# Fitlody

Exercising with the images and music which generated by yourself.

Project Overview

Fitlody is a digital device which could generate the images and music by collecting the data from the users themself when they are exercising on it.

How to encourage people to increase their interest in exercising and persist in them has always been a question worth discussing. Therefore, our device focuses on making users to generate dynamic images and music during exercise to increase the user's enthusiasm, thereby keeping their bodies healthy. Initially, we believe that our device can be placed in parks, gymnasiums and other places suitable for outdoor sports. Based on the ban caused by COVID-19, our target user group has changed. Through investigation, we found that more than 90% of people lacked exercise during the ban. Therefore, our target users are changed to people who work at home and learn to lack exercise during this special period. However, if COVID-19 ends, we hope that our device can still be placed in public places.
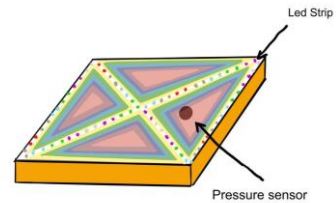
Our device provides users with push-ups, skipping rope, weightlifting and some other sports modes. When the user is standing on the device for exercise, the pressure sensor and vibration sensor placed in the device will collect the user's motion data and transmit it to the system, and then generate music and dynamic images. In this prototype, we realized the functions of using pressure sensors to collect data, generate music and use LED strip to generate images.

Related Works

By reading the literature, I found that some researchers have studied the relationship between sports and art. They found that there was a very close connection between sports and art, and they can promote people's participation in the two. When sports and art cooperate, they can not only create new aesthetic works, but also have a great effect on people's physical and mental health[1]. In addition, I studied the game ring fitness adventure produced by Nintendo. The game is very popular during COVID-19, and all offline online sales platforms were out of stock[2]. I interviewed two users who bought this game. They said that the most attractive thing about this game is that the combination of rich visual experience and various sports methods increased their interest in exercise. Based on these surveys, I think that adding visual images to our devices is very helpful to increase user interest. At the same time, this is also in line with the goal we want to achieve to help users maintain fitness at home.

Video Link: https://youtu.be/xygegvDDbeE

[1] J. Long and D. Sandle, "Investigating the interrelationships between sport and the arts," *Sport in Society*, vol. 22, no. 5, pp. 717–722, May 2019, doi: 10.1080/17430437.2018.1431593.
[2] "Ring Fit Adventure for Nintendo Switch Review: Fitness Game with Switch Peripherals," *Stealth Optional*, Apr. 06, 2020. https://stealthoptional.com/review/ring-fit-adventure-nintendo-switch-review-price-worth-buying-fitness-exercise-game-switch-peripherals/ (accessed May 09, 2020).

Design Process

Overview

In this part, I will describe in detail the design and production process of our project after our team completed the proposal. I divided this process into 3 parts. They are user research, make prototype and evaluation. In the process, the following goals were completed:

1. A survey on how people exercise at home.
2. Two interviews about studying the relationship between vision and motion take the Nintendo game ring fitness adventure as an example.
3. Experience in making patterns with Unity.
4. The process of making prototype using Arduino and LED strip.
5. User testing of prototype

User Research

Online Survey

To better understand how people exercise at home during the ban, I designed a survey. In this survey, I asked people in detail about the ways and types of people exercising at home. There are a total of 18 samples in this survey. I found that more than half of the users choose to use visual images for physical exercise at home. They think that video games and instructive TV aerobics can make them more interested in sports. One-third of users choose to use the fitness equipment conveniently stored at home for physical exercise, including yoga mats, skipping ropes, dumbbells and so on. These fitness equipment do not require a large space and are very easy to use at home.

According to the survey data, I think that *Fitlody* meets the standards for easy portability. Also, adding visual images to it in my design will make it easier to attract users.
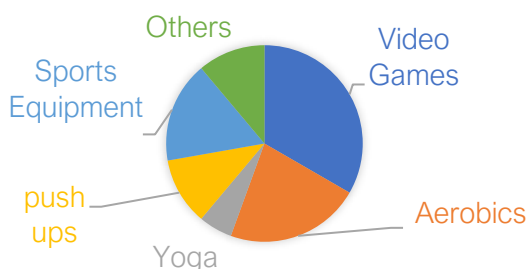
Interview

In order to understand how visual images can better attract users, I started with the Nintendo video game Ring Fitness Adventure and interviewed two players. The first player told me that two play modes are the most attractive to her. Another player believes that playing this game does not require a single pass, he can choose to stop at any time, which gives him a lot of freedom. Based on the interview, I summarized two insights.

1. Multiple modes can be selected to allow users to spend longer exercise time.
2. Adjustable exercise time will attract potential users who do not like exercise.

For these insights, our device also prepares a variety of sports modes for users. In this prototype design, my prototype can light up the LED light strip according to the user's movement. When the user stops moving, the light strip will also stop lighting, waiting for the user to exercise again.

Making Prototype

The first attempt to use Unity to design patterns

In the initial vision, we plan to use Unity to make dynamic patterns and use the projector to project the screen onto the canvas. Based on this assumption, I used Unity to try to design patterns.

According to the tutorial I made two dynamic patterns. The first one which is the balls diverge from the center point, rotates clockwise, and then stops rotating counterclockwise.
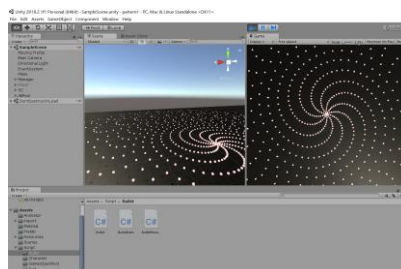
Design Process

The second one is the balls shot from the center point, and then hit the circle boundary and then rebound to the center point. The number of balls increases each time it bounces.
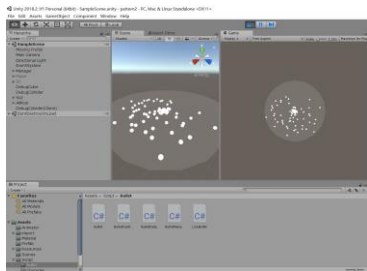

However, both patterns were made followed by tutorials. I found the coding is too difficult for me to change them and control them. Also, I failed to connect them with Arduino. In addition, I have not received my projector that time. In this case, I had to abandon the use of these two patterns, in this prototype priority to use LED light strips for production. We plan to use these two patterns to produce the next prototype.

Making prototype using Arduino and LED strip

In this prototype production, I used a canvas as the frame of the device. In order to make the visual effect richer, in line with the shape of the LED light strip, I drew some patterns on the canvas.

On the back of the canvas, I pasted a light strip with 40 LED lights on the canvas. The good light transmittance of the canvas allows different colors of LED lights to be displayed to users.
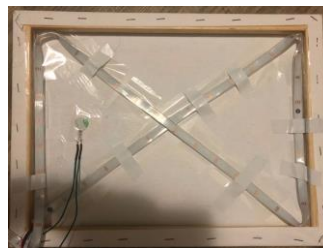
In addition, the pressure sensor was placed in the center of the back of the canvas. Because of this, the pressure sensor can more sensitively sense the user's pressure on the device.

User testing of the prototype

After the equipment was completed, I invited my roommate to test this prototype. Because of the limited load bearing of the canvas, we chose push-ups as the test project.

After the test was completed, the user provided some useful feedback. Based on these feedbacks, I have summarized them into insights. These feedbacks will be resolved in the next prototype.

1. The physical structure of the canvas and the location of the LED light strips will make the user feel uncomfortable.

2. The pressure sensor is too small and results in insensitive data reception.

3. The LED lights are not clearly displayed in the bend.

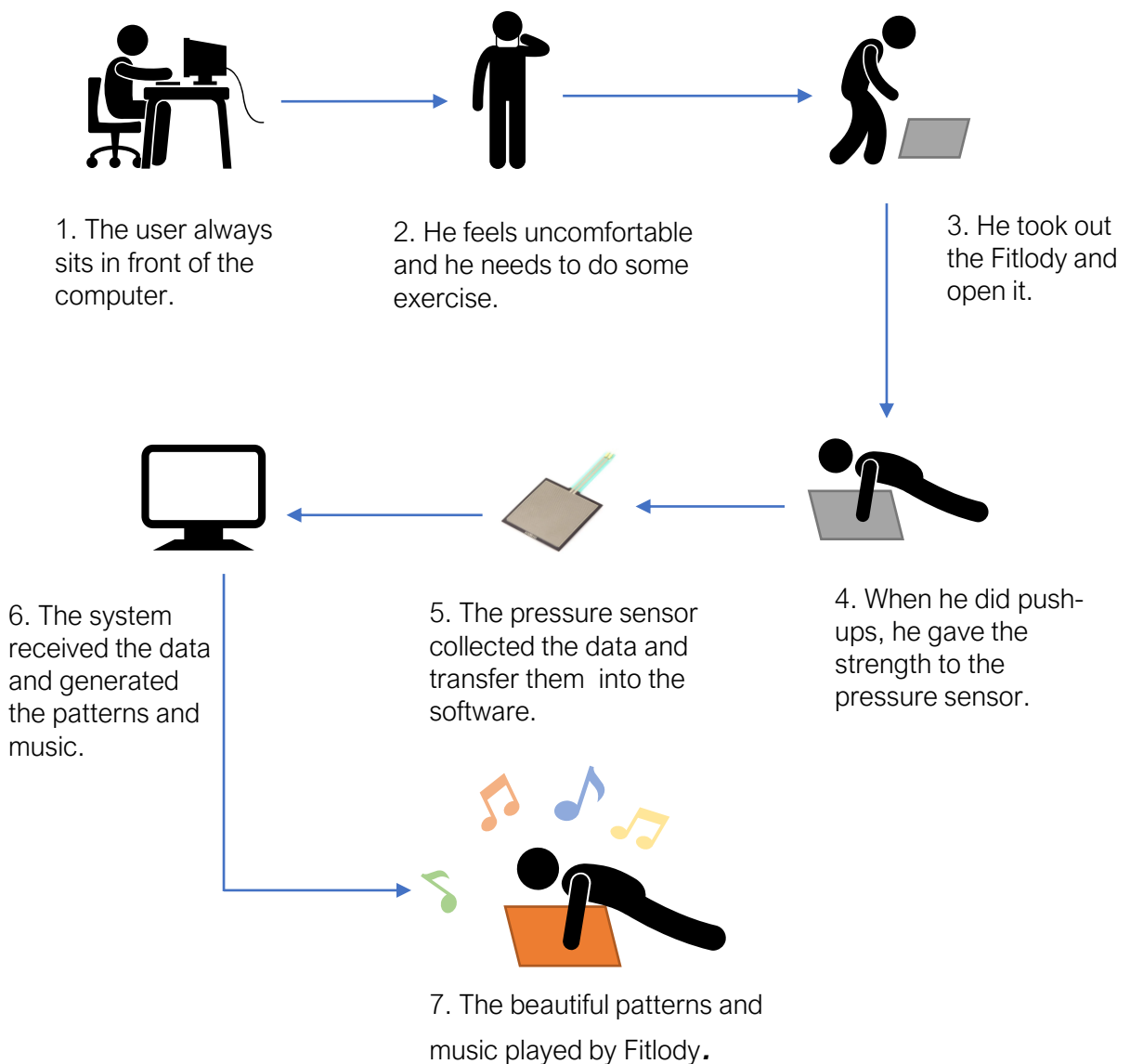4. The user wants to have a screen to record sports data.

Interaction Plan

The interaction plan of team project

Scenario 1

One user has been working from home. Because of the ban, he has not been out to exercise for a long time. One day, when he was cooking, he found that his waist and neck began to ache. Tired of ordinary sports equipment, he wanted to try new ways of sports. He took out Fitlody and turned on the switch, put his hand on Fitlody and started doing push-ups. Fitlody recognized his exercise mode and played a gentle pattern for him. His strength is recognized by the pressure sensor, and according to the transmitted data, rhythmic music also sounds at the same time.

Interaction Flow

1. The user always sits in front of the computer.

2. He feels uncomfortable and he needs to do some exercise.

3. He took out the Fitlody and open it.

4. When he did push-ups, he gave the strength to the pressure sensor.

5. The pressure sensor collected the data and transfer them into the software.

6. The system received the data and generated the patterns and music.

7. The beautiful patterns and music played by Fitlody.

Interaction Plan

My prototype is mainly focused on collecting the pressure data generated by the user during exercise and lighting the LED lights in sequence according to the exercise pressure and number. When the user applies pressure to the canvas, the pressure sensor below the canvas will sense the pressure. When the pressure data is greater than 10, the LED lights will light up in groups of two. When all 20 groups of LED lights are on, a group of sports ends, and all lights go out at the same time. When the user stops in motion, the LED lights will remain at the number of stops.
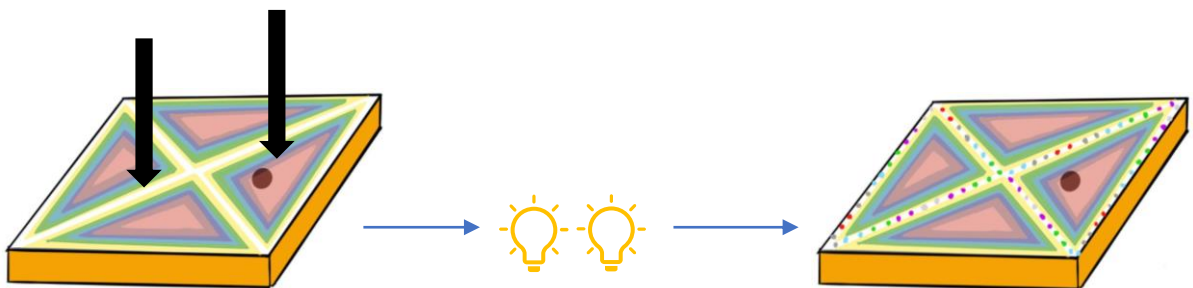
When the user continues to exercise, the LED lights will light up in groups of two according to the user's movement. A group contains 20 movements. When all the LED lights are on, a group of movements ends.
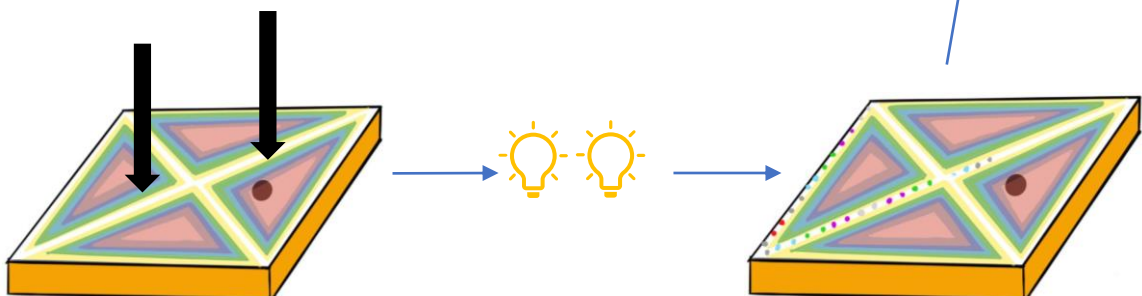
When the user can't insist on finishing a group of exercises, the number of LED lights will remain the same when the user stops. When the user exercises again, the LED lights will continue to light up until the end of a group of exercises.

Project Objectives and Success Criteria

The following table is my project objectives and success criteria companied with the measure.

Project objectives	Success Criteria	Measure
The material section	✓ The user presses over 70 kg of force on the canvas, and everything goes well	✓ Whether the device can be used normally when the pressure is too high
The pattern section	✓ The user thinks the pattern is beautiful and does not harm their eyes.	✓ Whether the user likes the pattern on the device. ✓ Does the user think that the pattern on the device is harmful to the eyes.
The input section	✓ The pressure sensor can transmit the user's pressure data to the computer every time.	✓ Whether Arduino can work normally. ✓ Whether the pressure data is within a reasonable range.
The output section	✓ The LED strip lights up normally following the movement rhythm. ✓ When the user stops moving halfway, the LED strip retains user data.	✓ Whether the LED light strip can light up in groups of 2 with the pressure sensor. ✓ Whether the LED strip can be stopped when the pressure stops.
Can prototypes increase user interest in exercise	✓ After the interview, users thought that the light strips and patterns could attract them to exercise longer.	✓ Whether the device can allow users to increase interest in sports.
Whether users use prototypes to maintain physical fitness	✓ According to the interview, users said that 20 sets of exercise can effectively help them maintain good health.	✓ Whether the device can help the user exercise and maintain the health.