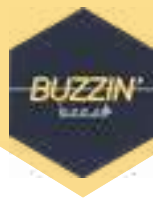




PROJECT PLAN

Version 2.0
04.23.2020



PROJECT OVERVIEW



The Queen Bee is a haptic audio device that is worn around the user's neck in a similar fashion to wireless neck fans [1]. It receives signals and information from a mobile application via a bluetooth connection to produce haptic feedback for the user. This haptic feedback follows the beat of the music, with differing vibration patterns for different bass frequency ranges. The mobile application is responsible for decomposing and analyzing audio files to determine which haptic feedback patterns to display. Additionally, the mobile application allows for organization of music through playlists, browsing of music through various means, and visual feedback in the form of a music visualizer.

OBJECTIVES

Through this project, we intend to:

- Provide convenient and more affordable access to an enhanced and different method of experiencing music;
- Create a device that provides a user with haptic feedback which varies based on the frequencies of music being played
- Create a mobile application for Android that has a user-friendly interface for organizing and playing music, while accurately decomposing music to influence the signals sent to the neckband's haptic motors.

For this project, the mobile application will need to:

- Work on an Android device;
- Freely access and analyze the music stored on the Android device;
- Able to stop, play, and skip through songs;
- Display an audio visualizers
- Provide some level of control over the haptic feedback in the neckband device

Additionally, the neckband device will need to:

- Be lightweight and well-shaped for user comfort;
- Have minimal wires for little to no hindrances





TEAM

AMANDA MCLEOD

ROLE: Team Lead, Project Manager,
Device Design and Creation

EMAIL: amandamcleod@cmail.carleton.ca

PHONE NUMBER: 613-204-2734

DAWN EGGLETON

ROLE: User Experience Lead, Documentation
Manager, Website Manager

EMAIL: dawn.eggleton@carleton.ca

PHONE NUMBER: 613-794-1092

HANNAH PERKS

ROLE: Design Lead, Asset Development,
Social Media and Marketing

EMAIL: hannahperks@cmail.carleton.ca

PHONE NUMBER: 613-402-2944

JONAH JANAKOVIC

ROLE: Mobile Development Lead

EMAIL: jonahjanakovic@carleton.ca

PHONE NUMBER: 519-504-4496

KALIA HAMEIRI

ROLE: Mobile Design Lead, Video Producer

EMAIL: kaliahameiri@cmail.carleton.ca

PHONE NUMBER: 613-793-4285





TARGET AUDIENCE

The Queen Bee targets individuals who wish to experience their music in a new and different manner. This psychographic profile includes users who simply enjoy music and new experiences, as well as users who are less able to experience music in the traditional auditory manner due to some level of hearing impairment. Behaviourally, the product will be intended for relatively stationary and slower moving activities, rather than active or sports use. Additionally, product use is expected to be approximately daily, at the same usage rate as a pair of headphones. The device will be designed to be usable by a broad demographic with nothing structurally to make it specific to a given gender or age group.

ACCESSIBILITY

The use of haptic motors to deliver a non-audible musical experience makes the Queen Bee a good candidate as an accessibility device for the hearing impaired community. However, to avoid the device becoming an identifier of disability, and thus a point of discrimination, we will not be specifically targetting only the hearing impaired community, though we will be including them in the process and consider them throughout development. We will endeavor to make the device as usable and useful to this community as possible throughout production by consulting with members of the community on its functionality and design and will make every effort to include the community as part of our user testing process.



Figure 1. Targetable factors in marketing and product development





DESIGN TASKS



MOBILE APPLICATION

- Page layouts created in Android Studio:
 - Home page
 - Song list
 - Playlist list
 - Currently Playing bottom bar
 - Options page
- Asset design for buttons and custom icons in Adobe Illustrator
- Visualizer design for at least 1 visualizer
 - Static design samples in Adobe Illustrator
 - Animated design samples in Adobe After Effects, based off the static design samples
- Application icon design in Adobe Illustrator

NECKBAND DEVICE

- Casing structure design
 - Blueprinting in Adobe Illustrator
 - 3D modelling in Autodesk Maya, based on the blueprints
- Device production
 - 3D printing with the Ultimaker printer
 - Post-print processing and refinement
 - Circuitry installation
 - Testing and iterations of the above
- Casing stylization design
 - Airbrush painting
 - Branding with painting of patterns and symbols





PROGRAMMING TASKS



Programming of the Queen Bee product is primarily focused on the development of the mobile application; however, certain aspects of the neckband device also require some programming. These tasks will be completed by our Product Design and Mobile Application Design teams.

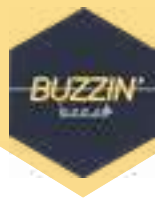
MOBILE APPLICATION

- Music player functionality, programmed in Android Studio
 - Play/Pause/Skip functions
 - Shuffle function
 - Select song
- Music file access/management on Android devices
 - Gain access to audio files
 - Populate music library with audio files
 - Provide music decomposition tool with access to audio files
 - Create Playlist function
 - Add to Playlist function
- Music decomposition and analysis using the Visualizer class in Android Studio
 - Decomposing music into waveforms
 - Sorting waveforms into usable frequency bins
- Music visualizer programming
 - Design element creation and placement
 - Design element response to volume
 - Design element response to frequency ranges
- Adding Bluetooth functionality to application
 - Activating Bluetooth functionality
 - Sending frequency range and haptic sensor pattern data across the connection

NECKBAND DEVICE

- Bluetooth connection to application
 - Bluetooth chip capable of being detected by a device
 - Bluetooth chip capable of connecting to a device
 - Bluetooth chip receiving signals from a mobile Android device
 - Bluetooth chip transmitting signals to the haptic driver
- Haptic feedback functionality
 - Determination of vibration patterns to be assigned to frequency ranges
 - Haptic motor response to frequency ranges





MISCELLANEOUS TASKS



Although the majority of tasks are focused on device production and application development, the Queen Bee project requires a number of other tasks relating to usability (to be handled by our User Experience team), social marketing (to be handled by our Marketing team), and documentation (to be handled by all members).

USER TESTING

- Arranging test groups
- Running user tests
 - Facilitation
 - Note-taking
- Analyzing, summarizing, and dispersing test results to the appropriate personnel

SOCIAL MARKETING

- Creation of marketing elements
 - Physical merchandise creation
 - Multimedia elements
 - Images for social media
 - Production process video for Senior Project Fair
- Managing and updating of social media accounts

DOCUMENTATION

- Updates to design documentation throughout production
- Version control management of code-based aspects





SCHEDULE



For the purposes of project planning, we have separated our project into six major milestones and also generated a Gantt Chart. We also maintain a Google Calendar and weekly post-it notes to keep track of subtasks and important dates respectively (see the Appendix).

MILESTONE #1 : NOVEMBER 1, 2019

- Design Day
- First prototype printed and in user testing
- Mobile application flow user testing completed

MILESTONE #2 : NOVEMBER 11, 2019

- Neckband device has completed early user testing
- Neckband device has entered alteration stages based on user test results

MILESTONE #3 : NOVEMBER 25, 2019

- Mobile application design is finalized after user testing

MILESTONE #4 : DECEMBER 1, 2019

- Basic application functionality is complete and ready for amalgamation

MILESTONE #5 : JANUARY 5, 2020

- Neckband device is constructed

MILESTONE #6 : JANUARY 8, 2020

- Progress report





MILESTONE #7 : JANUARY 13, 2020

- Alpha presentation

MILESTONE #8 : FEBRUARY 23, 2020

- Neckband device and mobile application are communicating via bluetooth, making the experience functional

MILESTONE #9 : MARCH 1, 2020

- Senior Project Fair plan and promotional material designs completed

MILESTONE #10 : MARCH 17, 2020

- Beta presentation

MILESTONE #11 : MARCH 30, 2020

- All refinements are complete
- Product is ready for presentation

MILESTONE #12 : APRIL 9, 2020

- Senior Project Fair

MILESTONE #13 : APRIL 23, 2020

- Project closure completed



GANTT CHART



Figure 2. Semester 1 of gantt chart

GANTT CHART



Figure 3. Semester 2 of gantt chart



RISK ANALYSIS



DEVELOPMENT TIME

If we recognize that a feature is not progressing along as much as we would like it to, we will assess the team members allocated to the task and offer support if we deem the task recoverable. However, if we deem that it is delayed past recovery, we will drop or alter the delayed feature, so long that the majority agrees with this decision.

TEAM MEMBER ABSENCE

If at any point a team member is absent due to unforeseen circumstances, hence causing hindrance on a major task in need of attention, we would review and update the team member's work plan accordingly and offer any support that the member may need in order to achieve the necessary task. This includes reassigning the work to another member.

SCOPE CREEP

To eliminate scope creep, we shall regularly assess the scope, timeframe, and milestones of our project, at every demonstration or milestone. Smaller objectives will be mentioned and assessed in terms of importance during weekly scrum meetings. This will keep the team focused on the objectives needed to complete the project.

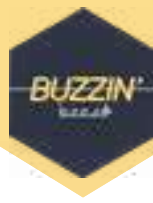
PHYSICAL DEVICE ISSUES

If the physical device is no longer feasible, the project shall shift focus to the development of the mobile application portion of the project. If the physical device is the only feasible portion of the project, we shall re-evaluate the needs and objectives of the project, and shift the focus of the project to develop the physical device. If any parts are ordered and do not arrive, we shall assess the best strategy of obtaining either the same or a similar part. This may include paying an additional price, using Carleton's laser cutting or 3D printing facilities, or locating a similar part that is easily obtainable.

LOST CODE

To eliminate any chances of lost code, the team has implemented a GitHub repository that will allow the constant pushing of code and assets. The team has also agreed to bi-weekly hard drive savings as a second contingency solution.





INCOMPLETE/DISSATISFACTORY WORK

If a majority of the team deems another member's work to be incomplete or unsatisfactory, we will work as a team in order to review and update the timeline as well as milestones. Additionally, team member support will be offered to said team member(s) to complete the task at hand in a timely, divide-and-conquer manner. The project lead shall work with the team member to assess how the team member shall complete or re-do the work.

BLUETOOTH FUNCTIONALITY ISSUES

If we notice we have surpassed our date for the successful bluetooth functionality to be working, we will attempt to hardwire the application to the neckband in a manner similar to plugging in a pair of headphones.

BROKEN APPLICATION

If at any point we notice that we are surpassing the dates for the working application, we will drop the application entirely and extend the hardware scope. That being said, we could add a play or pause button on the neckband as well as pre load the decomposed music within the neckband in this instance.

DIFFERING PHYSICAL CHARACTERISTICS

In order to avoid exclusion, we will be attempting to make a "one-size-fits-all" neckband using a flexible filament material type. This material type will allow users with varying size necks to easily wrap the neckband around their neck. However, in case of unexpected needs that arise during user testing, we will create varying sizes as necessary.

BROKEN PARTS

In order to accommodate a situation in which we encounter broken parts, we have ordered a surplus of all parts.





LATE PHYSICAL PART ARRIVAL TIME

If we were to run out of surplus parts and are forced to wait, we would direct our attention to a different task in the meantime. Additionally, if there is a delay from our primary source, we have a secondary source with identical and/or comparable parts.

GETTING ALONG, BUT NOT MOVING ALONG

To avoid a situation in which we are getting along, however, not moving along, we have set out to be blunt with our internal deadlines, as well as adjust and break up bigger tasks into subtasks. More information can be seen in Management Policies

CAN'T FEEL VIBRATIONS/ DISTINGUIS VIBRATION PATTERNS

In the situation where our user testing informs us that the neckband is not feasible due to inability to distinguish vibrations or vibration patterns near the collarbone, we will shift development to find another location on the body (such as the wrist) which may be more sensitive to such features and target this location. We will also re-circuit as needed to adapt to size changes and repeat any physical device tests for this new device shape/location.

USER TESTING

We shall, in every capacity, attempt to complete as many user tests as possible in order to re-assess risks and mitigate them through the development process. If, during these tests, we find that a core feature of our project must be heavily altered or discarded, we shall work as a team to come up with a solution. This will include reallocating the time and work of team members, altering their objectives and timetable to account for this, or removing the feature from the project. Our ideal user tests include three tests for the mobile application, two tests for the physical device, and one test for the overall experience. However, additional user tests will be run if major changes are made before moving on to the next stage/user test.

MOBILE APPLICATION FLOW TEST

Our mobile application flow test will be conducted in-person between two separate groups of at least three participants each. This will allow us to test two possible flows for the mobile application and ensure we select the one with the best results for improved usability. The test will use Powerpoint prototypes of the greyscale wireframes for easier adaption to user feedback.





MOBILE APPLICATION DESIGN TEST

Our mobile application design test will be conducted via online survey with a minimum of ten participants. It will use polished mock-ups to test:

- readability of text;
- understandability of iconography for buttons that do not contain descriptor text; and,
- overall enjoyment level of the color scheme.

MOBILE APPLICATION HOME PAGE DESIGN TEST

To ensure clarity of our application's home screen, we will conduct an additional survey of at least ten participants to investigate:

- the clarity of our playlist quick link;
- the understandability of our visualizer icon, in case we should use it; and,
- additional iconography testing for the general application.

NECKBAND LOOK & FEEL TEST

The look and feel test will be done early using a life-size prototype of the neckband with zero functionality. This will be used to determine if:

- our sizing is acceptable;
- the device is flexible enough for our one-size-fits-all approach;
- the device is comfortable and lightweight; and,
- users can determine how to turn the device on and pair it based on the device's design, buttons, and any labelling that will be included in the final design.

HAPTIC SENSOR TEST

The haptic sensor test will test the strength of the haptic motors against a person's chest in the appropriate location so that we can determine if vibrations can, indeed, be felt by the user near the collarbones in a way sufficient for the device's function. This test will also be able to advise us as to the recognizability of vibration patterns. There will be a minimum of five participants and the test will be conducted in-person.

EXPERIENCE TEST

The experience test will function as a beta test for our product and involve both elements (mobile application and neckband device) communicating with each other. Results of this test will be used to refine the product. This test will be conducted in-person with a minimum of five participants.





MANAGEMENT POLICIES



COMMUNICATION

Communication between team members will primarily occur through a team Discord server [2]. Group members are expected to check the Discord for updates every day if possible, or outside of time off. While in senior project work periods, communication will shift to in-person, with important information repeated on the Discord or in documentation as needed for future reference.

Our team Discord server has two channels in which count towards accountability.

- Friday-Updates: a channel in which all team members must update the team of the tasks that they will be completing in the next sprint. Every team member shall follow the following syntax: [state of task] - task (i.e. [in progress] - bluetooth to phone connection)
- Progress-Screencaps: this channel is the channel in which all videos and progress pictures belong to. It plays a role in exciting the team all while retaining a level of work progression.

Along the same lines of accountability, the team has a google spreadsheet in which all class dates are written to the left, with names of team members at the top. If a team member is late or is absent for no given nor valid reason, this date will be marked in red and will count towards their peer evaluation.

Communication with the advisor will occur through Carleton's email system and will be primarily sent and received through Jonah Janakovic. Responses will be placed in Discord for the remaining group members to reference as needed.

TEAM MEETINGS

Team meetings will take place at the beginning of the first work period of the week to orient the team to the weekly tasks, current issues, and progress from the week before. Towards the end of every work period, a secondary brief meeting will be held to discuss the necessity of any take-home work for group members and expectations on when this take-home work is to be completed by. Additional meetings between the whole team or sections of the team will occur on an as-needed basis during work periods, or outside of work periods (either in person, or in Discord voice calls).

TEAM MEMBER ABSENCE

Due to any injury, sickness, personal issues, or other issues, there is a possibility that a team member may be absent for a time. If any member of our group is absent for any significant amount of time, their portion of work for this project will be significantly delayed. As a precaution, every team member's role will mesh with another team member's role. This way if a team member is absent one or more of the remaining team members can assist with the work that is left behind by the absent team member.

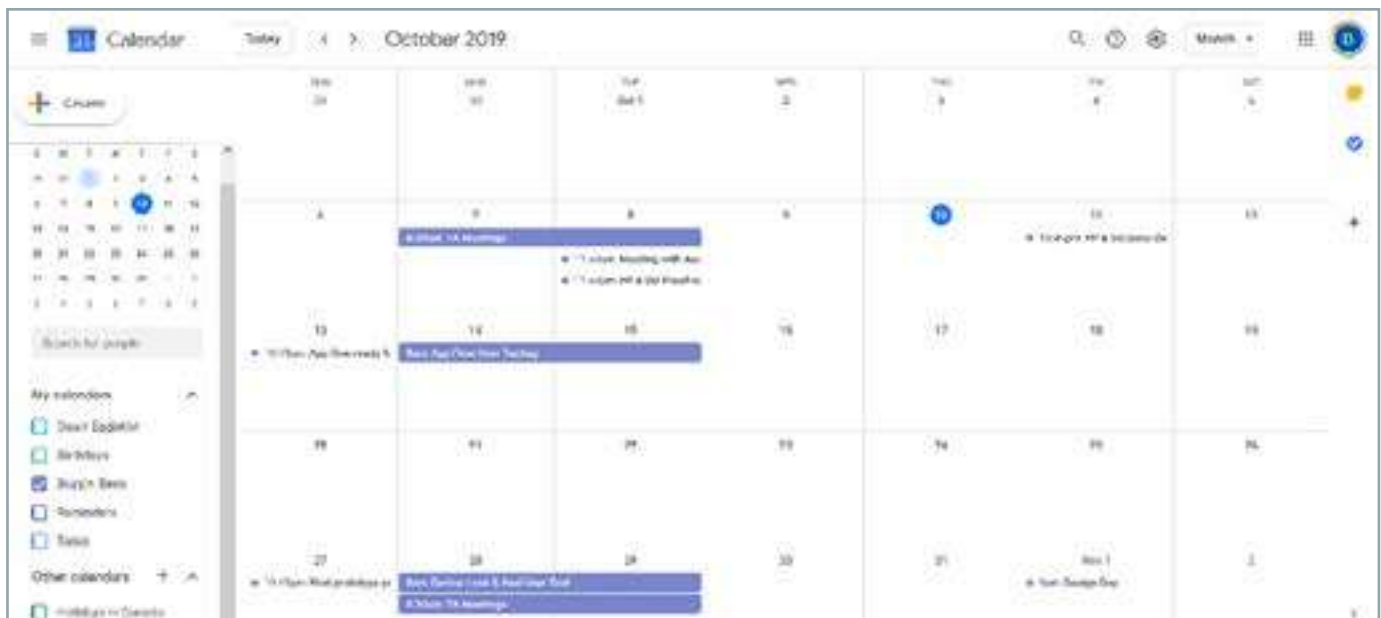


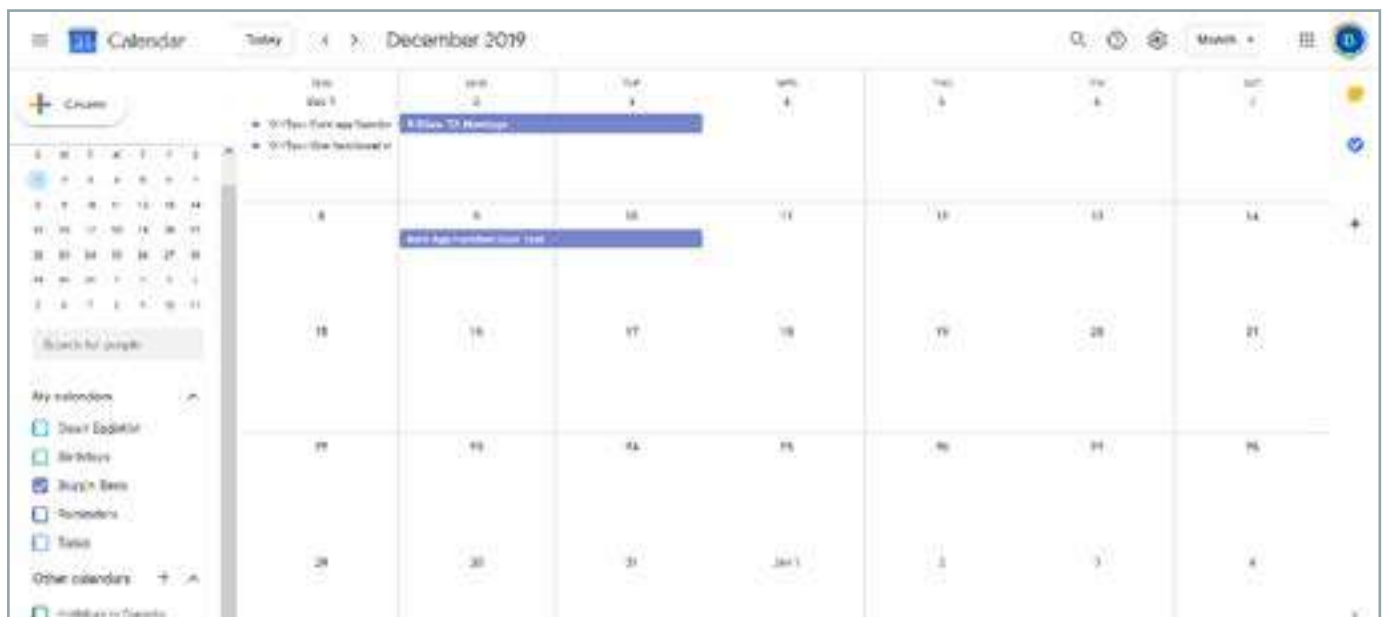
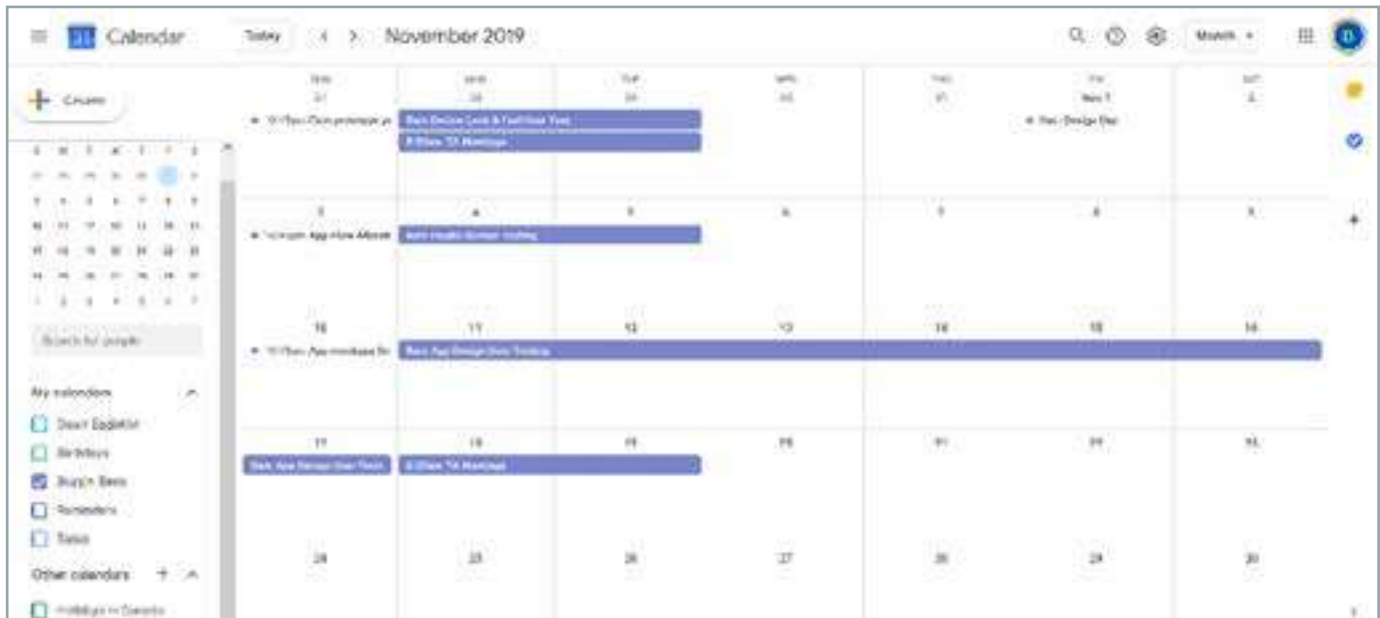
TASK MANAGEMENT

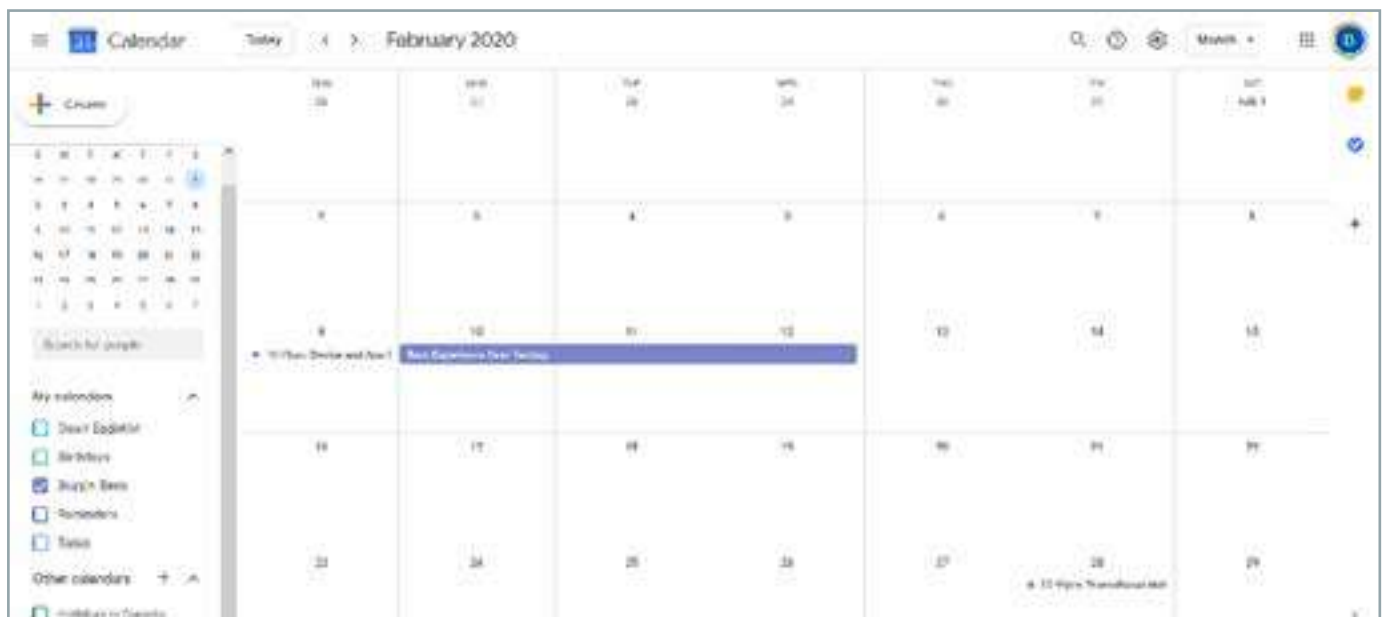
During the first team meeting of each week, a list of current task goals for the week will be written up for each member. Additional weekly 'stretch goals' will also be listed for if the member should complete their main tasks for the week more quickly than anticipated. In the creation of new task lists, the previous task list will be referenced, allowing carry-over of incomplete tasks and stretch tasks to the following week's list.

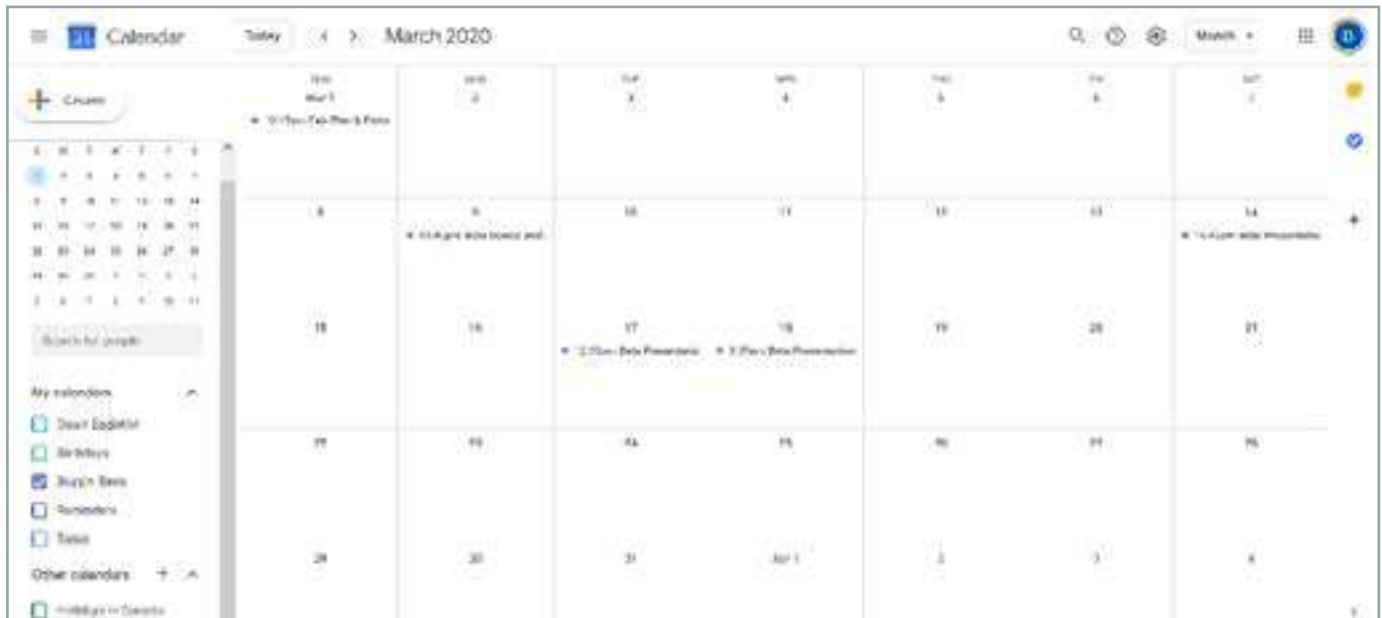
GOOGLE CALENDAR

Our Google Calendar [3] houses all major milestones and dates. These dates correspond to submission dates imposed by class administrators, TA meetings, and monthly minimum viable product (MVP) checklists.











REFERENCES



- [1] GULAKI. "Amazon.com: Hands Free Portable Neck Fan - Rechargeable Mini USB Personal Fan Battery Operated with 3 Level Air Flow, 7 LED Lights for Home Office Travel Indoor Outdoor (Black): Computers & Accessories." Amazon. Available: <https://www.amazon.com/Hands-Free-Portable-Neck-Fan/dp/B07S737P48> (retrieved October 6, 2019).
- [2] Discord. "Discord - Free Voice and Text Chat for Gamers." Discord. Available: <https://discordapp.com/> (October 6, 2019).
- [3] Google. "Google Calendar." Google Calendar. Available: <https://calendar.google.com/calendar/r> (October 6, 2019).

