

Disability Friendly Pictionary
CSE 321 - Realtime Embedded Systems
Project 3 Stage 1
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Part A: Project Statement

This proposal is for a disability friendly Pictionary game controlled via an Embedded device. The purpose of the system is to allow individuals who have shaky hands, or missing fingers to easily play a drawing game with their friends. The device uses IR sensors to sense the user's movement and an LED dot matrix to display the picture being drawn. There is also an LCD screen displaying the current state of the game

Part B: Initial Constraints and Specifications

Constraints:

- System Watchdog must make sure program doesn't get stuck on any of the stages within a single game
- System must continuously monitor and analyze hand movements of the individual.
- The LED mapping will reflect what the current drawing looks like from the user
- Must use constantly calculating hand movements and phasing out background noise
- Must run forever even if a thread hangs
- Must be thread safe

Specifications:

- All components are 3.3V and 5V functional
- 8x8 Dot Matrix
- 4 IR sensors
- 1 16x2 LCD
- 4x4 Keypad, only first 2 rows are in use though

Part C: Asks

Purpose:

Disability friendly game. Need 4 players to play, 1 player will draw, the other 3 will be guessing what that player has been drawing. There will be multiple rounds and whoever has the most points by the end will win.

Inputs:

- Keypad
 - '1' = player 1 guesses
 - '2' = player 2 guesses
 - '3' = player 3 guesses

- '4' = start game
- '5' = incorrect guess
- '6' = correct guess
- 'A' = invert pen state
- 'B' = invert eraser state
- 4 IR sensors: Port C
 - Move left : pin 0
 - Move right : pin 1
 - Move up : pin 3
 - Move down : pin 4

Outputs:

- LCD
 - Start state: press A when ready to start
 - Prep state: starting in 5s
 - Drawing state: row1 – draw R1 – 60s, row2 – P1=0 P2=0 P3=0
 - Guessing state: row1 – P1 is guessing, row2 – P1=0 P2=0 P3=0
 - Wrong guess state: row1 – P1 is incorrect, row2 – P1=0 P2=0 P3=0
 - Correct guess state: row1 – P1 is correct, row2 – P1=1 P2=0 P3=0
 - Next round state: row1 – R2 in 15s, row2 – P1=1 P2=0 P3=0
 - Game over state: row1 – P1 WINS!, row2 – P1=1 P2=0 P3=0
- LED Dot Matrix
 - Wherever the drawer's cursor is, the LED will blink
 - The pen will initially start up
 - When the pen is down, the LED on the cursor will stay lit up
 - When the eraser is on, the LED on the cursor will stay turned off

Constraints:

- When a player guesses, the drawing timer will stop, until the guess has been verified by the player drawing
- If the guess is incorrect the timer will begin again
- If a player makes an incorrect guess their score will go down by 1
- If a player makes a correct guess their score will go up by 1
- When the time runs out, the round will end and the countdown for the next round will begin
- If a player guesses correctly then the round will immediately end
- If one player is guessing and another player wants to guess next, they can buzz in, but can only guess after the other player is done guessing
- If the guessing takes more than 10s the timer will start to tick down again
- There will be only 3 rounds to the game
- If the pen is down or the eraser is attached then the
- Eraser supersedes pen down

- The drawers pen and eraser will act on an LED every .25s
- When the cursor reaches the edge of the Dot Matrix it will be stopped
- At the end of each round the dot matrix will clear completely

Part D: Preliminary BOM

NUCLEO L4R5ZI

<https://www.mouser.com/ProductDetail/511-NUCLEO-L4R5ZI>

Micro USB Cable

https://smile.amazon.com/AmazonBasics-Male-Micro-Cable-Black/dp/B0711PVX6Z/ref=sr_1_3?keywords=micro+usb+cable&qid=1639137130&s=electronics&sr=1-3

IR Sensors

https://smile.amazon.com/HiLetgo-Infrared-Avoidance-Reflective-Photoelectric/dp/B07W97H2WS/ref=sr_1_37?crid=2ZECVUH3BF3V9&dchild=1&keywords=arduino+sensor&qid=1598036691&s=electronics&sprefix=arduino+sen%2Celectronics%2C165&sr=1-37

Dot Matrix Display

https://www.amazon.com/ACEIRMC-MAX7219-Display-Single-Chip-Control/dp/B08VHX2KC4/ref=sr_1_8?crid=276F517QCP371&keywords=arduino+dot+matrix&qid=1636404440&qsid=137-0148648-7603540&sprefix=arduino+dot+matrix%2Caps%2C59&sr=8-8&sres=B07FFV537V%2CB08KS68GYZ%2CB07KQ31FX6%2CB00LSG54O2%2CB08VHX2KC4%2CB07T28MSP5%2CB07X4W3MVD%2CB08CSJNGJL%2CB088LWLHP5%2CB08SQT9GGB%2CB089752GYX%2CB01567H3PG%2CB079NJLGMG%2CB01D8KOZF4%2CB08745JBRP%2CB074WMHLQ4

LCD

<https://www.mouser.com/ProductDetail/713-104020111>