

Design Document 3 - Project Plan

Team Name: sdmay23_30

Team Members:

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| 1) Mesa Hassel | 2) Eileen Hillier |
| 3) Kaitlyn Nolting | 4) Stuart Pearson |
| 5) Andrew Adams | 6) Daniel Duerr |
| 7) Isaac Vrba | |

2.1 PROJECT MANAGEMENT/TRACKING PROCEDURES

The agile scheme will probably work best for our project because we don't have the crystal clear scope that other project groups have. Agile will allow us to restructure and change goals or functionality as we learn more about how our specific implementation is going to come together. We also plan to make this a sprint heavy project to get rapid feedback and development, and the agile style will serve that strategy best.

For the software side we will collaborate using github to be able to share our code progress with one another. We also utilize the user story framework within github to be able to break down our progress into smaller chunks and better implement our agile scheme. Hardware and overall team progress will be tracked by hand on a shared google document/drive.

Team communication also happens through Discord.

2.2 TASK DECOMPOSITION.

1. Hardware
 - a. Research Period
 - i. What kind of LEDs will be best for the design?
 - ii. What method will we use to control the LEDs
 - iii. What method will we use to interface the LEDs to the control system
 - iv. What method will we use to detect the notes being played (ie adc, vibrational information to digital)
 - v. mounting apparatus form
 - b. LED Testing
 - i. Variable lighting control test
 - ii. Brightness control test
 - iii. Location of LEDs
 - c. Vibration/Pitch Detection
 - i. Correct detection of note played
 - ii. Detecting correctly multiple notes played simultaneously
 - iii. Location of device on kalimba
 - d. Communication with Software

- i. When to light next LED
 - ii. Correction passing of vibrational information from hardware to software
 2. Software
 - a. Research Period
 - i. How to store/upload music
 - ii. How to control the LEDs through software
 - b. Design UI Period
 - i. Figma app layout
 - ii. create initial app pages
 - c. Core Functionality
 - i. add songs to a database
 - ii. create a function for users to add/remove songs to a local library
 - iii. create a function for users to preview songs
 - iv. light the LEDs from the software according to the next note
 - d. Stretch Goals
 - i. create a function for users to crop songs
 - ii. create a function for users to add checkpoints to songs
 - e. Test Software
 - i. create tests to check for any bugs that may need to be fixed
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2.3 PROJECT PROPOSED MILESTONES, METRICS, AND EVALUATION CRITERIA

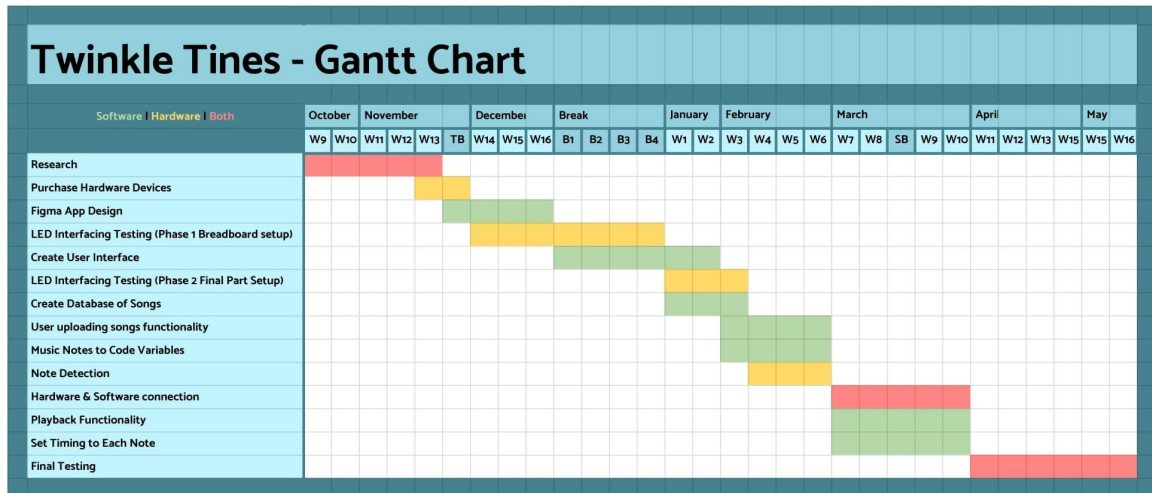
Hardware

- Designers should be able to select methods and devices for LEDs, LED control, LED interface, note detection, and mounting apparatus upon conclusion of the research period using a decision matrix to finalize the choice from the options researched.
- LEDs are able to light up and indicate notes to be played when selected within 0.25s
- Note detection device should be able to detect notes with 95% accuracy and 0.15s
- Device should communicate information to and from software within 0.1s
- The device should not weigh more than two pounds in combination with the original device and our attachment.
- Device LED apparatus should be mountable on most normally sized and shaped kalimba

Software

- Note recognition software should be able to identify 95% of the notes played by the user. (shared milestone)
- Software should be able to assign each note to its corresponding variable with 95% accuracy.
- Users should be able to add songs to a local library.
- Be able to access all pages in the app from any other page.
- Software should be able to light the LEDs for each note.

2.4 PROJECT TIMELINE/SCHEDULE



2.5 RISKS AND RISK MANAGEMENT/MITIGATION

General Risks:

- [0.001] we *might* die
- [0.001] Solar flare knocks out entire Earth electrical grid
- [0.002] Full scale nuclear war, Putin decides to stop messing around

Research:

- [0.05] Research incorrect information and need to restart or come back later and do more research.

Purchase Hardware Devices:

- [0.3] Purchase incorrect or poor quality device, risk should be mitigated through research phase and purchasing extra devices
- [0.1] We already have two kalimbas, and generally LEDs are very cheap and available, low supply chain risk
- [0.25] If we need a PCB, from a quick google search, lead time is usually not more than a month and often much less for simple boards. Additionally, the PCB could be constructed wrong and have to be resubmitted for manufacturing.

Figma App Design:

- [0.2] Can't access Figma.
- [0.4] Figma has significant learning curve

LED Interfacing Testing (Phase 1 Breadboard setup):

- [0.2] One or more of the LEDs could be bad apples, so we will get many extras to prevent this from being an issue

Create User Interface:

- [0.1] Designs from the app design phase do not work in the program.

LED Interfacing Testing (Phase 2 Final Part Setup):

- [0.15] LEDs overheat and burn out, risk should be mitigated in phase 1.

Create Database of Songs:

- [0.1] Can't store songs locally

User uploading songs functionality:

- [0.2] No file format is compatible with the method of uploading we chose

Note Detection:

- [0.05] On a kalimba that is improperly tuned, the device might correctly identify a "wrong note." The solution would be to retune
- [0.45] Too much background noise. This should theoretically be completely mitigated with a pickup
- [0.2] Complications while attempting to record the note that the user played.
- [0.35] Multiple notes at once may not all be registered if one of the notes played is especially quiet.

Hardware & Software connection:

- [0.3] Incompatibility between connections, risk mitigated through early communication between teams
- [0.2] Either the hardware or software team is not ready in time for our planned connection between the two in March.

Playback functionality:

- [0.25] Bugs in the code may crash/freeze/loop software in the middle of playback.
 - Hard to judge probability due to the heavy dependence on how we code it

Final Testing:

- [0.99] Someone gets the urge to violently hurl the kalima at the floor
 - Risk Mitigation: Good thing we have a second one!
- [0.05] Catastrophic failure at the very end, low risk

- [0.5] At any point we could drop the Kalimba near the end, break everything, and not have time to rebuild. This can be mitigated by developing multiple kalimbas and keeping one as a dedicated back up.
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2.6 PERSONNEL EFFORT REQUIREMENTS

The overall plan is to have each group member put in 4 hours a week outside of class time. During our weekly (1 hour) meeting, we can continuously reevaluate time commitment projections and reallocate work hours and planning as required.

Andrew Adams	Isaac Vrba	Eileen Hillier	Kaitlyn Nolting	Mesa Hassel	Daniel Duerr	Stuart Pearson
4 hours/ week	4 hours/ week	4 hours/ week	4 hours/ week	4 hours/ week	4 hours/ week	4 hours/ week

Individual effort requirements will be subject to change based on subgroup and timeline date. The group will also discuss the need to increase the number of hours when facing increasing project demands. Hours include 1.5 hours per weekly meeting.

2.7 OTHER RESOURCE REQUIREMENTS

Any other requirements needed for us to complete the project include:

- LEDs, Kalimba, communication cords, 3d printing access for mount, electrical interfacing materials
- Our undying love for one another
- Potentially advice from people with music expertise
- Research sources
- Copious Caffeine Collections