter playground would blink in lower frequency signaling the opposite. Depending on the interpretation and personal needs, people may want to go to the playground when it is crowded after covid-19, so kids can play with each other.



Using Arduino Board to sketch interactions between movements and LED display

Appendix