Dits & Dahs

ECE 167

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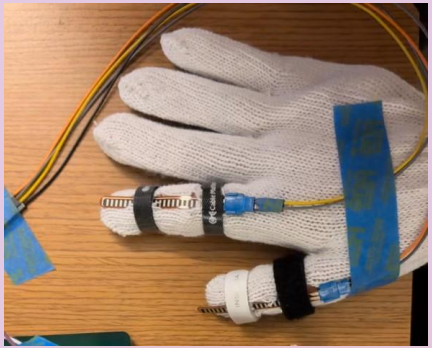
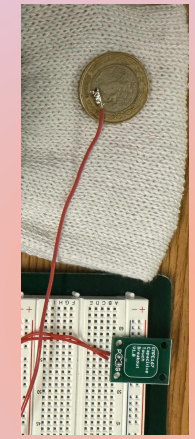
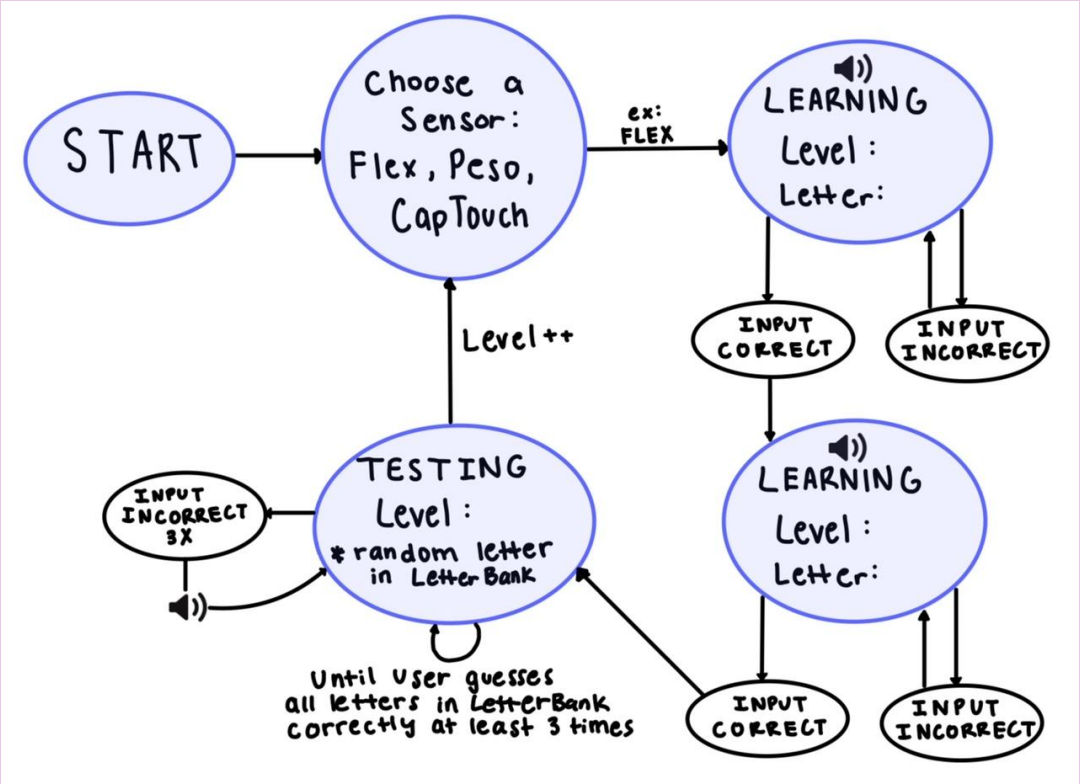
Overview

- Game:
  - Morse Code training game is modeled after MorseMania® where the user is prompted a letter and enters a Morse Code translation
  - Two Modes: Learning where Morse Code is played/tested. Testing where user is tested on new and previous letters
- Sensors:
  - Modeled after different Morse Code Keyers
    - Flex Sensor: User bends thumb or index finger to type a dit or dah
    - Peso CapTouch Sensor: User's duration of touch determines dit or dah
    - Custom 167 CapTouch: User's duration of touch determines dit or dah

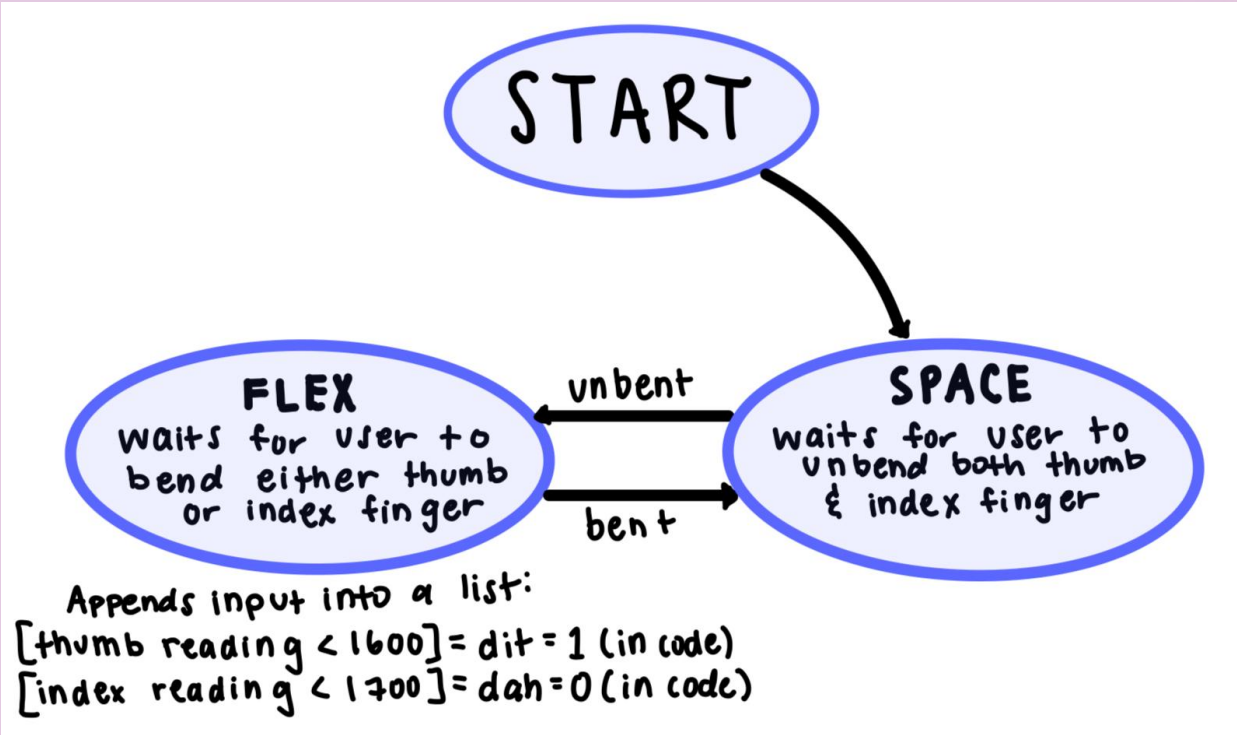




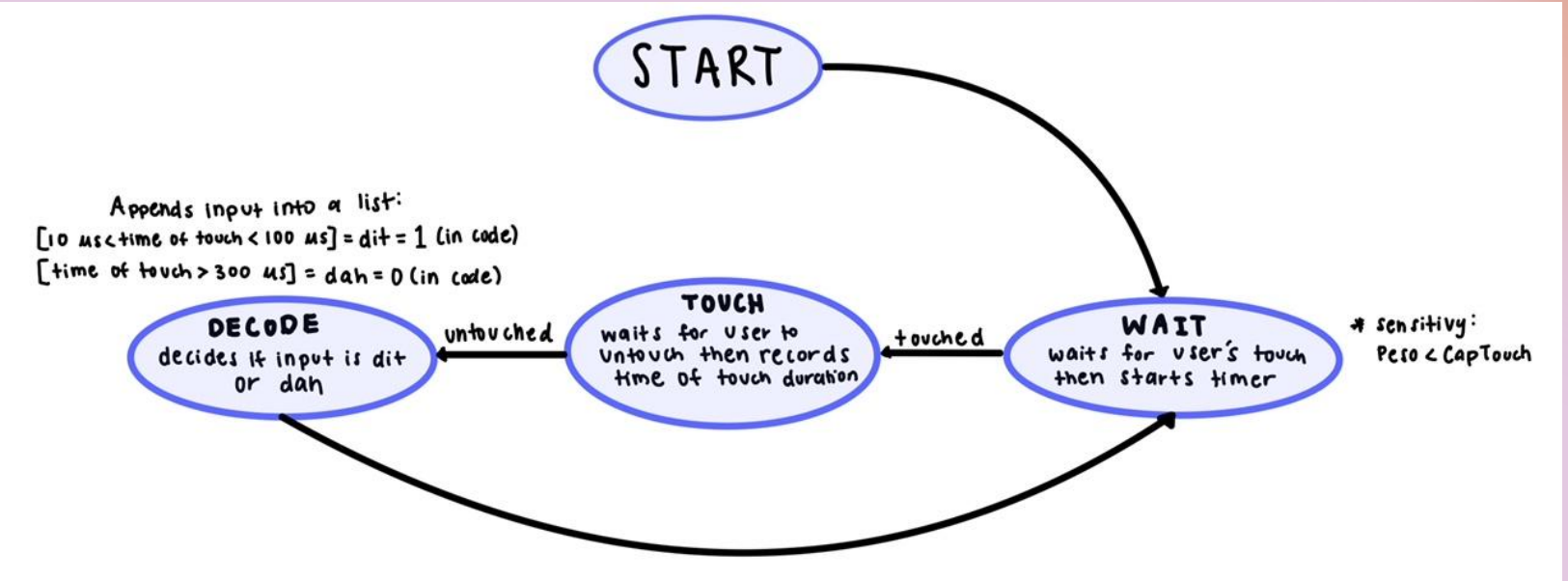
Game

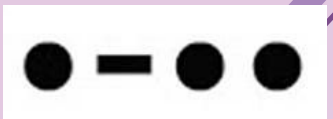

START
Choose a Sensor: Flex, Peso, CapTouch
ex: FLEX
LEARNING Level: Letter:
INPUT CORRECT
INPUT INCORRECT
Level++
TESTING Level: * random letter in LetterBank
INPUT INCORRECT 3X
LEARNING Level: Letter:
Until User guesses all letters in LetterBank correctly at least 3 times
INPUT CORRECT
INPUT INCORRECT

Morse Code Decoder for Flex



Morse Code Decoder for CapTouch





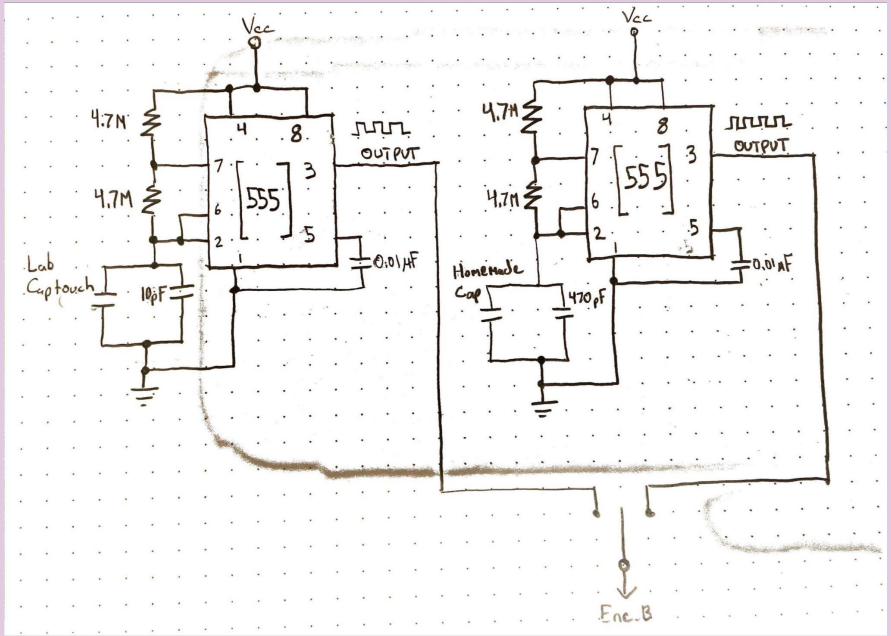
CapTouch -> Morse Code

How?

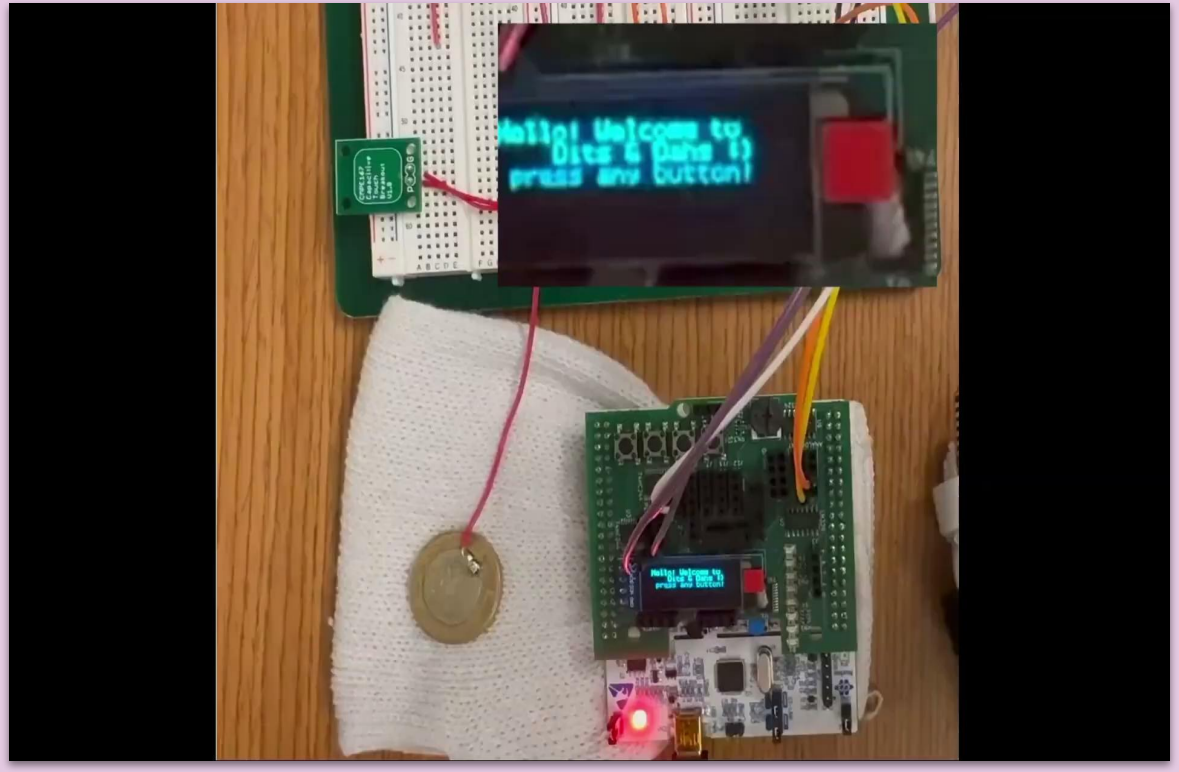
- Taking advantage of the LM555 astable mode configuration, the frequency was adjusted to work with both sensors.
- Utilized CAPISTOUCHED() function to measure the duration a user is touching the sensor.
- Used duration of touch to translate the touch to Dit or Dah.

$$f = \frac{1.44}{(R_1+2R_2)*(C+C_{Sensor})}$$

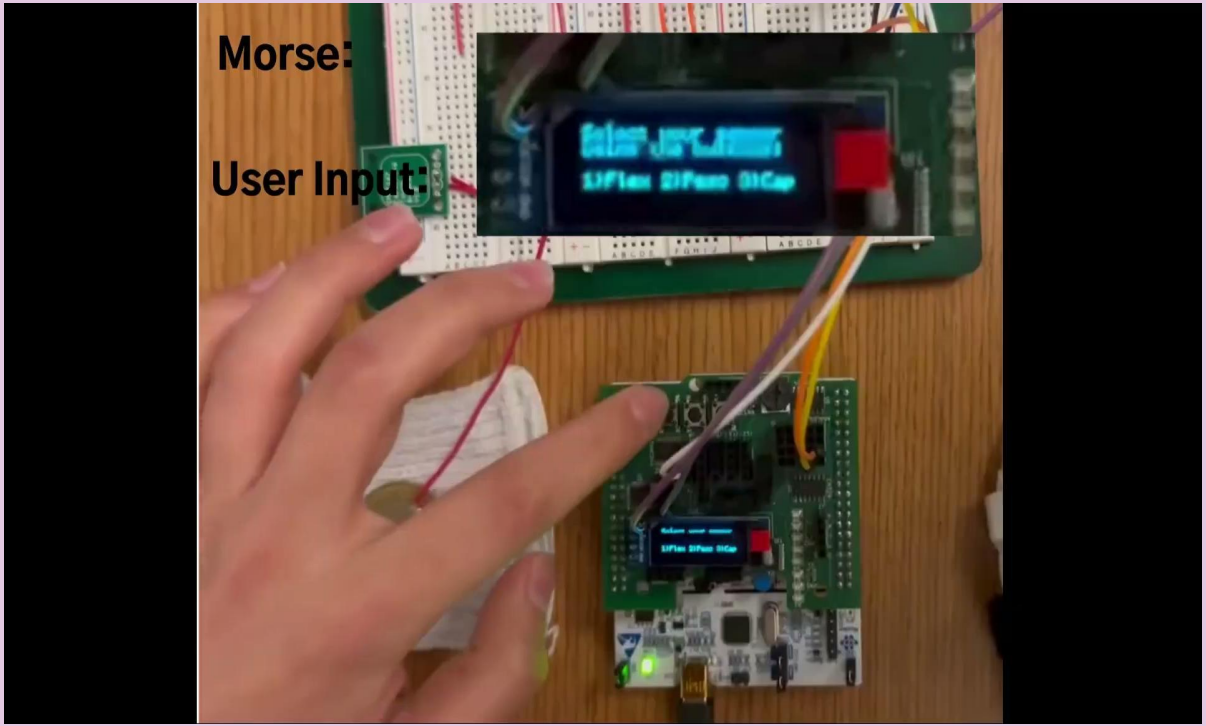
Schematic



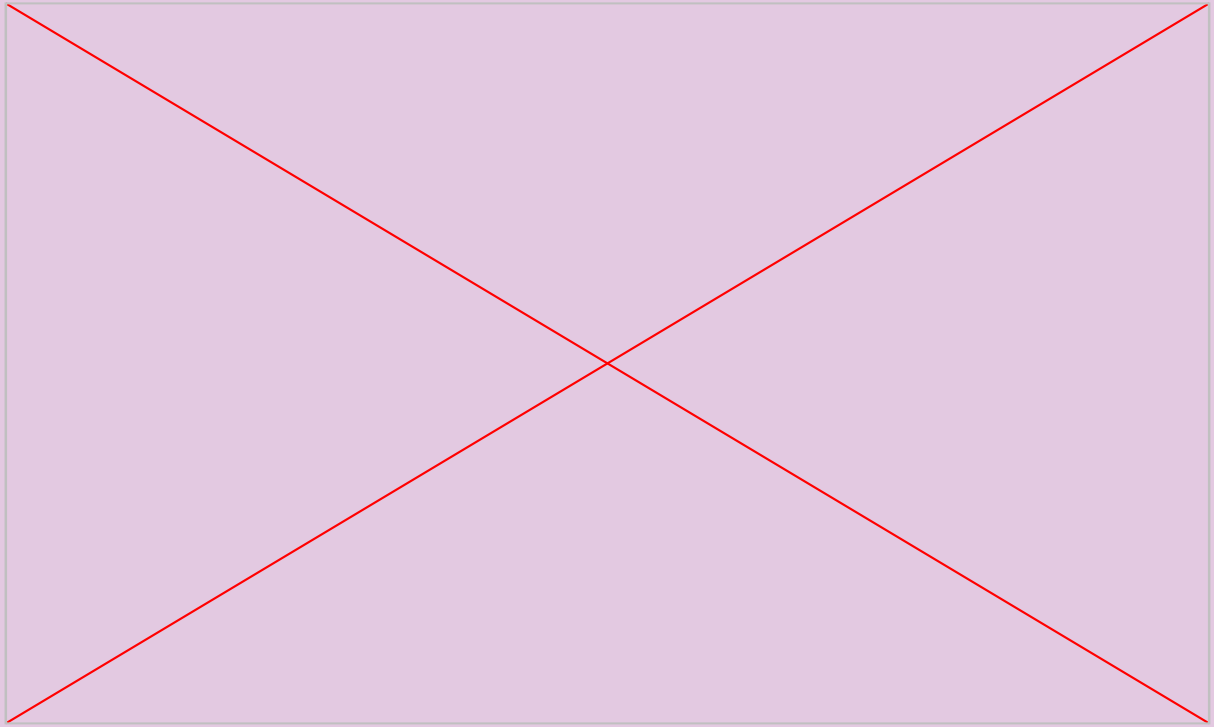
Demo for CapTouch



Demo for Peso



Demo for Flex



Thank You
Or

T – H •••• A •– N –• K –•– Y –••– O ––– U ••–

CapTouch Interface

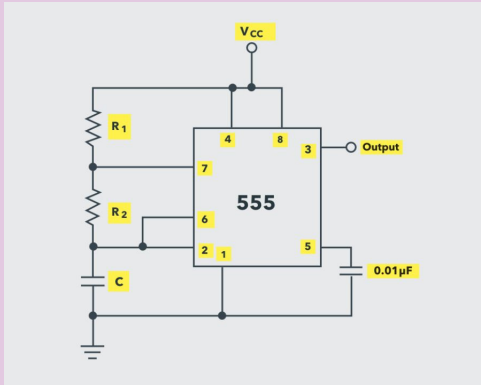
Capacitive Touch Sensors

- Detect changes in capacitance when a conductive object (e.g. human finger) comes close or touches.
- This occurs when distance, *d,* between plates changes, thereby altering *C*.

$$C = \frac{\varepsilon_r \varepsilon_0 A}{d}$$

LM555 - Astable Mode

- Popular IC used as a timer or pulse generator.
- Astable mode generates a free running square wave oscillator.
- Frequency is controlled by external resistors and capacitors.



$$f = \frac{1.44}{(R_1+2R_2)*C}$$

Homemade CapTouch using Peso

Idea

- A coin, like a peso, can act as one plate in a capacitor, with the human finger as the other.
- Potentially convenient for transmitting morse Code messages.

Implementation Challenges

- The changes in capacitance were much larger than that of the lab CapTouch (*More* sensitive).
- As a result, it caused greater changes to the oscillators frequency.
- Touch detection became unreliable.

Solution

- Since changes in capacitance were greater, the way around was to simply increase magnitude of C.
- C was raised by a magnitude of 10^3 times the original configuration.
- Results were reliable and sensitivity of Peso became manageable.