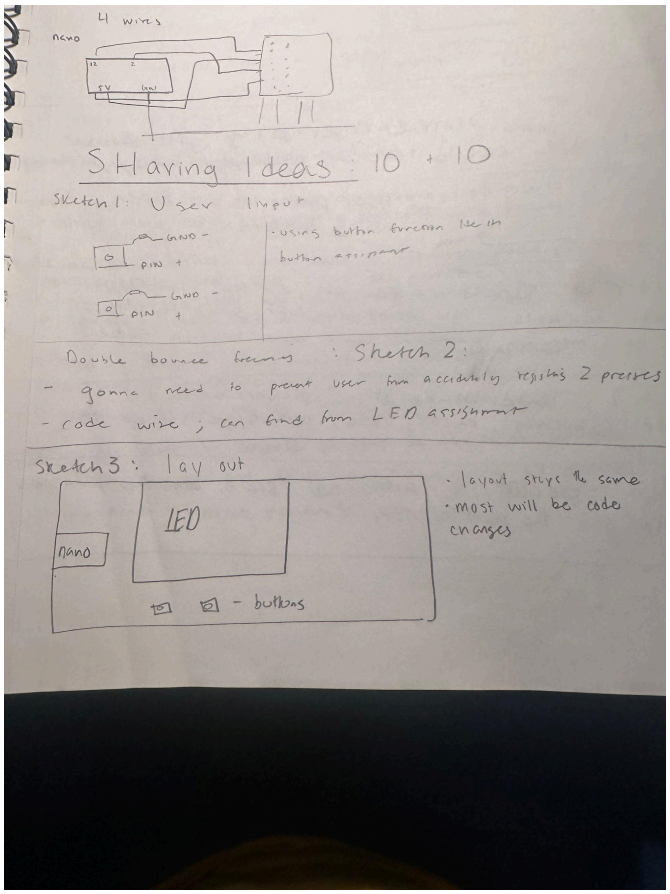
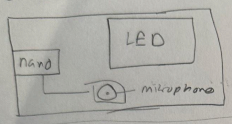
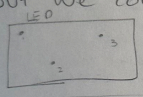
10 + 10 Scribble Sketch:



Sketch 4: Using microphone as input: user says grid number; divide LED lights as grid.



Sketch 5: Same memory game, but we could add multiple lights / patterns



→ User picks 1-3 in order using buttons

Sketch 6: Could add an extra button that controls how bright the light gets. Add that to the memory game. Would need to find code.

Sketch 7: could make it 2 player version. add 2 buttons; modify code; best score out of 10.

8: Use speaker to announce score, whether player would get the point or not.

9.

9 Find 8x8 RGB board to increase complexity of the game. User also has to select the right color

10. Include memory training modes.
- Short Term or Long term
  - ↳ different patterns
- would be hard to code
- would be a great addition

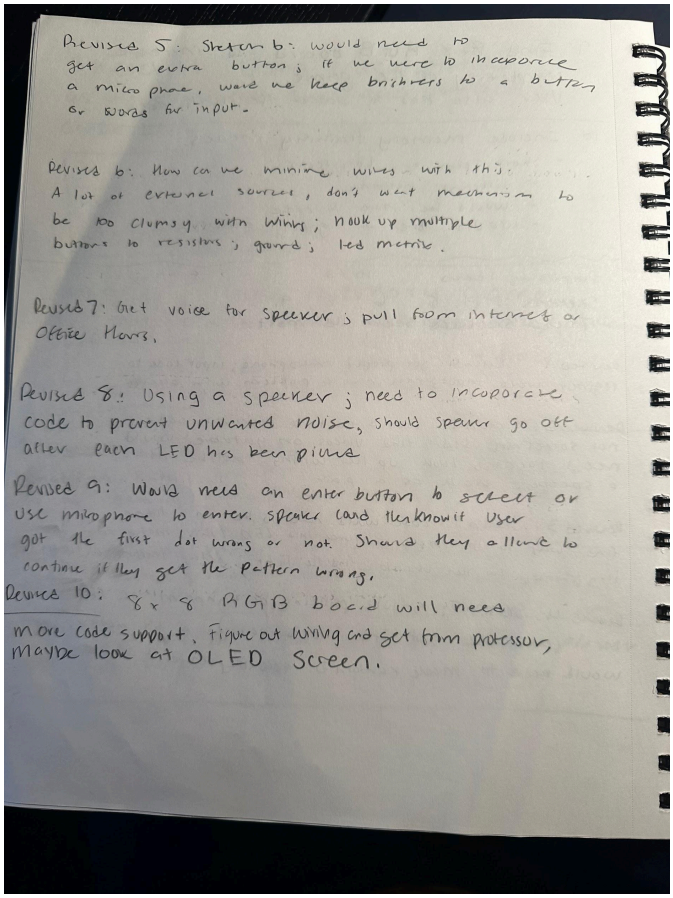
- Promising Ideas 10/3
Sketches: 4, 5, 6, 8, 9,
- These sketches seem the most

Revised 1: Sketch 4: get proper microphone; input code to register word input; may have a problem with accents

Revised 2: Sketch 4: would need to research code, not something used; find videos on youtube. would need to also look up the wiring; maybe microphone & speaker work as a pair

Revised 3: Sketch 5: code would have to be on a timer, find way to incorporate a timer into LED lights, make it long enough for the user to find the light. delay function or timer?

Revised 4: Sketch 5: should patterns be random or like in a reasonable spot. It is hard to navigate a 64 matrix. would need to make random to actually make it fun.



3 Drafts of elevator pitch and 1 final draft:

Draft 1: Problem-Solution Emphasis with Prototypes

Improving reaction time is essential for gamers and professionals, but existing tools lack engaging feedback and meaningful metrics. Our interactive reaction timer overcomes these challenges by integrating an Arduino MKR-WIFI, Adafruit OLED display, a joystick for precise navigation, and a speaker that plates a sound upon a successful button press. Players navigate dynamic light patterns on teh OLED with joystick controls, and the system provides real-time auditory feedback for correct inputs. At the end of the session, players receive their average reaction time, enabling tangible performance tracking. Prototype showcase a sleek, progressive design where adaptive challenges keep users motivated to improve.

Draft 2: Enhanced User Experience

Tradition reaction training tools fail to provide the engaging feedback and performance metrics users need to see real improvement. Our reaction timer game combines an Arduino MKR WiFi 1010, a 128 x

128 Adafruit OLED display, and a joystick for precise navigation. When players correctly press the button in response to a dynamic light pattern, the speaker plays a confirmation sound, creating an interactive feedback loop. At the end of the game, users receive their average reaction time, providing insights into their performance. Prototypes demonstrate a user-friendly design with prohressively challenging levelsm, delivering a fun, effective, and personalized training experience.

Draft 3: Innovation Impact

Reaction training devices often lack the real-time feedback and meaningful data necessary for significant improvement. Our reaction timer game transforms the experience with an Arduino MKR Wifi 1010, a high resolution Adafruit OLED display, and a joystick for intuitive control. Players respond to dynamic patterns, receiving instant feedback through a speaker that plays a sound for correct inputs. The system tracks and displays the average reaction time at the end of the session, enabling users to measure and track their progress. Prototypes highlight a sleek design that combines visual, tactile, and auditory stimuli, setting a standard for effective reacting training tools.

Final Draft:

Improving reaction time is crucial for gamers, athletes, and professionals, yet traditional tools lack engaging interaction and meaningful performance tracking. Our reaction timergame addresses these shortcomings with an Arduino MKR WiFi 1010, a 128x128 Adafruit OLED display, a DIYables joystick, and a speaker that provides auditory feedback when the button is pressed in the correct position. The OLED displays dynamic light pattern that challenge players to react quickly and accurately. At the end of the game, players are shown their average reaction time, offering valuable insights into their progress. Prototypes showcase a sleek design with progressive difficulty levels, combining visual, tactile, and auditory elements to create a comprehensive, engaging training experience.

Lit Review:

Journal Entry of Literature Review:
Since my project focuses on the realm reaction times, I have researched articles on how electronics can aim to improve such reaction times..

- **Paper 1:**
    - This research examines various smartphone applications designed to enhance reaction times through quick-response games. The study compared several popular applications by assessing their impact on reaction time after a month-long training program. Participants showed an average reduction of 30 milliseconds in reaction time across applications. The authors found that while smartphones are accessible and convenient tools, the lack of real-time feedback on performance limits their effectiveness. The authors suggest incorporating

sensory feedback or adaptive difficulty levels to create a more interactive and effective training experience.

- **Paper 2:**
    - The research paper titled "The Effect of Tactile Imagery Training on Reaction Time in Healthy Participants" examines whether tactile imagery (TI)—mentally simulating tactile sensations—can improve reaction time. The study used a vibrating stimulus applied via finger-mounted vibration motors, controlled by an Arduino microcontroller, to evaluate participants' reaction times before and after TI training. Findings indicate a significant 25% reduction in reaction time post-training, with effects lasting over four weeks, suggesting TI as an effective, non-physical method to enhance reaction times for various applications.
- **Paper 3:**
    - This study explores how music volume impacts reaction times in young adults, a factor linked to vehicular accidents among drivers under 25. Using the Brain Gauge device, the study recorded both simple and choice reaction times across varying music volumes. Results indicate a statistically significant increase in reaction times as volume rises, with higher volumes impairing focus and response speed. The findings imply that loud music can substantially affect reaction time, suggesting safety concerns for young drivers exposed to high-volume music.
- **Paper 4:**
    - This study investigates the precision of various reaction time testing methods across visual, auditory, and tactile stimuli. Using highly accurate tools such as the Arduino microcontroller and Brain Gauge device, the authors found that traditional reaction time measurement devices, like touchscreens or mikes, introduce significant delays, often leading to inaccurate results. The study reveals that reaction times across modalities (auditory, visual, and tactile) are closer to 200 milliseconds than the slower rates reported in previous literature. Findings suggest that reaction time accuracy is highly dependent on the device used, underlining the need for more precise technology in clinical and research settings to yield reliable data.
- **Paper 5:**
    - This study critiques traditional reaction time measurement tools for introducing variability and inaccuracies. Using Arduino and Brain Gauge devices, the authors measured reaction times for visual, auditory, and tactile stimuli, finding no significant differences across modalities when accurate circuitry was employed. Higher stimulus intensities resulted in faster responses across modalities, contradicting past studies that reported varying reaction times for each sensory modality. This research suggests that modern, precise tools can standardize reaction time measurements, enhancing clinical assessments for cognitive and neurological conditions.

Bibliography

- **Paper 1:**
    - Lee, T., & Chang, E. (2020). "Smartphone Applications as Tools for Reaction Time Training: A Comparative Analysis." *Journal of Mobile Computing and Health Applications*
    - https://pmc.ncbi.nlm.nih.gov/articles/PMC4811195/

- **Paper 2:**
    - Lakshminarayanan, K., Ramu, V., Rajendran, J., Chandrasekaran, K. P., Shah, R., Daulat, S. R., Moodley, V., & Madathil, D. (2023). "The Effect of Tactile Imagery Training on Reaction Time in Healthy Participants." *Brain Sciences*
    - https://pmc.ncbi.nlm.nih.gov/articles/PMC9954091/pdf/brainsci-13-00321.pdf
- **Paper 3:**
    - Farrell, J. (2020). "The Effect of Increasing Music Volume on Reaction Time." *The Journal of Science and Medicine*, 3(Special Issue)
    - https://www.josam.org/josam/article/view/62
- **Paper 4:**
  McRacken, D., Dyson, M., & Hu, K. (2020). "Accurate Reaction Time Methods Demonstrate Similar Results from Different Sensory Modalities." *The Journal of Science and Medicine*, 3(Special Issue)
    - Link sent me to a PDF: https://www.josam.org/josam/article/view/81?download=pdf
- **Paper 5:**

McRacken, D., Dyson, M., & Hu, K. (2021). "Accurate Reaction Time Methods Demonstrate Similar Results from Different Sensory Modalities." *The Journal of Science and Medicine*, Special Issue: Undergraduate Student Research, 1-6.

- https://www.josam.org/josam/article/view/81

Story Board:

Story Board Sketches

Image 1

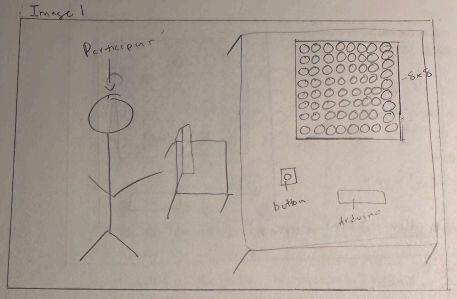
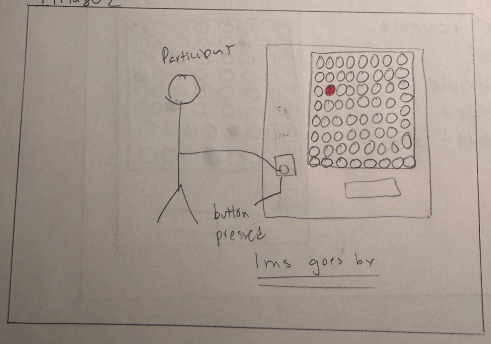


Image 2



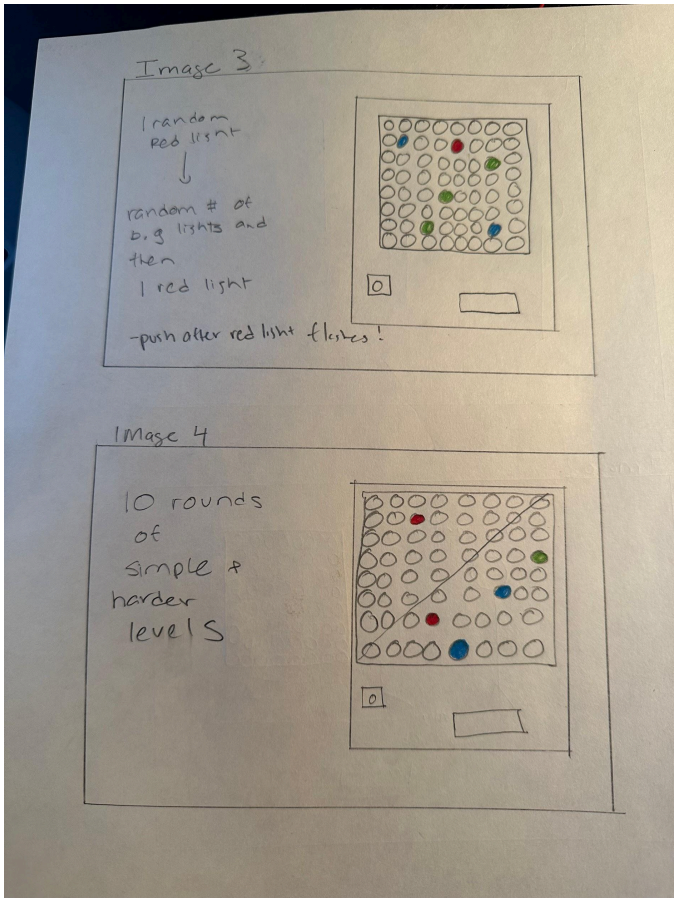
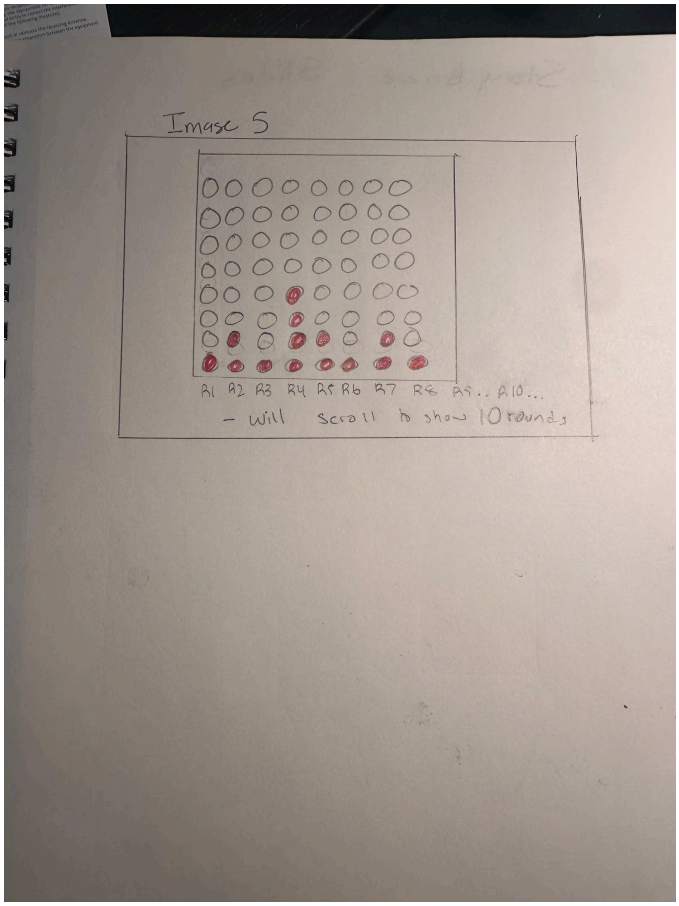
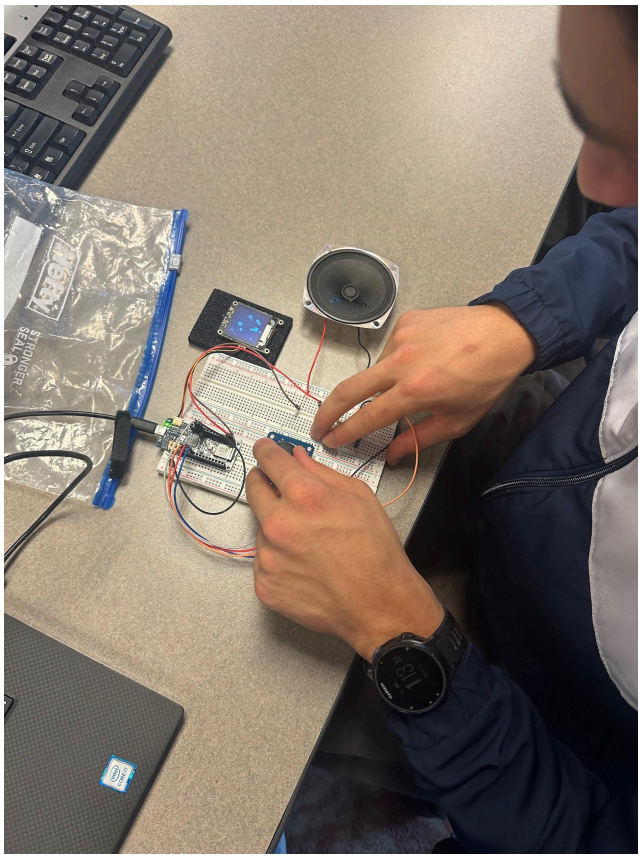


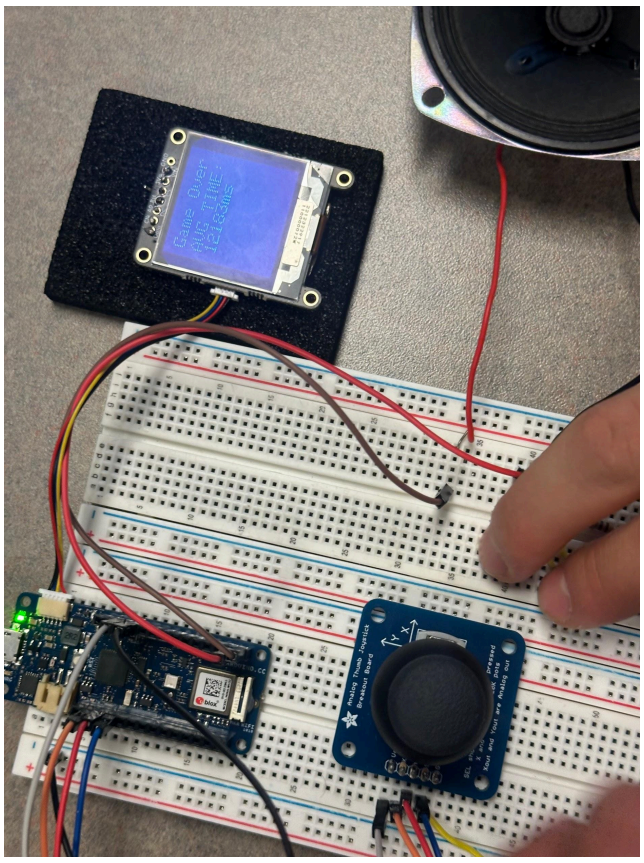
Image 3
1 random red light
random # of b, g lights and then 1 red light
-push after red light flashes!
Image 4
10 rounds of simple & harder levels



Link of github:
https://github.com/tarunhoskere31/CS-485-3

3 Photos of someone interacting with my project:




Game Over
Avg Time
121.83ms