Team Name: Beats by David

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Description: We plan to set up a small fleet of raspberryPi devices in common study areas around the engineering center. Each raspberryPi will have a microphone attached to it (that only records decibel magnitude, not conversations!) and a thermometer. These devices will record the magnitude of sound and the temperature at different times throughout the day.

This information will be stored in some type of SQL database and will be able to be viewed through a simple web interface. We hope to have live data as well as historical averages that will represent that data collected over the course of the project.

*** If successful, this project will allow students to view the average temperature and 'loudness' of different study areas in the engineering center, providing a resource to find the most comfortable, quiet study area. ***

Vision Statement: "Helping CU students find an optimal work environment to study peacefully."

Motivation: Everyone likes studying in a quiet area at a comfortable temperature. The motivation for this project is to help students find the quietest, most comfortable study areas.

Risks: The following is a list of risks that could negatively impact our project.

1. Someone could literally walk away with our raspberryPi devices.
2. RaspberryPi devices could lose power quickly quickly.
3. RaspberryPi devices are fairly fragile and could break easily.
4. We may not finish all the steps of the project in time.
    a. UI might not be as aesthetically pleasing as intended.
5. Data may not be representative of the actual decibel/temperature conditions if the devices are in non-optimal positions within the study rooms.
6. Cost of the devices will be on the team members.

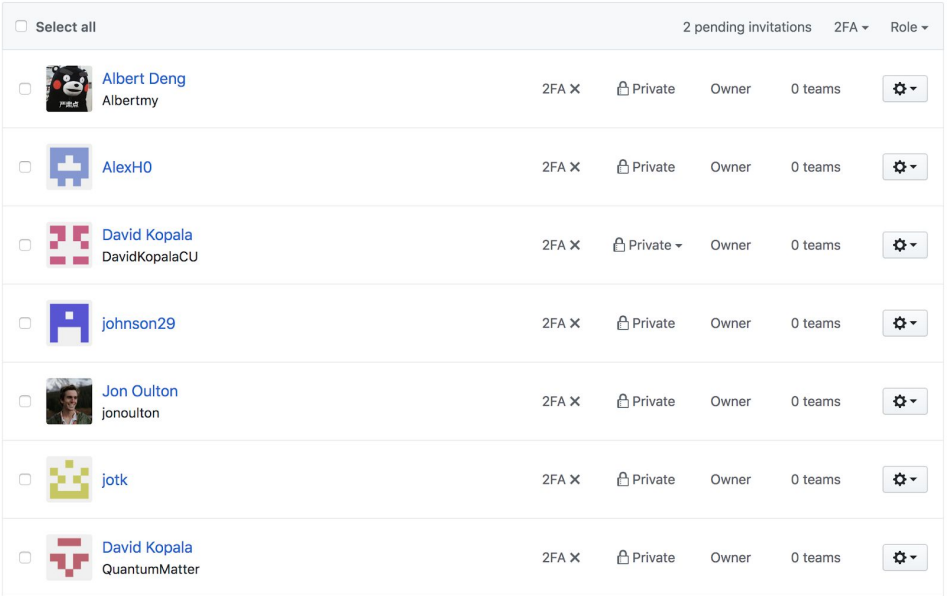
Risk Mitigation Plan: The following is our list of strategies to mitigate the risks in the sections above. The numbers of the mitigation plans correspond to the issues mentioned in the risk section.

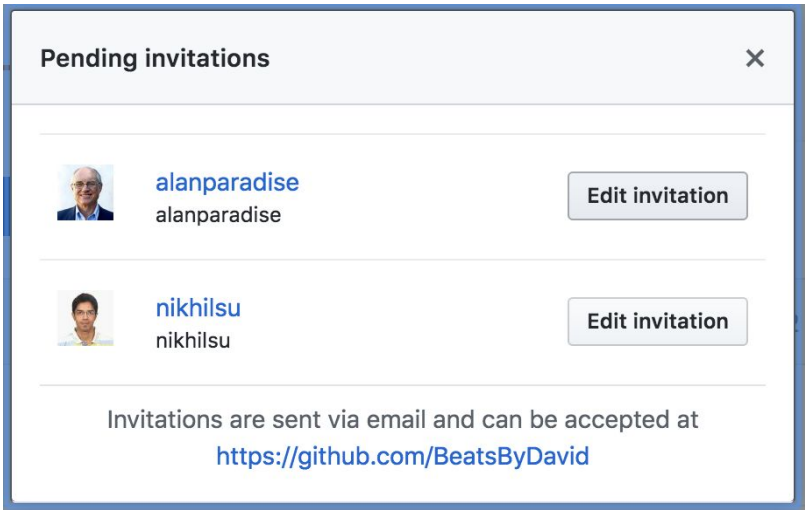
1. We will hide the devices. For example, tape to bottom of desk or put on top of the light fixtures in the room. Further, we will put a piece of paper on each of the devices with our names and the purpose of the project.

2. We will test how long the raspberryPi's function for using a rigged battery pack. If they do not last long, we will discuss the possibility of where else we can host them (plugged in).
3. We will put the devices inside cases made specifically for the raspberryPi. We could also potentially create our own cases using 3D printing and using foam on the inside to ensure all parts have the lowest risk of damage.
4. We will use an agile approach (described below) to make sure the most important parts of the project are functional early on. If it becomes apparent that the foundations of the project are not feasible (e.g. devices don't record viable data, they die too quickly, coding is too complex, etc.), then we will still have time to pivot our project to a more feasible.
5. We plan to put at least 2 devices in each room. In this way, we may not be able to ascertain whether the data is perfectly accurate, but we will be able to determine if the data is inaccurate. If the devices show vastly different data measurements, we will know at least one is inaccurate.
6. We have budgeted as a group to put in ~$50 / person at most. All group members are okay with this financial investment. We plan to distribute the costs evenly, and we will test the concept to prove we can make the measurements work prior to purchasing the full fleet of devices.

Version Control

Organization Page:	https://github.com/BeatsByDavid
Notes	https://github.com/BeatsByDavid/Notes
Code	https://github.com/BeatsByDavid/Code
Milestones	https://github.com/BeatsByDavid/Milestones





Development Method:

We plan to implement an agile approach to software development, and we'll use Trello to organize all of our tasks and sprints.We find this method to work best for us as a group since solutions are emphasized to resolve with group efforts and we can minimize bugs and issues using increments to improve out product. We will do a standing meeting to go over what has been accomplished thus far and what will be accomplished during the meeting. The plan is to follow as close as possible a set schedule. With the first few weeks, weeks 1-3 we will acquire the hardware and begin to put it together. Then within weeks 4-12 will be spent on integrating the software to the hardware and setting up a server. The last few weeks will be spent testing, troubleshooting and begin creating a user friend UI.

Collaboration Tool:

Slack - We chose Slack due to familiarity with the program

Program Features:

-Group/Team Chat - Allows for easy and convenient coordination of team meetings.

-Direct Messages - for member to member communication

-Random Chat - for water cooler/Non-work banter

Proposed Architecture

Backend

PostgreSQL Database - Relational Database; Stores Data

AWS EC2 Instance - Server that stores the database, website, etc

Middle Layer

Flask - Lightweight python server, response to requests (Like NodeJS)

Celery Workers - Asynchronous handling of requests

SQLAlchemy - SQL Objects in python

Rabbit MQ - Message broker for Celery

JSON RPC - Protocol for sending/receiving data

- Websockets - Allows persistent connection with clients
- Frontend
  - Nginx Web Server - Delivers static website
  - React Website - Tool for creating responsive websites
    - Material UI - Front end resources
    - Redux - Practice for saving/updating state
    - React Router DOM - Routing for React
    - Socket IO - Connects to server to listen for new data
- Hardware (Physical Devices)
  - Raspberry Pi - Master device, collects data and uploads to the server
  - Python - Language that we'll use to collect and upload data
  - Microphone - additional hardware to measure decibel levels of a given room
  - Thermometer - Allows us to measure/record temperature
  - Battery - Provides power
  - SD card - minimal on board memory to transfer data to a server

UI:

For potential users, we want the user interface to be as easy as possible and intuitive for anyone to know. To achieve this, we will have a map of a building (presumably the engineering center) and the map will have various colors from red, which will indicate the "loudness" of the area and green to indicate if an area is quiet. We will also implement an option for the user to click on the room. Once they do so, they will be able to see the "trend" of the given room, when it is usually the loudest and when it is the quietest on the given day.