

Capstone

CSCE 483

BRITTANY CAPE JENKINS

627002263

Aug. 24, 2022 - Dec. 9, 2022

Section 931

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Aug. 24 Lecture

Aug. 24, 2022

I sat down with a group of people and we introduced ourselves. We talked about our internships and summers and they all seemed pretty cool. After Dr. Mahapatra's introduction we discussed some of our interests and ideas for a project. Andrew seemed interested in a robotics project that helped carry items. I spoke about my interests in networking and accessibility in computing.

Andrew	Jackson	Max
Connie	me	

After speaking with our TA,

Karl, I am planning to visit student services and ask about disabilities that are impacted by technology or public spaces and see if there is something they know about a certain group that is impacted on campus. After class I completed my Questionnaire and Identified interests in Networking, robotics, and Human Computer interaction.

Below are the Notes I took in class:

Notebook / participation / peer review - 30% (Individual)

proposal (10%)

CDR (10%)

Final Report (10%)

Final Demo (20%)

Weekly Progress (10%) - agenda, goal, minutes

Teamwork (10%)

30 - minute weekly discussions

- prepare an agenda
- ms word templates

} group

To Do:

- questionnaire
- Resume (Updated)
- read The 5 dysfunctions of a Team (3 hrs to read / quiz 9/12)
- Set -up Notebook

Motivation |

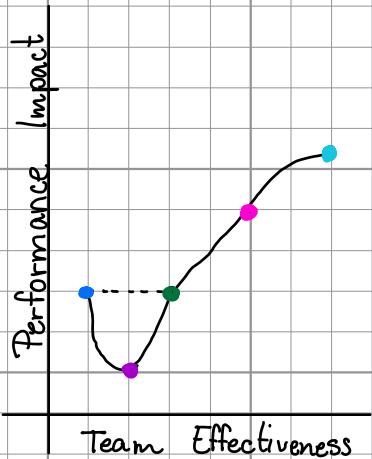
- Engineering projects too large & complex
- top skill desired by companies
- Good teams can out perform larger, less efficient teams

What is a Team? |

- 2 - 10 members
- complementary skills
 - cross functional: engineering, financial, and marketing
 - cross disciplinary: different sciences and areas
- common performance goals
- shared approach to organization and development

Team Development |

- Forming: Learn about each other, can be uncomfortable
- Storming: develop objectives, resolving conflicts
- Norming: Team becomes cohesive, accepting roles & objectives
- Performing: achieving goals, disagreements resolve
- Adjourning: team dissolves, hopefully because of successes

Performance |

- Working - group : forming
- Pseudo - team (storming)
- Potential team (norming)
- Real team (Performing)
- High performance team (performing)
 - committed to each others success

Characteristics of Real teams

- No set guide
- Characteristics
 - choose based on skills (technical, problem solving, interpersonal)
 - identify common objective (clarify motivation, requirements are important)
 - clarify decision making (by authority, consensus, majority, expert?)
 - hold effective meetings (agenda, be prepared, time/place, pay attention)
 - establish team roles (Admin: team lead, PM, scribe, Technical: hard/soft, testing)
 - assign responsibilities (clear responsibilities and tasks, fair workload)
 - Spend time together (meetings, joint work, extracurricular)
 - respect each other (active listening, how you respond, constructive)
 - manage conflict constructively (focus on performance, keep calm, communicate)
identify concerns, mediation: reach a consensus with a mediator
proposing a solution to a conflict)

Need for Proposal

- Team name
- mission / objectives
- decision making guide
- meeting guide
- Team roles
- conflict resolution

Brainstorming

Aug. 31, 2022

- QWERTY vs. some other layout
- oversize keyboard benefits / drawbacks
- mechanical modified keyboard / bluetooth
- embedded system vs. software component
- what are some problems in general on campus

I became the point person to begin emailing Student Services to set up a meeting where we could discuss accessibility issues on campus that can intersect with technology to create a solution.

- Piano trainer
- Sign language to English digital interpreter

Disabilities Services Email

Aug. 31, 2022

Howdy Justin,

I am a senior computer engineering major in my final semester at Texas A&M, and my capstone team has begun brainstorming for our project. A topic that interests us is developing a technology that would solve a problem that students with disabilities experience.

I am reaching out to you because I saw on the TAMU disabilities services page that you manage Assistive Technology Services for the university and my team would value advice from someone who is knowledgeable about assistive technologies that exist for different disabilities and where some disparities are in that technology.

We are interested in solving a problem that people who have a disability face regularly. Do you know of any specific disparities that remain prominent issues for students with disabilities on campus or in general? We have considered hearing and visual disabilities, but if there are other communities of students we could consider while deciding on a direction to take with our project we would love to know more.

We also would like to be allies for students with disabilities by respecting the barriers that this community of students faces. Do you have any advice on how to best respect that as we move forward with our project?

What is one thing you wish more people understood about people with disabilities in general?

A couple of ideas we have considered are a keyboard and mouse developed for people with Parkinson's disease and a sign language to English digital interpreter. If you have any suggestions to improve these ideas or see stronger needs elsewhere, we would love to consider those.

I would really appreciate your time answering some of my questions, and thank you for considering offering my team advice as we get started on this project! If you have any other information that you believe my team should know or any questions for me, please reach out by email or by phone!

Sincerely,
Brittany Cape Jenkins

I sent emails to Justin Romack (manager of assistive technologies) and Diana North (sign language interpreter) to ask for advice while my team is brainstorming project ideas. We are planning to wait for their responses before making a shortlist of project ideas.

Engineering Design Process

Aug. 31, 2022

Science Vs. Design

(Sorry for the handwriting on this page, I was shaky during class)

Science Problems:

- statement compact and well-posed
- Predictable
- identifiable closure
- specialized knowledge
- Example: current flowing through a known circuit

Design Problems:

- incomplete, ambiguous, self-contradictory
- integration of multidisciplinary fields
- no known closure of solution
- Design a system that meets certain utility, financial, and safety requirements

What is Engineering Design?

- Process of devising a system, component, device to meet desired needs. Applies engineering, math, physics, science concepts to meet an objective

- The design process: methodologies that helps meet a client's needs based on constraints
- Iterative: multiple attempts, learn as you go
- meeting objectives: at least one

Prescriptive:

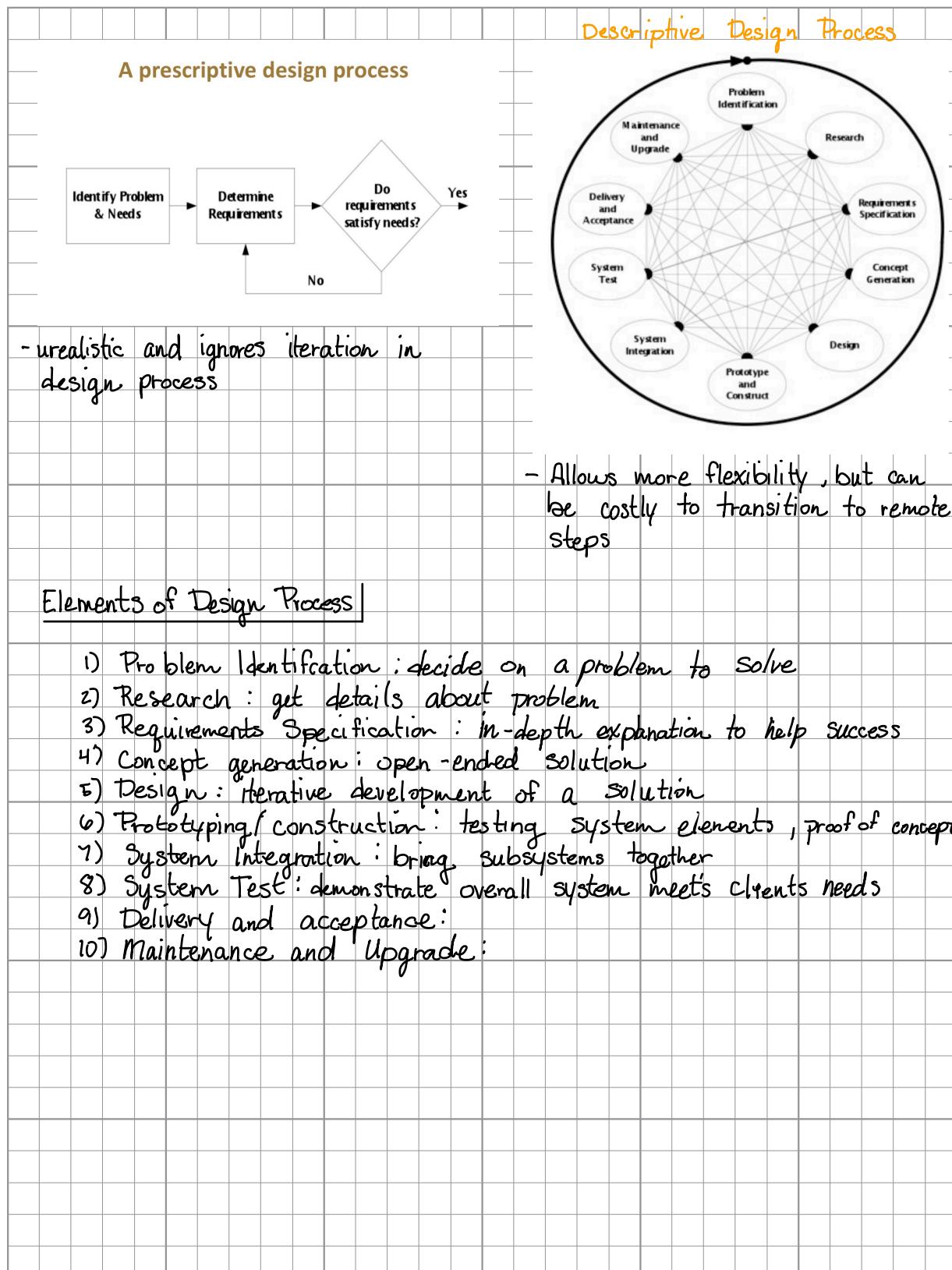
- process or recipe for system
- algorithmic / logic based

Descriptive:

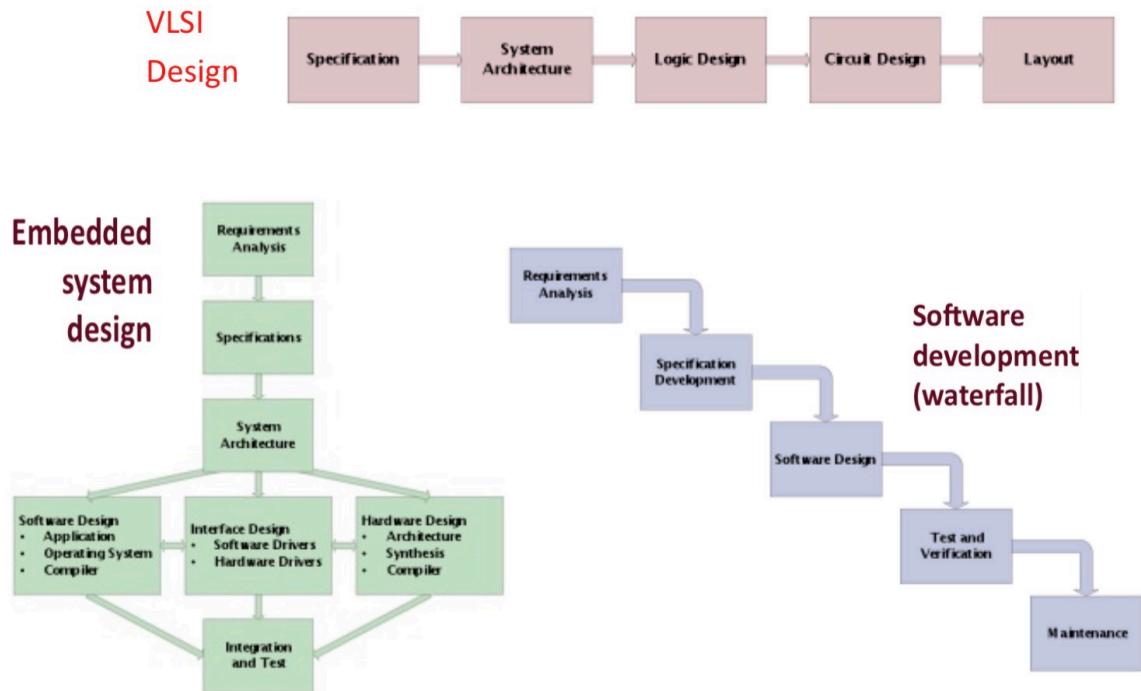
- Flexible
- less formal
- describes activities to realize design

Why follow a design Process

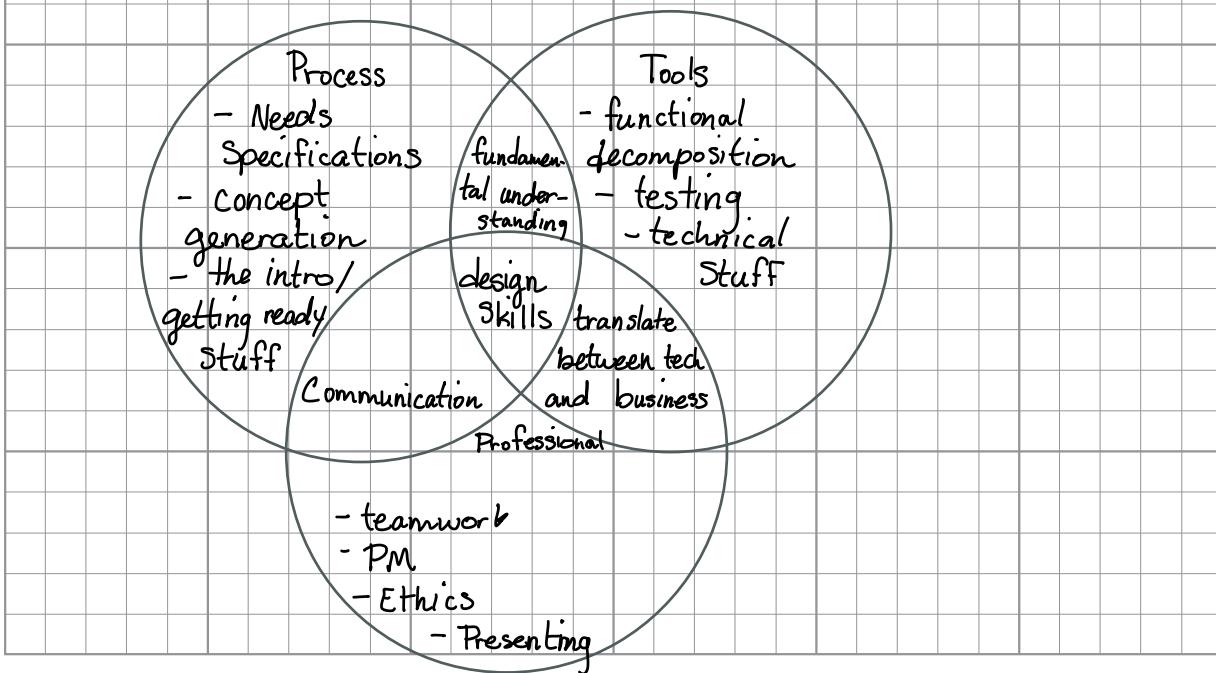
- formal thought process to ensure good practices and support innovation
- keeping cost down over time
- keeps team on same page



Technology-specific design processes



Lots of types of design in technology, need to have design skills which is the purpose of this class.



Top 3 Discussion

Sept. 7, 2022

We discussed with Dr. Mahapatra and Karl our idea for a keyboard designed to assist a person with a motor function disability, like Parkinson's Disease. Some of the design features we had considered previously are:

- Ergonomic or enlarged key caps to help a user press them more confidently
- Predictive typing algorithm and display
- error correcting features

Some considerations Dr. Mahapatra gave us were:

- multi-language functionality
- Begin researching pros and cons of an embedded plug-and-play system versus a software that can support any keyboard including the one we design

Action Items :

- ✓ - Brittany schedule a time to meet w/ Justin Romack
- Everyone be researching embedded systems and OS communications to begin deciding project direction
- Everyone be thinking about team structure and proposal

Email about Schedule (Justin)

Sept. 8, 2022

Reminder for Appointment:

Sept. 14, 2022 @ 10:00 - 11:00 am

Student Services Bld. Rm. 122

In-Person

I called and scheduled an appointment with Justin Romack for next Wednesday before class. Then I emailed him an update about our project.

BJ

Brittany Jenkins

To: Justin Romack >

1:10 PM

Re: Senior Capstone: Accessibility Project

Howdy Justin,

Thank you for the quick response last week, Monday's holiday threw off our schedule, but I scheduled an appointment with you and my team on Sept. 14th at 10 AM. Thank you so much for being willing to discuss with our team about our project!

I wanted to update you on the status of the project. Our professor liked the idea of developing a keyboard for people with Parkinson's Disease, so we would like to talk about important issues that people with this or similar disabilities face to narrow down where our major focus should be with a keyboard such as this. We would also like to talk about possibilities we haven't yet considered about developing an assistive technology such as this, so we are really looking forward to discussing it with you!

Best Regards,
Brittany Cape Jenkins

Texas A&M | Computer Engineering '22
Phone : [\(979\) 479 - 5065](tel:(979)479-5065)

Pros & Cons Keyboard Research

Sept. 8, 2022

Embedded systems

Pros :

- simpler deliverable
- higher dependability
- tailored for specific use

Cons :

- nearly immutable framework, difficult to update
- restricted assets for memory

Software system

Pros :

- less memory restrictions
- easy updates / feature extension

Cons :

- Obsolete coding practices as base of system
- higher prerequisites for compatibility

Types of Engineering Design Projects

- Creative: new / innovative
- Variant: improve existing design / add features
- Routine: devices that are well documented
- Systems Engineering: create larger system from several subsystems
- Experimental: kind of prototyping
- Analysis: analyze existing system / improve or correct it
- Tech Evaluation
- Research

Needs Identification

- Know the problem you would like to solve
- customer often comes with problem and perceived solution all wrapped up together. Engineers job to challenge those assumption and innovate.
- Steps
 - 1: gather raw data from User
 - 2: interpret data in the form of needs
 - 3: organize needs from general to specific
 - objective tree
 - 4: Prioritize the needs by weights
 - 5: Review the outcomes and the process
 - Does this all make sense?
- ★ - Deliverables ★
 - 1: Marketing Requirements
 - 2: Objective Tree
 - 3: Weighting Needs

The Problem Statement Document

- Need: A statement that identifies the need of the Project
- Objective: Proposed Concept to meet the need
- Background: site relevant prior research
- Marketing Requirements: describe user needs
- Objective Tree

Project Proposal: (Section 4.1) Alternative Solutions → totally different implementations

Meeting With Justin Romack

Sept. 14, 2022

Where are your technical expertise concerning embedded vs. software?

Known effects of Neurological Disorders?

Large flat keycaps?

favorite websites? Desktop icons?

Taking over some mouse clicks / movements w/ quick keys.

Our meeting w/ Justin Romack was unsuccessful. He did not show up. We have a meeting scheduled for tomorrow with Mac from the Brazos Valley Center for Independent Living (BVCIL).

JR Justin Romack
To: Brittany Cape Jenkins >

9/9/22

RE: Senior Capstone: Accessibility Project

Howdy Brittany!

Super good to hear from you!

I'll be entirely honest... This population is not something we work with in our office, so I don't really have a read on the technology used in this space.

As much as I'd like to be a help to y'all, I actually think you could use other community resources to get better info.

I want you to reach out to the Brazos Valley Center for Independent Living (<https://www.bvcil.org/>) to speak with their Executive Director, Jackie. She may have direct experience *and* be able to connect you with others in the area. It'd be ideal if you talked to someone with Parkinson's to understand the barriers they navigate (that first-hand account is critical in the research and development phase because it's often we assume barriers).

Just thinking out loud... With tremors and other physical challenges that impact motor control, big, flat keys would be great. Also, think about keys that could be programmed to macros for common, yet complex tasks. Maybe assigning favorite websites or key resources. What about a key that launches dictation or voice control? Those are things I'd consider.

Let me know what you think.

Thanks,
J

Based on his last email this may be outside of his area of expertise, hopefully tomorrow's meeting is more fruitful.

I called BVCIL, and they put me in touch with Mac instead of Jackie since she was unavailable.

Brittany, Connie, and Max attended this meeting.

Needs Statement, Objectives, Requirements

Sept. 14, 2022

When and Why do you use this product?

- When it is difficult to type on a keyboard, want to focus on motor function disabilities

Requirement Statement

- People with motor function disorder have trouble using computers → This product makes computers easier to use.

Need → As technology becomes more prevalent in society, it becomes more important for people with motor function disorders to have usable / accessible technology.
→ People with motor function disorders have more trouble using keyboards for daily tasks.

- Easy to use
 - QWERTY is known
 - Quick keys
 - Predictive text
 - large keys
 - filter out extra clicks
 - plug and play (nothing to download)
- compatible with all computers

Objective

- Build a specially designed Assistive keyboard to Accommodate motor function disabilities and make computer use easier
- Reduce the need for a user to rely on a mouse to use their device.
- Design Research: Sunken key vs. key caps
- Constraints
 - Peripherals are the main way to interact with a computer, so our solution will have to be a variation of existing technology
 - Working with those who may know less about computers
 - Embedded vs Software

Meeting w/ Mac

Sept. 15, 2022

Cindy Conte - Robert Conte foundation

- Support groups for people w/ Parkinson's
- Brazos Valley Gives

Fight PD @ Robert conte foundation.org

Tel: 713-203-8880

Rock Steady Boxing Gym

Austin Technology - Parking mobility

- Software more flexible
- Portability will be critical
- reverse screen reader tech for autofill
 - research google / ms autofill solutions
 - adapt what's already there

- QWERTY vs... Alphabetical

The meeting with Mac went very well, we are unfortunately getting down to the wire when it comes to submitting our proposal, and we keep getting passed around a bit. He told us to reach out to Cindy, which I plan to do on Monday.



connie 09/15/2022

Hey guys, our meeting this morning with Mac from BVCIL went pretty well, here's a recap and some key takeaways I jotted down:

- Apparently, the reason why technologies labelled as "assistive technologies" are so expensive is bc typically the users don't foot a majority of the bill, other things like insurance will cover it. Just something to keep in mind bc we mention "cost-effective" in our proposal a lot
- When asked abt doing an embedded vs software approach, Mac said he is mainly a software guy but he can see the benefits of going embedded for plug-and-play functionality
- Interestingly enough, he brought up the exact same idea of an LCD screen with haptic motors underneath as a solution for completely customizable buttons and functionality
- He doesn't have Parkinson's, but does have limited strength in some fingers so he typically only uses his thumbs and pointer fingers to type - actually hates typing on QWERTY
- He said he doesn't have any personal connections with anyone with Parkinson's but he gave us the contact info of Cindy Conte from the Robert Conte Foundation who might be able to help us, Brittany should be able to reach out to her soon to set something up

Next steps:

Brittany - contact Cindy Conte

Everyone else - keep working on proposal report

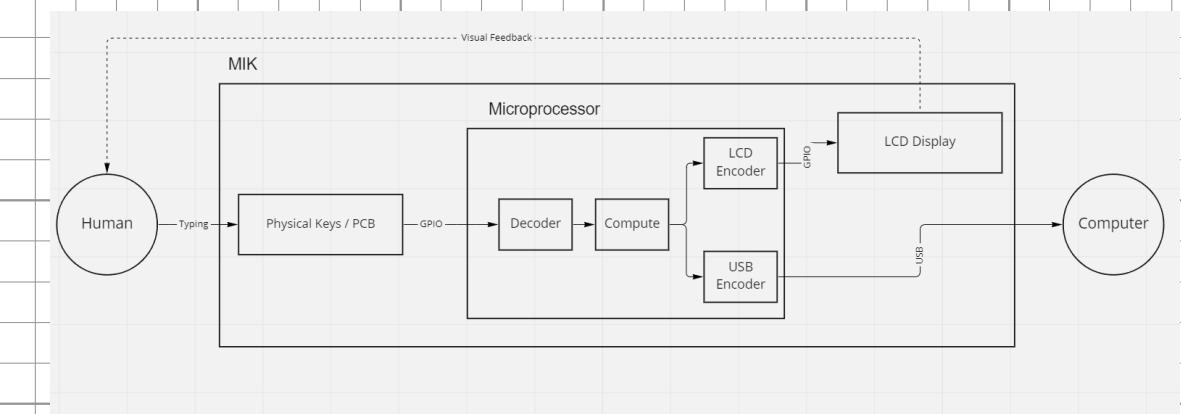
Above are additional notes from the meeting that Connie sent to the team.

Brittany, Connie, and Jackson Attended this meeting.

Proposal Preparation

Sept. 17, 2022

Met with team to discuss details of the project proposal. Last week we decided team member roles and got approval to do the keyboard.



We developed the diagram above and copied our needs, objectives, and requirements from the previous assignment.

Then we delved into the technical specifications concerning hardware, software, and embedded systems.

Finally we decided certain parts like the schedule should go to the project manager. We decided to meet back up on monday having completed our individual parts and discuss presentation, user stories, finish summary and intro together, and establish tasks for Sprint 1.

Proposal Continued

Sept. 19, 2022

For section 5, we had discussed everyone having a technical and non-technical role.

Max, Abhishek, and Andrew all had the most hardware experience so I chose them for the hardware sub-team after they stepped up for it. Therefore, Connie, Jackson, and I became software. Finally, Andrew and Jackson decided to take on modeling

Non-technical :

Project Manager	- Brittany
Hardware SCRUM	- Andrew
Software SCRUM	- Jackson
Communications	- Brittany
Finance	- Abhishek
Technical Reports	- Connie, Max

Tools

Github

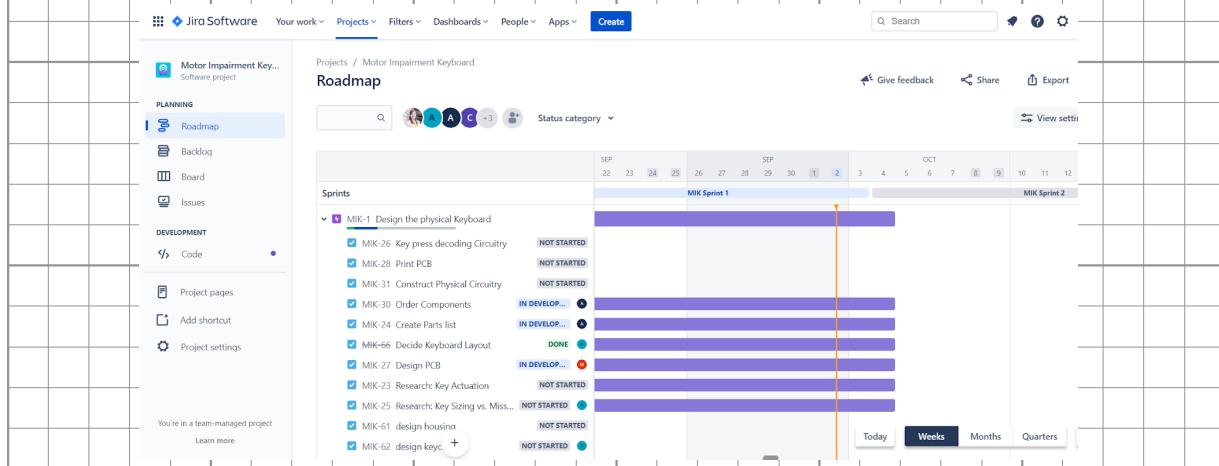
One Drive

Discord

Jira

↳ Jira enables us to have a SCRUM/ kanban style flow

I imported all of the tasks I could think of to Jira and set up a SCRUM.



With roadmap we can see start and end dates for each Sprint and all tasks being worked on

With Backlog we can organize Sprints and see all progress

Finally our kanban board allows us to get task finished and track them visually. the limits above are meant to encourage us to help each other if we find ourselves stuck.

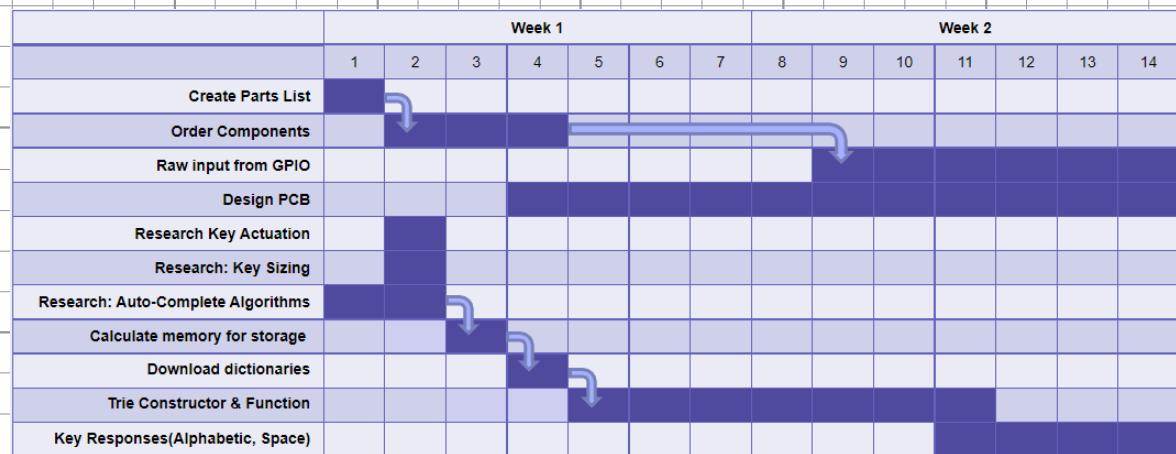
for schedule of tasks I took our user stories and created Epics for the Jira board.

Hardware / Software / modeling / Marketing Epics were created.

Finally Tuesday became the start day of our Sprints because it was in between Mon/Wed classes and allowed us Monday to prep for the next sprint together.

- Sprint 1 - Sept. 20 - Oct. 4
- Sprint 2 - Oct. 4 - Oct. 18
- Sprint 3 - Oct. 18 - Nov. 1
- Sprint 4 - Nov. 1 - Nov. 15
- Sprint 5 - Nov. 15 - Nov. 27

Gantt for Sprint 1



Alternative Solution that I wrote up was incorporating text-to-speech. This could still be a stretch goal for us but is outside of scope for mild / moderate impairment

Weekly Meeting 1

Sept. 28, 2022

Take away from first meeting are to have a more specific introduction.

I felt like we are on task, I may need a bit of help with the technical / programming portion of the project. Will ask if we can start pair programming next Monday. I am not an experienced developer, I have done more cybersecurity related work.

To Do: Contact Cindy Conte about Robert Conte Foundation.

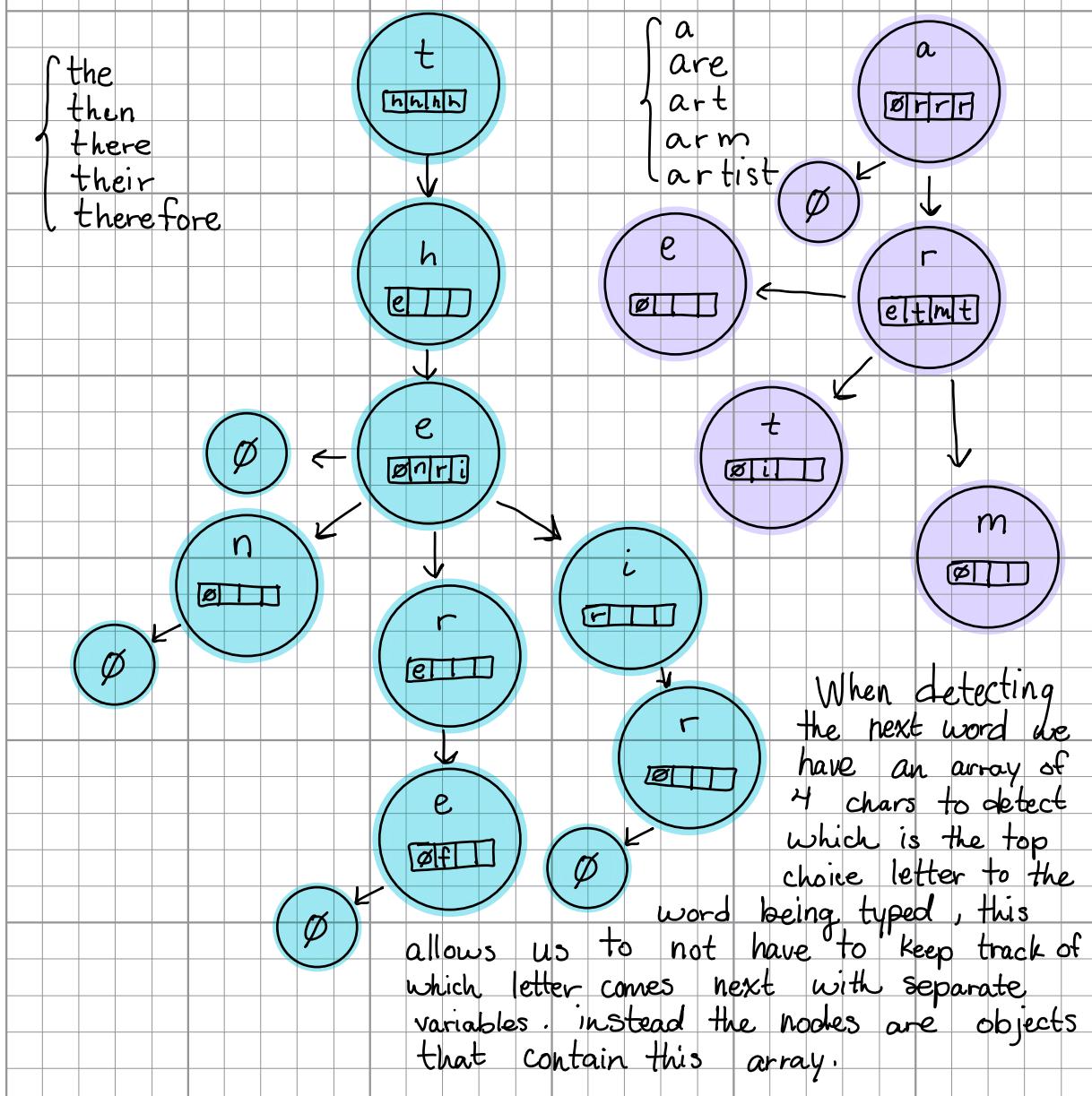
Trie Data Structure

Sept. 28, 2022

Discussion about how to efficiently traverse Trie:

I added that markov chains may be a solution with an information retrieval algorithm and we should consider going that direction.

Cons: more memory required to store collections and compute best fit words



Email to Cindy Conte

Oct. 3, 2022

Mac gave us info for Cindy Conte who runs a local Parkinson's Foundation. Requested info for people who could test our keyboard.

TAMU Capstone

Hi Cindy,

My name is Brittany Jenkins, and I received your contact information from Mac at Brazos Valley Center for Independent Living. I am a senior Computer Engineering major, and My capstone team is working on developing a keyboard specifically designed for people with mild to moderate motor impairments such as a mild case of Parkinson's Disease. We are looking for people who may be interested in talking with us about our design and hopefully testing it in later stages to make sure we are not making assumptions about good solutions.

We are specifically looking for anyone who uses keyboards on a regular basis either in the workforce or for their hobbies. This will help us tell if our design is any better than an average keyboard, and we would not require much of the tester's time, we are looking at hopefully meeting with each tester 2-3 times over the course of the semester.

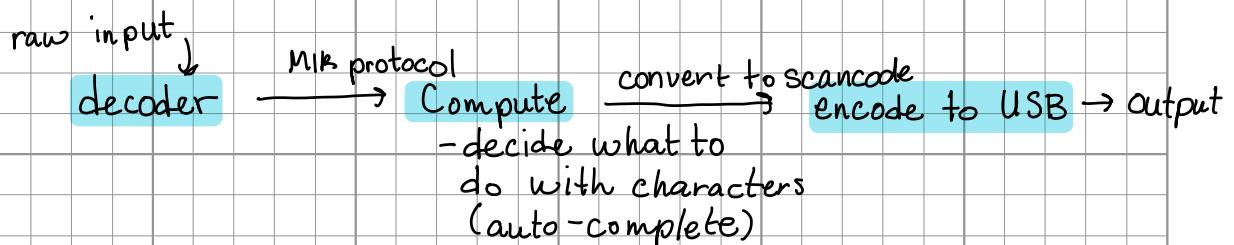
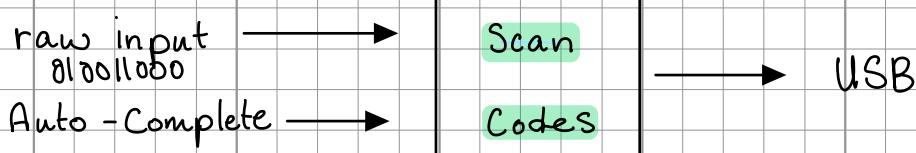
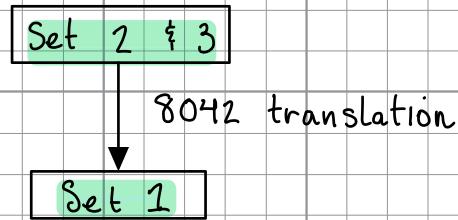
Please let us know if you are aware of anyone that might be interested, and please reach out to me if you have any questions! We are really excited about this project and would love the chance to work with you.

Best Regards,
Brittany Cape Jenkins

Keyboard Scan Codes

Oct. 3, 2022

3 different sets



Example :

$$\begin{array}{r} \text{AND} \\ \text{000 0000 0000} \quad (\&) \\ \sqcup \qquad \qquad \qquad \sqcup \\ \text{111 0000 0000} \end{array}$$

Special key (CTRL / ALT / SHIFT / WINDOWS)

3a - Capslock is an ordinary key

- How does this work w/ auto-complete ...

- Combination keys? (

0 0 0 0
↓ ↓ ↓ ↓
ALT CTRL SHIFT WINDOWS]

1000 - ALT
0100 - CTRL
0010 - SHIFT
0001 - WINDOWS

Example:
(WINDOWS + SHIFT)
0011

- $(78 \rightarrow 11 \text{ bits} / 2 \text{ bytes}) \rightarrow$ round to 12 bits, some wasted space
 \rightarrow unsigned short (2 bytes)

X Using ASCII for our protocol (lower-case)

Integer	: 0 - 9	Character = key
A - Z	: 10 - 35 (lower)	
'/~	: 36	
-	: 37	
=	: 38	
[: 39	
]	: 40	
or \	: 41 (pipe / backslash)	
;	: 42	
' / " "	: 43	
<	: 44	
>	: 45	
/	: 46	
SPACE	: 47	(16-bit MIKey Encoding Protocol
TAB	: 48	
ENTER	: 49	
Backspace	: 50	
Delete	: 51	
Escape	: 52	
CAPS	: 53	
F1 - F12	: 54 - 65	
↑	: 66	
↓	: 67	
←	: 68	
→	: 69	
M1	: 70	
M2	: 71	
M3	: 72	

Modifying ASCII for
our use to incorporate
Function keys, and
not have to deal
w/ Upper and lower
case letters

(MISCII) instead of ASCII

MIKey Encoding Not ASCII
(MENA)

MENA Protocol

Weekly Meeting 2

Oct. 5, 2022

Machine Learning Stretch goal : Contact Shuiwang Ji

To Do :

- Research USB Protocol

Annoying shipping issues → Solution Re-Order

Parkinson's Testers Update

Oct. 5, 2022

IRB Forms Submitted: Still waiting initial review as of

October 31, 2022

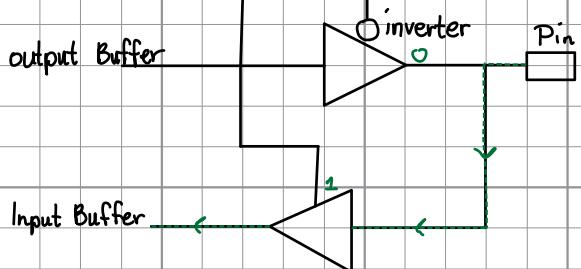
Contacts :

Robert Conte Foundation
Personal Friends

General Purpose Input / Output (GPIO)

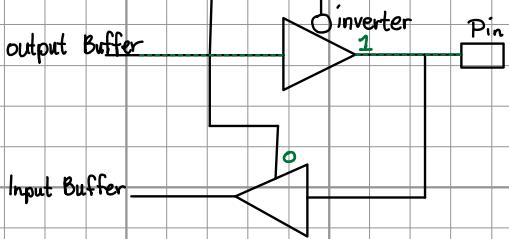
GPIO Pin Diagram:

1 Enable Line



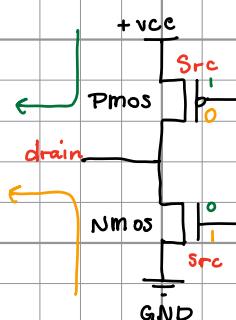
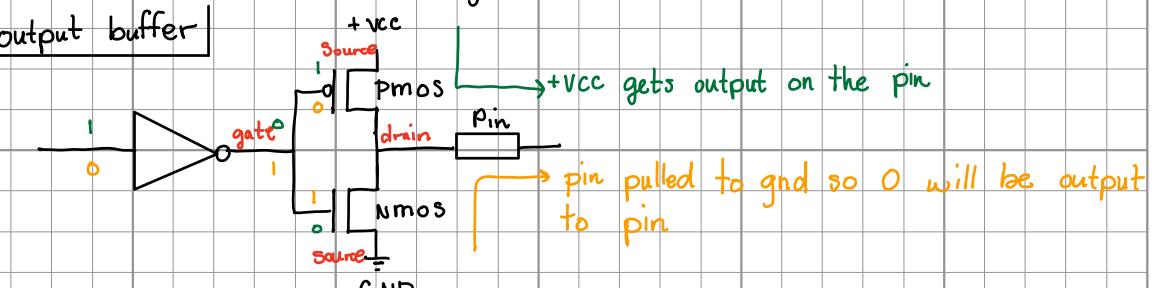
Pin configured to input mode

0 Enable Line



Pin configured for output mode

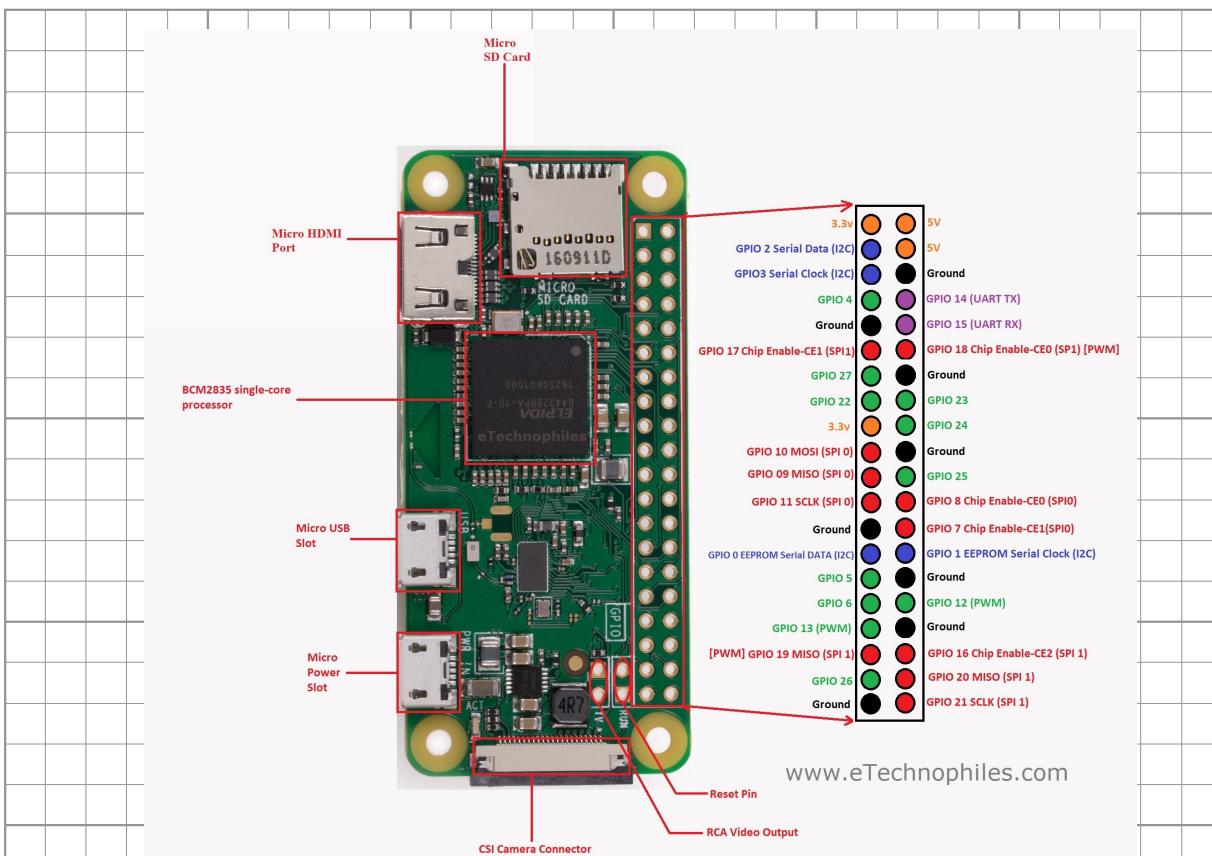
the buffers are transistors configured :

output buffer

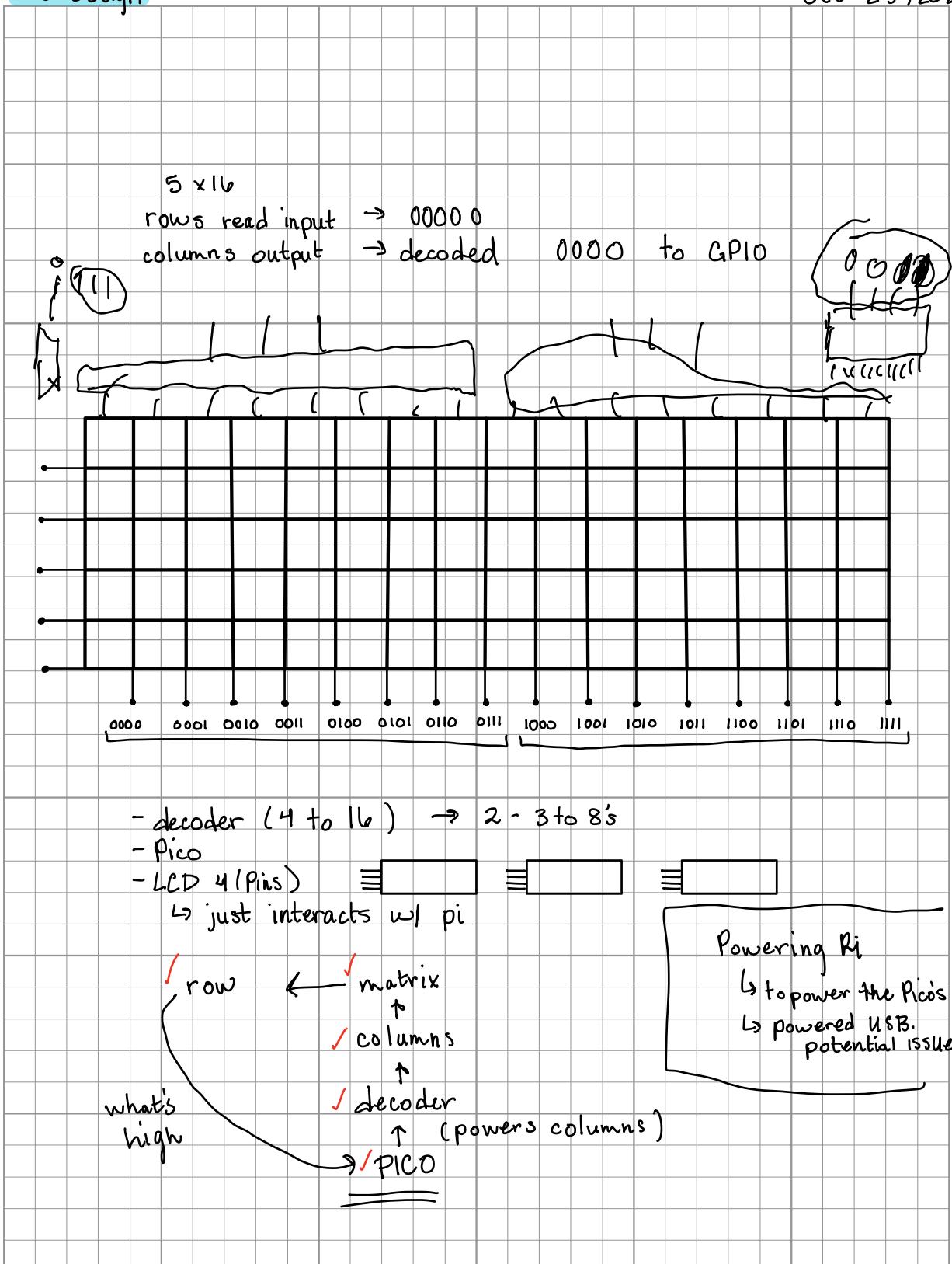
VCC to drain, microcontroller will read

GND feeds 0 to microcontroller, input is off

Default GPIO mode is input by neither connecting pin to VCC or GND (floating state)

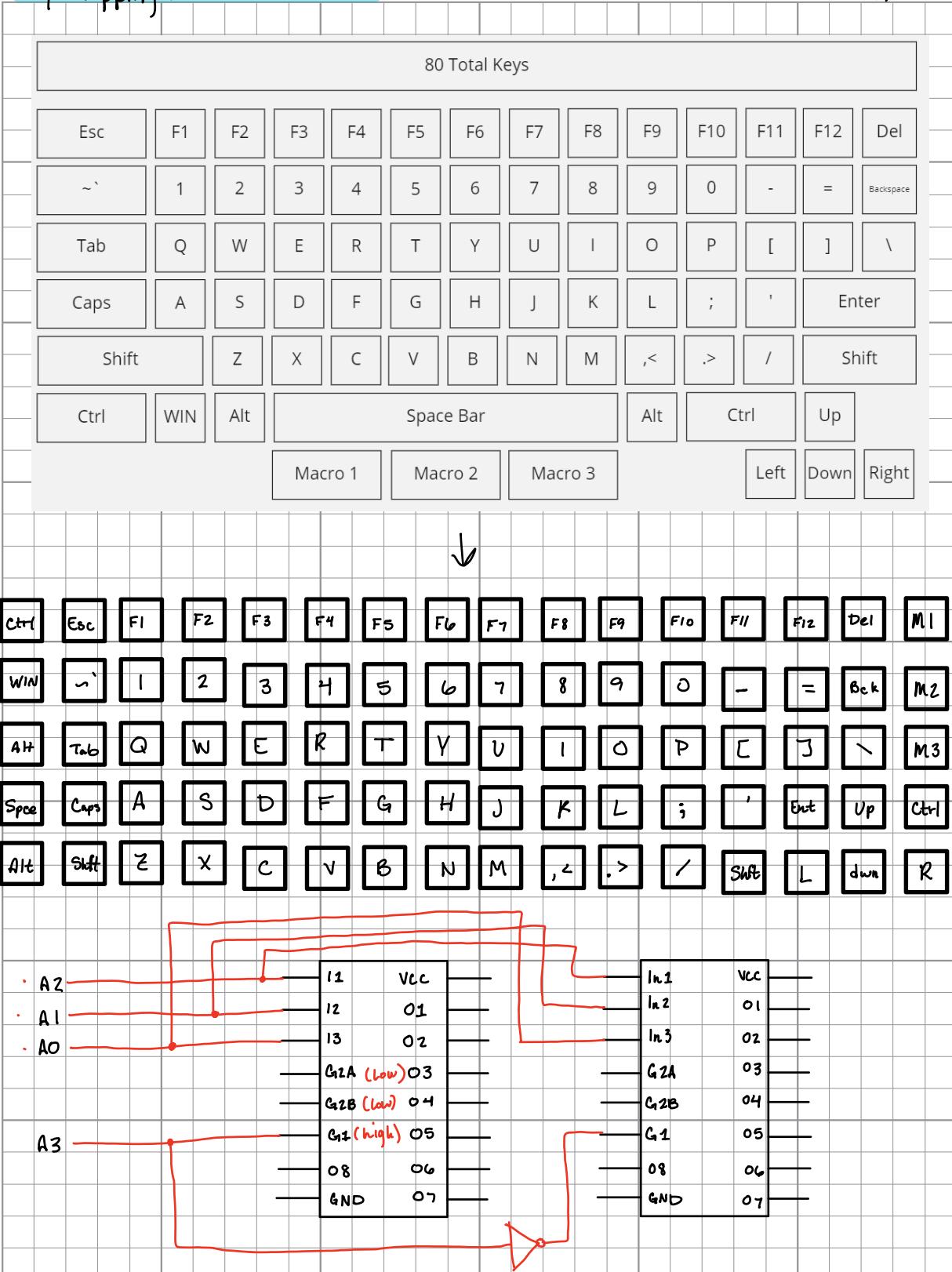


Libraries : `GPIO zero`



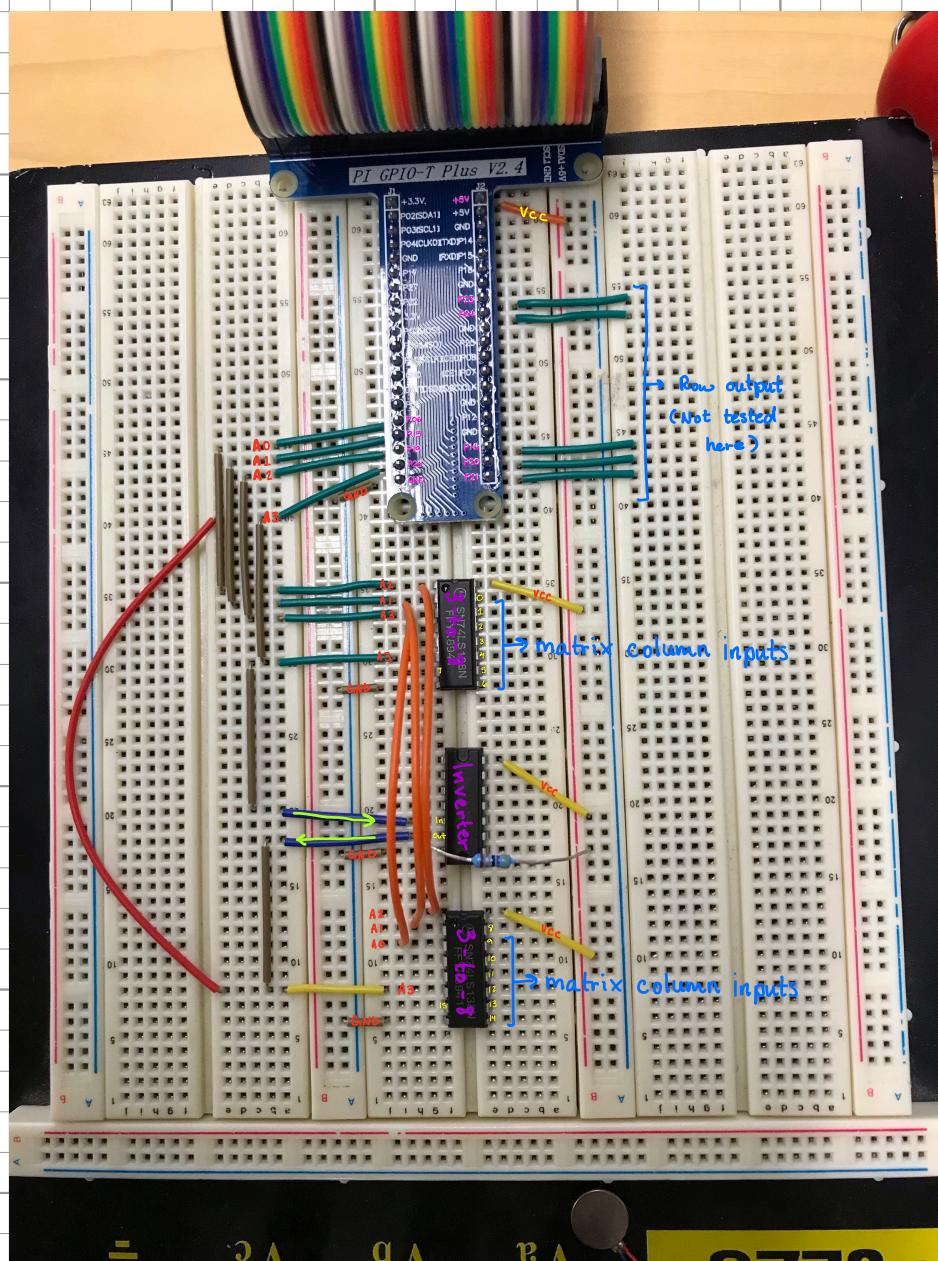
Key Mapping / Decoder Pinout

Oct. 24, 2022



Breadboard Logic Test

Oct. 26, 2022



Pull-down Resistor:

4.7 kΩ

on inverter's
input to
ensure a
known state

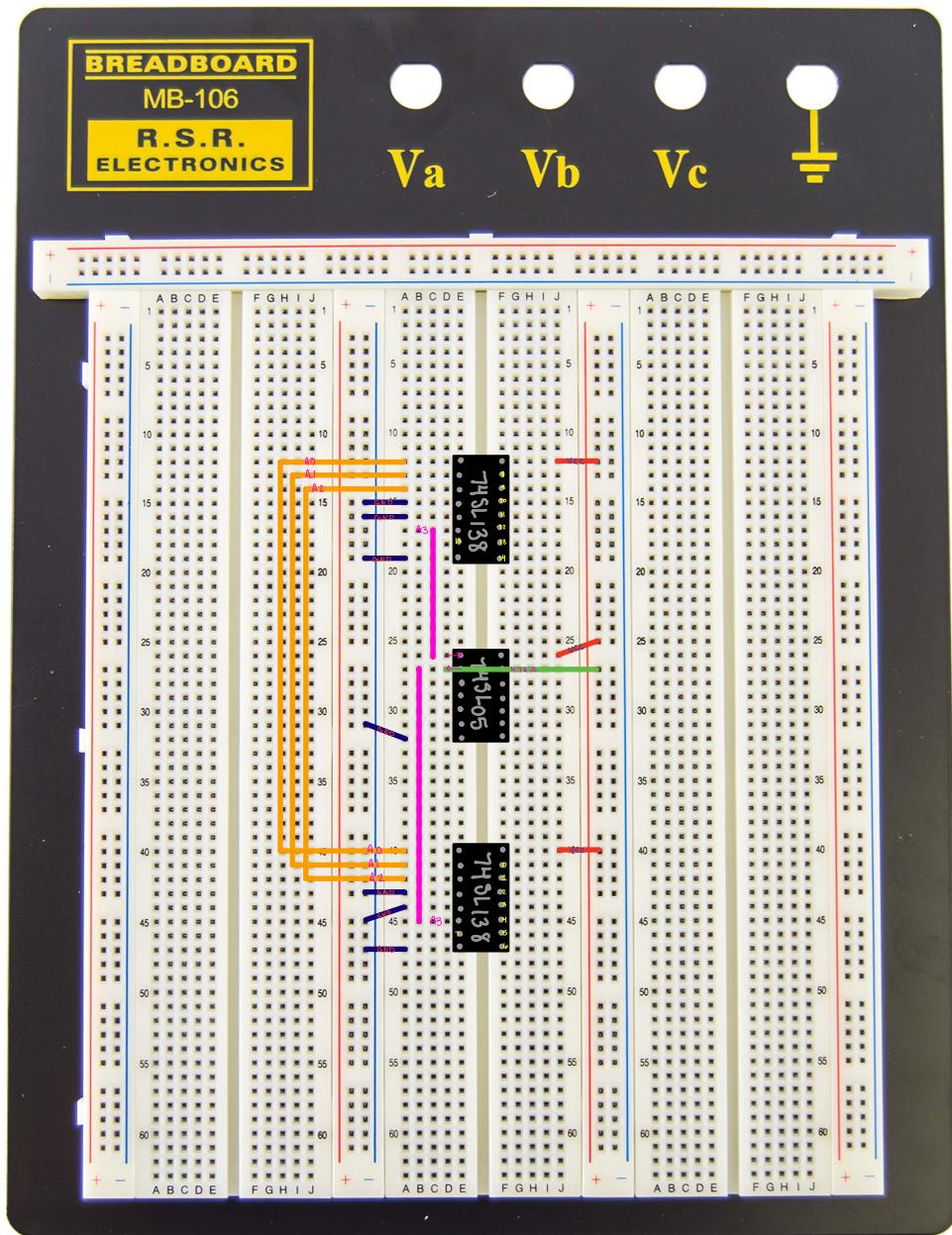
in	out
0	1
1	0

Circuit Test (Expected)

A3 A2 A1 A0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0000	1															
0001		1														
0010			1													
0011				1												
0100					1											

0101	1
0110	1
0111	1
1000	1
1001	1
1010	1
1011	1
1100	1
1101	1
1110	1
1111	1

- Note :
- the red jumper wire above bypasses inverter
 - G_{2A} & G_{2B} enables need to be grounded
 - the decoder after the wire gets A₃ put to high when A₃ is grounded, so it will have the first outputs (switch 2nd decoder to first)
 - input bits were in reverse of expected order (relabelled for clarity)
 - decoder outputs to high unless triggered, so every place a 1 is expected will actually be a 0. (and vice versa)



Note: Replace 74138's with 74238's in final design to ensure proper output

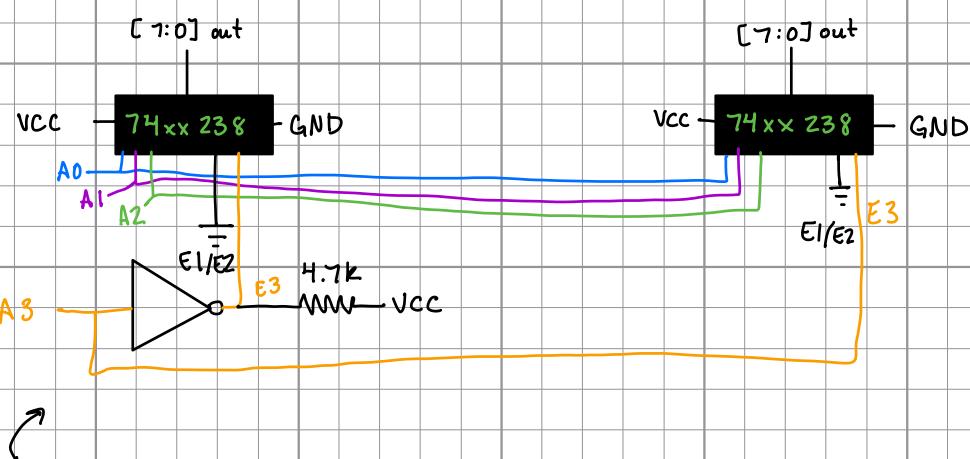
74138 vs. 74238

- have opposite truth tables
- 74238's have desired output high

Circuit Test (Expected)

A3 A2 A1 A0	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
✓ 0000	0															
✓ 0001		0														
✓ 0010			0													
✓ 0011				0												
✓ 0100					0											
✓ 0101						0										
✓ 0110							0									
✓ 0111								0								
✓ 1000									0							
✓ 1001										0						
✓ 1010											0					
✓ 1011												0				
✓ 1100												0				
✓ 1101													0			
✓ 1110													0			
✓ 1111														0		

Updated Schematic

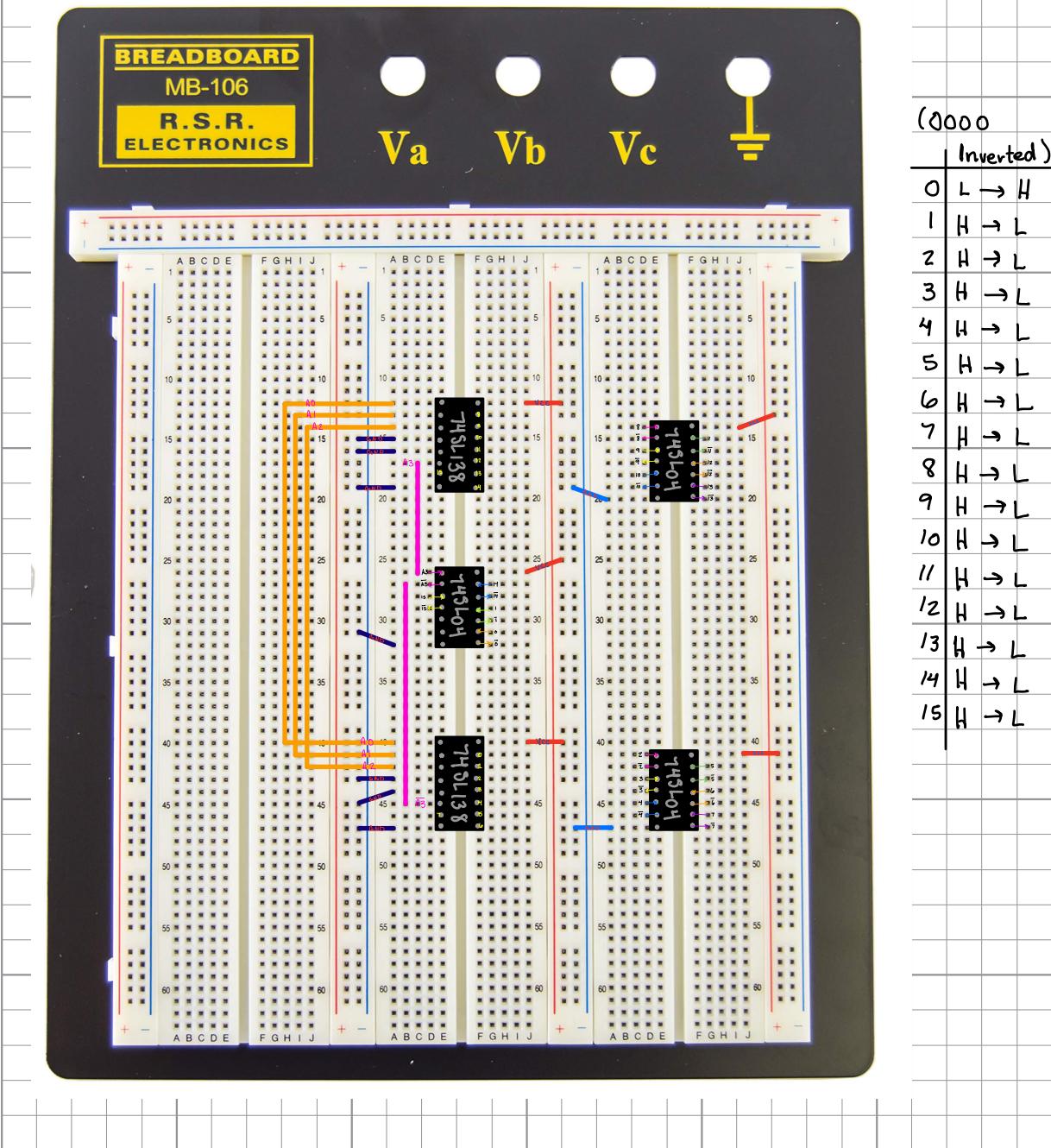


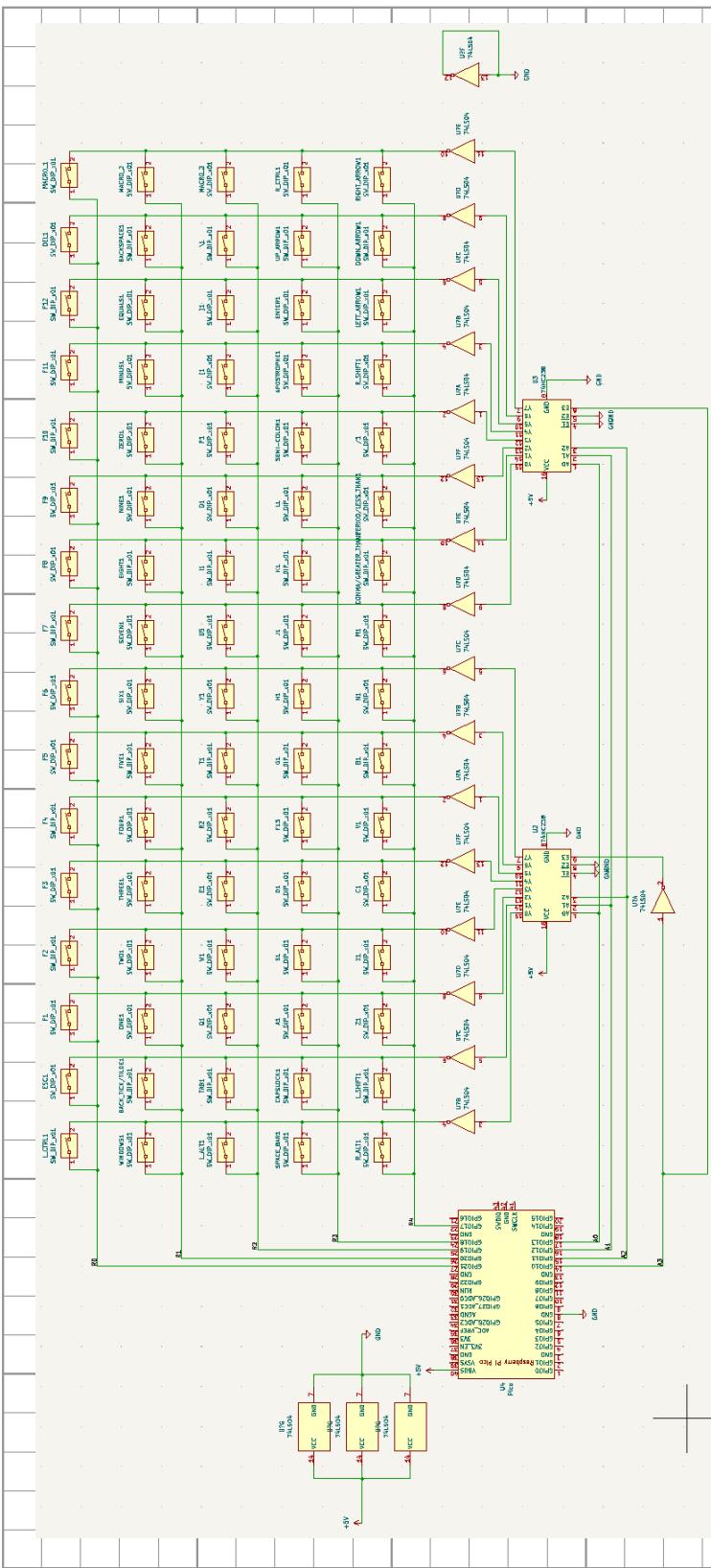
inverter belongs on the decoder
connected to the left most key
switches (makes enable high for
0000 - 0111)

Schematic Updates

Oct. 31, 2022

- Decided to use the 74LS138's with inverters, because the lab didn't have 74LS238's
- changing from 74LS05N to 74LS04N because 04's are not open collectors (testing on bread board first)





Still need to figure out
footprints for

- SN74LS138N
- MM74HC74N

All open pins pictured
have been grounded

Still need to tell Kicad
that power is coming
from Pi Pico

To Do: (After Above is
done)

- Import schematic to PCB
automatically
- Space components properly
- print / order PCB

PCB Design in KiCAD

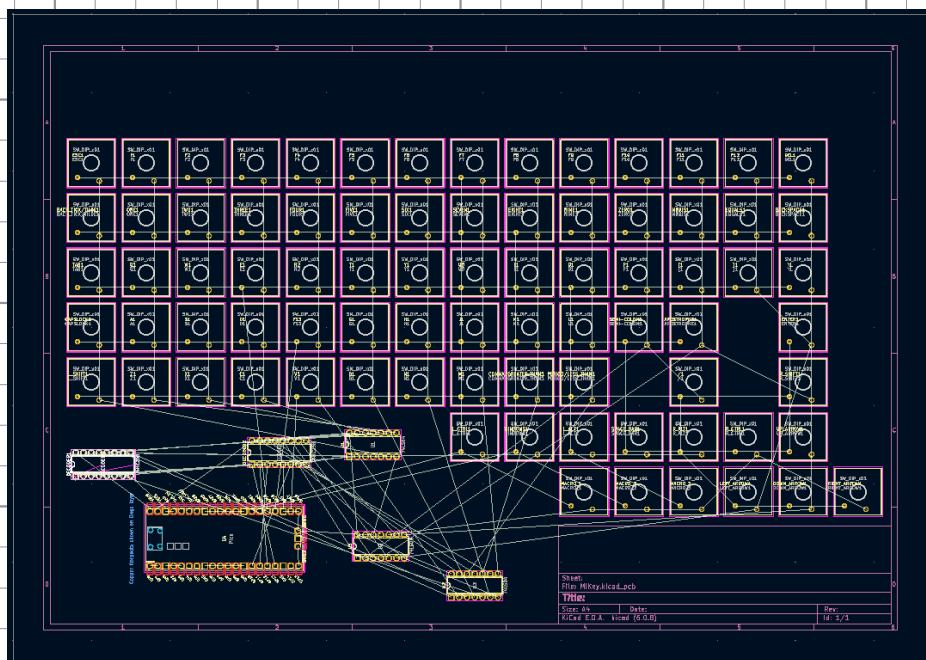
Nov. 1, 2022

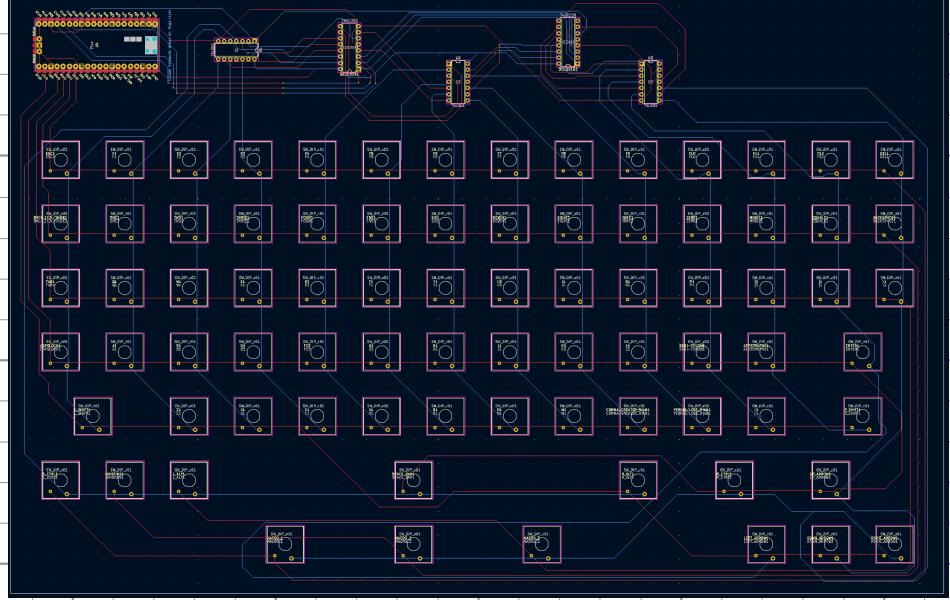
- Nov. 5, 2022

- Check about holes for stabilizers for spacebar
 - plate mounted (may not work w/ slim key caps)
 - screw-in
- opted to add in 2 unwired switches instead.



When the schematic was first exported to the PCB design it had to be reorganized as shown below.





Finally, I spaced the components according to Connie's measurements. Andrew completed the routing. Then I found PCBWay's requirements list and ran our design against the Design Rules Checker (DRC). I exported our files to Gerber Plots and sent in our design.

Order ID: G946791 Delivery Address Order time & date : 2022/11/15 13:04:07	Service: Darcy S Contact sales-rep (0 unread)	Order amount: \$ 215.82	
 View 388x247mm 2 Layers, Thickness: 1.6 mm, Finished Copper: 1, Surface Finish: HASL with lead [Product No.: W501992AS2C1] \$ 141.68 & 5Pieces If there is no extra cost we would prefer our board to be Through-hole plated.  Build Time: 24hours	✓ MIKey_Submission (2).zip  Production Tracking	In fabrication View Detail	Invoice

Key Check

Nov. 16, 2022

Ctrl	Esc	F1	F2	F3	F4	F5	F6	F7	F8	F9	F10	F11	F12	Del	M1
WIN	~`	1	2	3	4	5	6	7	8	9	0	-	=	Bck	M2
Alt	Tab	Q	W	E	R	T	Y	U	I	O	P	[]	\	M3
Space	Caps	A	S	D	F	G	H	J	K	L	;	'	Ent	Up	Ctrl
Alt	Shift	Z	X	C	V	B	N	M	,<	.>	/	Shift	L	down	R

80 Total Keys

✓ Esc	✓ F1	✓ F2	✓ F3	✓ F4	✓ F5	✓ F6	✓ F7	✓ F8	✓ F9	✓ F10	✓ F11	✓ F12	✓ Del	
✓ ~`	✓ 1	✓ 2	✓ 3	✓ 4	✓ 5	✓ 6	✓ 7	✓ 8	✓ 9	✓ 0	✓ -	✓ =	✓ Backspace	
✓ Tab	✓ Q	✓ W	✓ E	✓ R	✓ T	✓ Y	✓ U	✓ I	✓ O	✓ P	✓ [✓]	✓ \	
✓ Caps	✓ A	✓ S	✓ D	✓ F	✓ G	✓ H	✓ J	✓ K	✓ L	✓ ;	✓ '	✓ Ent		
✓ Shift	✓ Z	✓ X	✓ C	✓ V	✓ B	✓ N	✓ M	✓ ,<	✓ .>	✓ /	✓	✓ Shift		
✓ Ctrl	✓ WIN	✓ Alt	Space Bar					✓ Alt	✓ Ctrl	✓ Up				
			✓ Macro 1	✓ Macro 2	✓ Macro 3				✓ Left	✓ Down	✓ Right			

To Do :
Housing

All keys sent proper signals
on back end

key caps → Labels for key caps

Solder : Pico + LCD Screens

System test

(sent home w/ Max over Thanksgiving)

This checked
that all switches
were soldered on
to PCB properly

Debugging before Demos

Nov. 27, 2022

Only on start-up macros are not printing suggestions.

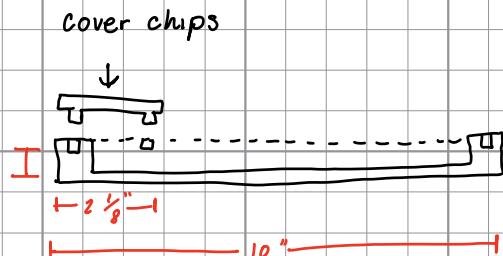
Hypothesis: Trie not being constructed properly on start-up.

(Max & Jackson worked out this issue)

Modelling Housing

Nov. 27, 2022

- How wide do the walls need to be to be structurally sound
- measure PCB

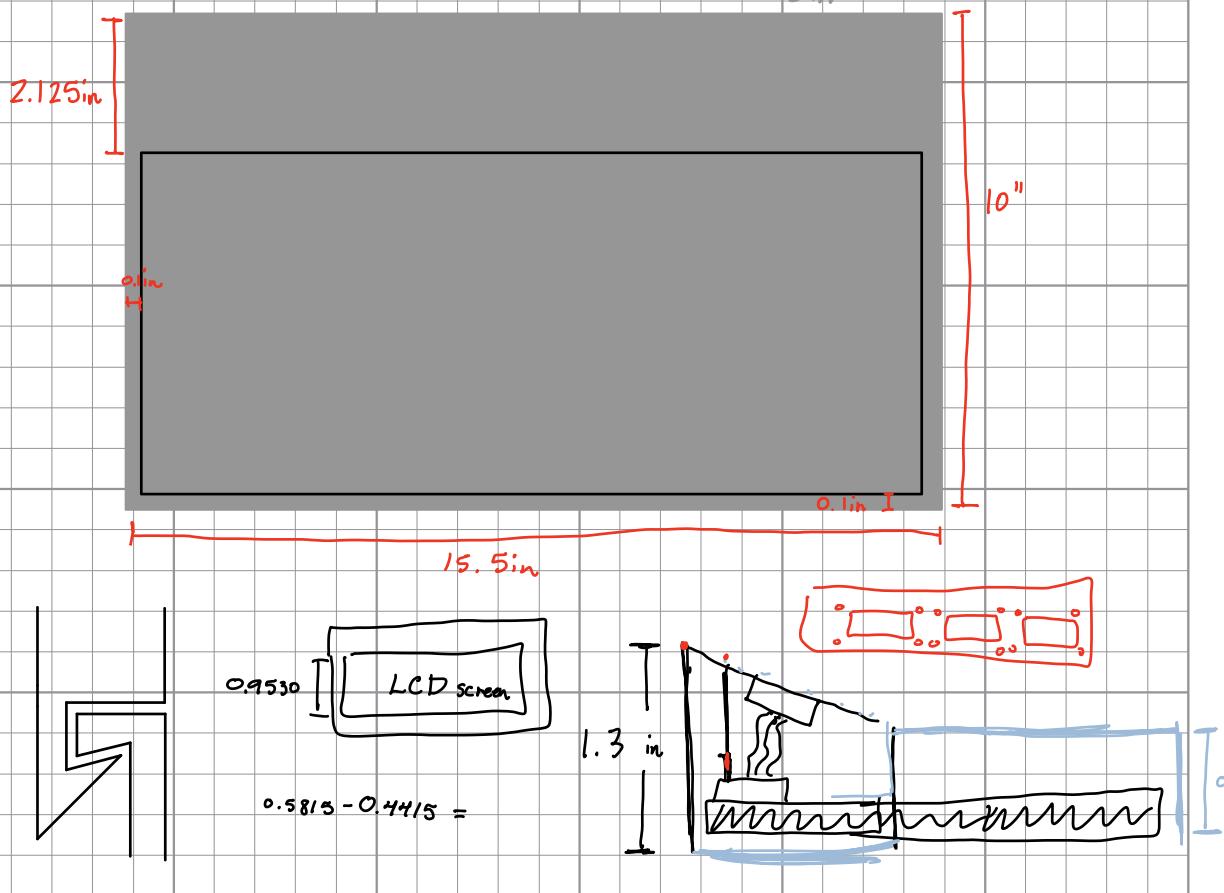


chip cover: 2.125in

PCB:

L: 9.8 in + 0.2 in

W: 15.3 in + 0.2 in



- Number of key Presses Saved (Fairytale typing practice)
- Latency time (Pi-to-LCD vs. Pi-to-computer)
- Reaction time (normal) - Mikey Reaction time = Latency
- shift work w/ LCD's
- check if any keys sticking (Keyboard tester online)
- Videogame usability (Needs performance setting)

18 Keys Left to Print:

- 10 - 1's
- 7 - 2's
- 1 - space

- Windows key not working
- "M" is sticking
"
←"
- ";" doing something funny
- Learning curve to keyboard layouts
- if you type 40 wpm you can save 80 key presses on average
- Phone Test

Usability Testing

Nov. 28, 2022

Number of keys Saved

In a hole in the ground there lived a hobbit. Not a nasty, dirty, wet hole, filled with the ends of worms and an oozy smell, nor yet a dry, bare, sandy hole with nothing in it to sit down on or to eat: it was a hobbithole, and that means comfort.

Total Number of Presses : 247 characters

MIKey Number of Presses : 196 characters

Macro Presses : 28 presses

of Words : 49 words

Paragraphs are the building blocks of papers. Many students define paragraphs in terms of length: a paragraph is a group of at least five sentences, a paragraph is half a page long, etc. In reality, though, the unity and coherence of ideas among sentences is what constitutes a paragraph.

Total Number of Presses : 288 characters

MIKey Number of Presses : 200 characters

Macro Presses : 43 presses

of Words : 44 words

Reaction Time Test (in One Drive)

Added Large Print Stickers

Nov. 30, 2022



Final keyboard set up.

Final Presentation Work Day

Dec. 4, 2022

Divided slides

ran through presentation

Connie & I remade system level design diagram

will need to trim down for ABET Presentation

Dec. 5, 2022

Research on ortholinear

trim down

ABET - integrate course work into slides

Regular keyboard comparison well done - talk about implementation of theory

In the Afternoon, I worked on finishing up my parts of the report.