

MicroCART Mini

*Contextualization /
Design Check-In*

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Ryan Lowe, Daniel Zaucha, Yi Hang Ang, Jonah Upah

Client & Faculty Advisor: Dr. Phillip Jones

Project Overview

MicroCART: Microprocessor Controlled Aerial Robotics Team

- Design mini quadcopter platform to be used in CPRE 488 and for Controls & Embedded Systems researchers
- Develop mini quadcopter printed circuit board (PCB), containing a Microcontroller, RF, IMU, and Wi-fi chip
- Develop software to stabilize and communicate movements
- Develop base-station to communicate with quadcopter
- Create and improve documentation and video tutorials for future teams



CrazyFlie micro-quadcopter

Our Goals

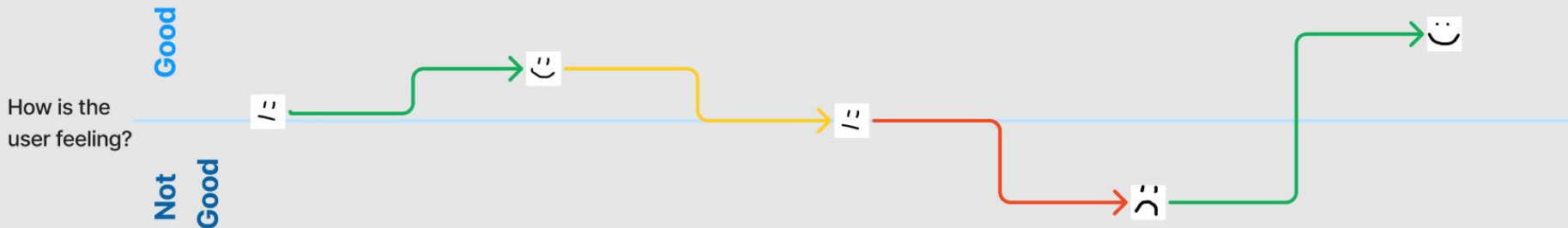
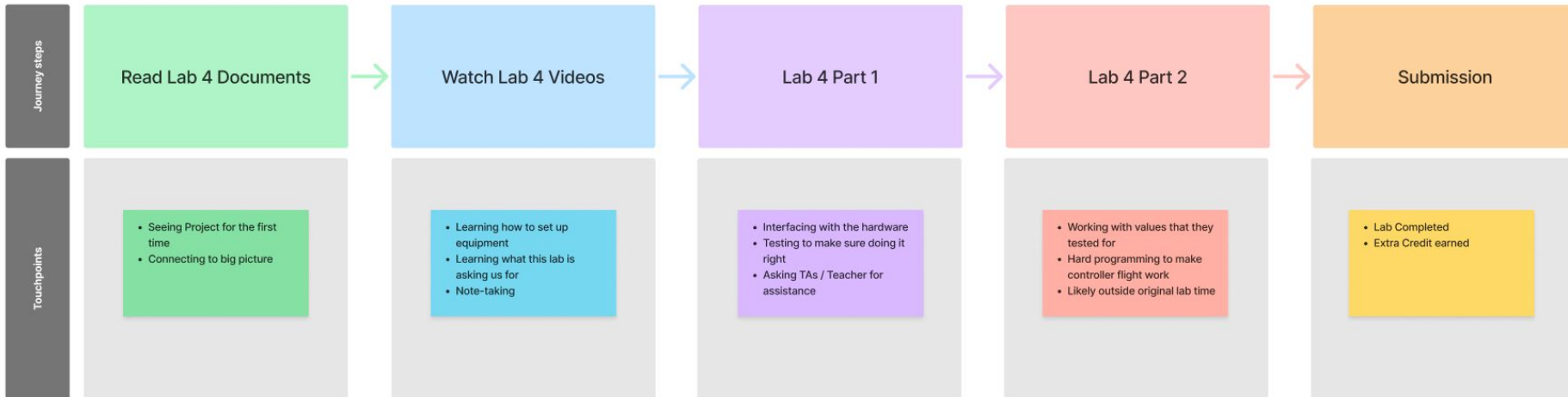
- ❖ Design/Improve a quadcopter platform integrating both hardware and software to be used for hands-on learning in CPRE 488.
- ❖ Ensure both remote accessibility and usability for future users through documentation and tutorials

Persona box



Name: John Smith
CPR E 488 Student

Journey Map



Pros/Cons Table

Chosen solutions:

- Polish current backend
- Implement a Test Stand Tracker and connecting it to Backend



Polish flag

<u>Solutions</u>	<u>Pros</u>	<u>Cons</u>
Start Fresh	<ul style="list-style-type: none">● Fix all known problems	<ul style="list-style-type: none">● More bugs since not user tested● Potentially unable to be completed in time● Takes a long time dedicated solely to this task
GUI instead of Backend code fix	<ul style="list-style-type: none">● Quick & easy● Leaves project in working state	<ul style="list-style-type: none">● Doesn't solve issue itself, only embellishes and potentially even hides the actual issue from future project groups
Polish current Backend	<ul style="list-style-type: none">● Makes current project better for users● Lets all teammates work on project at once	<ul style="list-style-type: none">● Broad in scope● Fixes not synced will cause communication issues
Combine Backend languages	<ul style="list-style-type: none">● Single navigable document● Able to test and check for changes from one piece of code	<ul style="list-style-type: none">● Likely to leave project not working or worse off● Different coding languages have different advantages for their individuality● Let alone fixing existing problems, will likely create more trying to reimplement different file's features.● Will have to search through the rest of the code to see where other files were previously connected and adjust them as well.
Implement a Test Stand Tracker and connecting it to Backend component	<ul style="list-style-type: none">● Inherited template code from past MicroCART team● Better user experience and understanding	<ul style="list-style-type: none">● Does not solve all the issues that the backend is having● Might cause hardware issues to pop up because it is a student-designed test stand

Technical Complexity Analysis

<u>Solutions</u>	<u>Time</u>	<u>Difficulty</u>	<u>Probably Outcome</u>
Start Fresh	5	5	<ul style="list-style-type: none">• Maybe working• Many bugs
GUI instead of Backend code fix	1	1	<ul style="list-style-type: none">• Working, but still inherently flawed• Later project groups may not see what we were looking at
Polish Current Backend	2	3	<ul style="list-style-type: none">• Definitely working• Fixes problems along the way
Combine Backend languages	4	4	<ul style="list-style-type: none">• Maybe working• Mixed results, not necessarily best• Different languages have better results when used for specific purposes
Implement a Test Stand Tracker and connecting it to Backend component	3	2	<ul style="list-style-type: none">• Working• Not a cure-all for all of the problems that the backend is having• May have other problems later down the line

Suitability of Our Design

- Human
 - Fixing bugs for ease of use
 - Reduce difficulties for better user understanding
 - Organizing resources for better user experience



Suitability of Our Design

- Economic
 - Hardware: self-designed battery holder to improve professionalism
 - Software: Updating outdated framework for a more performant system



Suitability of Our Design

- Technical
 - Hardware does not change, low external complexity
 - Frontend and backend communication issues, hard to debug and fix, medium-high internal complexity



Conclusions

- ❖ We have to create the lab materials for next years CPRE 488 class
- ❖ Keep documentation and quadcopter statuses up to date to ensure CPRE 488 students have a good experience with their Lab 4
- ❖ Perform extensive testing of software with the drones to find any bugs



Works Cited

- Jones. “CprE 488 - Embedded Systems Design.” Iowa State University,
<https://class.ece.iastate.edu/cpre488/schedule.asp>