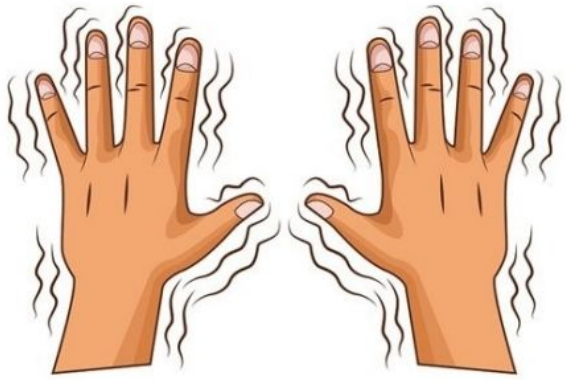
ENGI 301

Tap Test Device Proposal

2/25/24

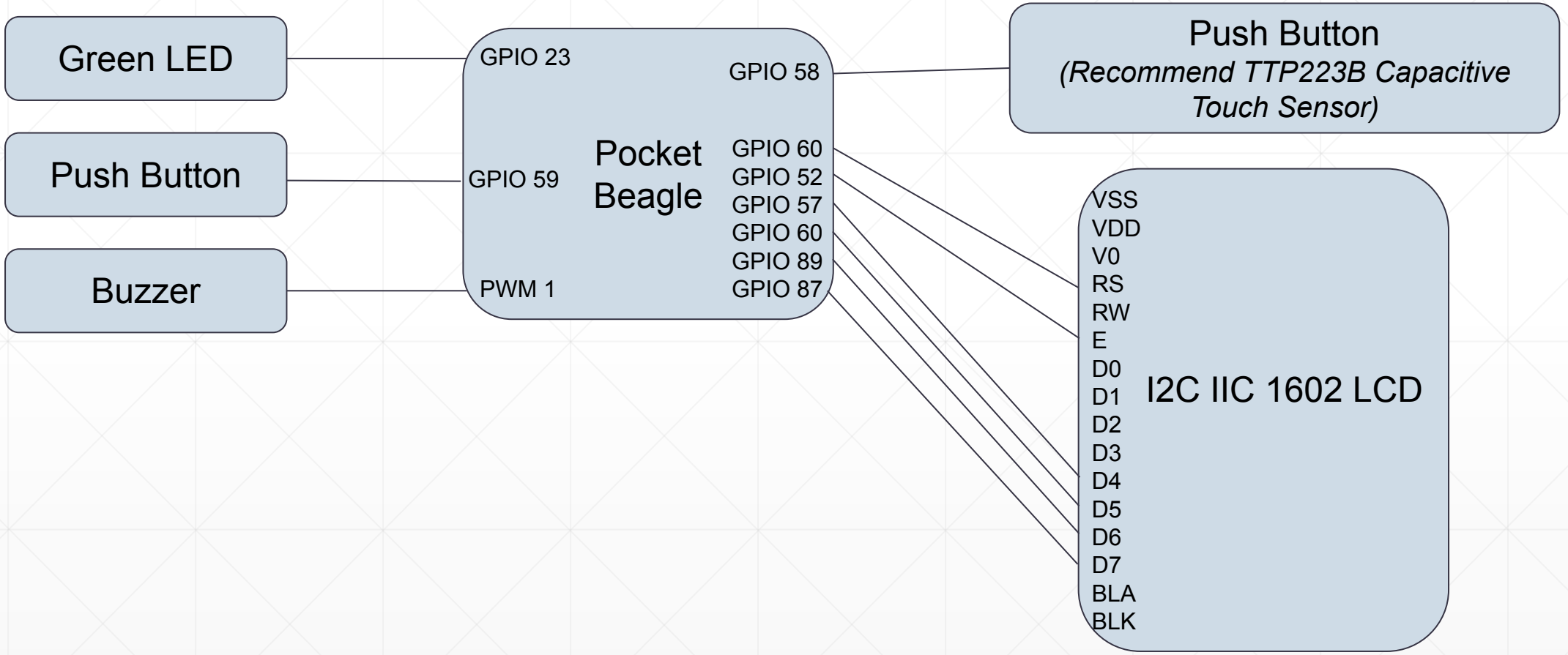
Gloria Ni

Diagnosing Severity of Hand Tremors

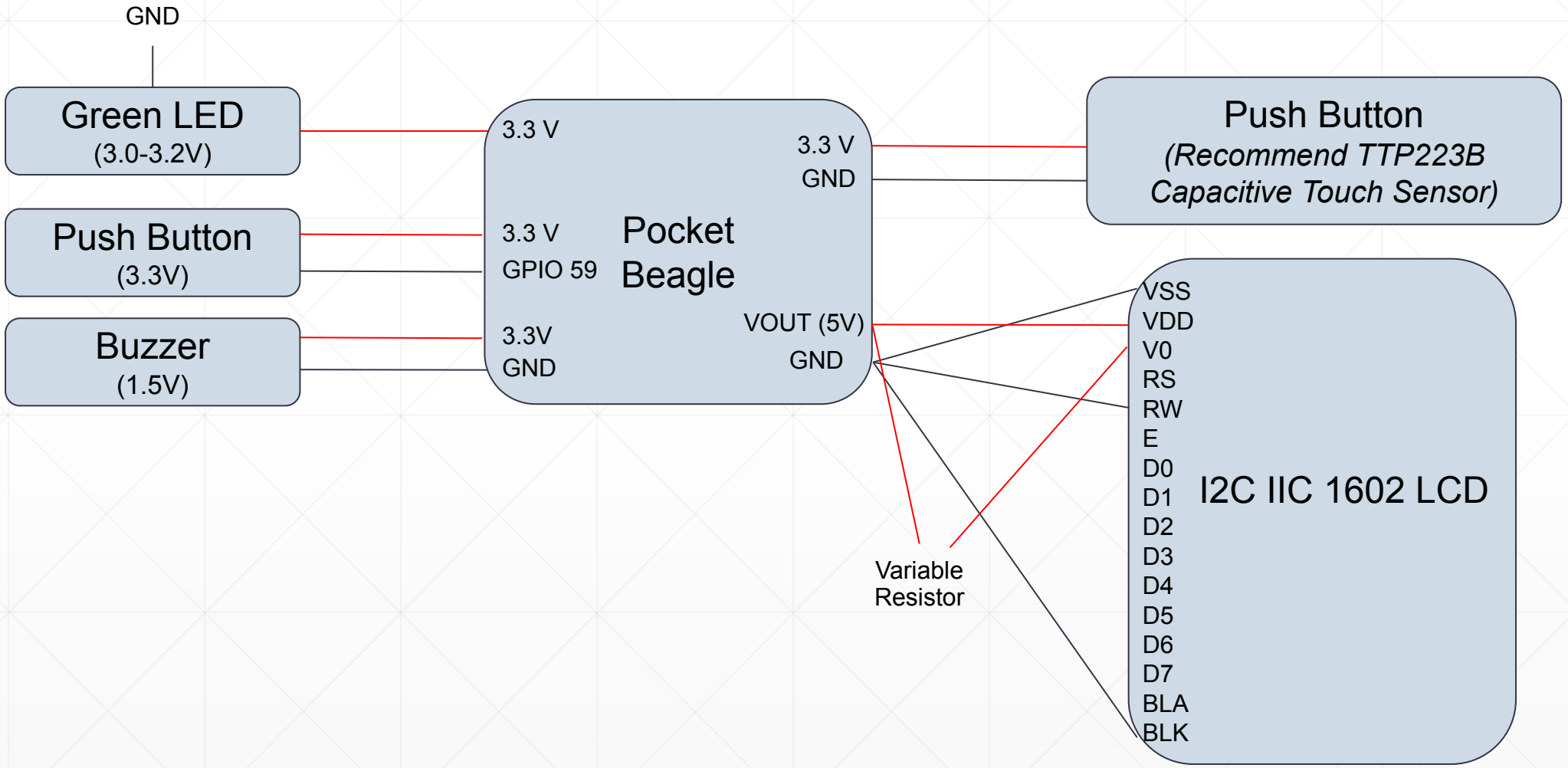


- Current Solution: The “Tapping Test”
  - Used to screen for tremors and ataxia (presence)
  - Part of the Assessment and Rating of Ataxia (SARA)
  - Procedure:
    - Patient takes a pen and repeatedly taps it as fast as they can
    - Doctor listens to the speed and degree of regularity of the rhythm
  - Issue: very subjective – can be used to detect if there is a problem but not so much the severity of it
- Device Goals
  - Allow doctor to quantitatively assess severity of tremor
    - Provide overall mean tapping frequency
    - Provide standard deviation and range in tapping frequency
  - Provide an intuitive user interface for both the patient and the doctor
    - LCD screen to display results to the doctor
    - LED to signal to the patient when to start or stop tapping
  - Low cost → increased accessibility compared to motion sensors

System Block Diagram



Power Block Diagram



Components / Budget

Component	ENGI301 to Buy?	Cost
TTP223B Digital Capacitive Touch Sensor	Yes	8.49
Green LED	No	4.98
I2C IIC 1602 LCD Display Module	Yes	10.99
Push Button	No	8.68
400Hz Mini Buzzer	Yes	8.99
Total		28.47

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Software Block Diagram

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Classes & Functions

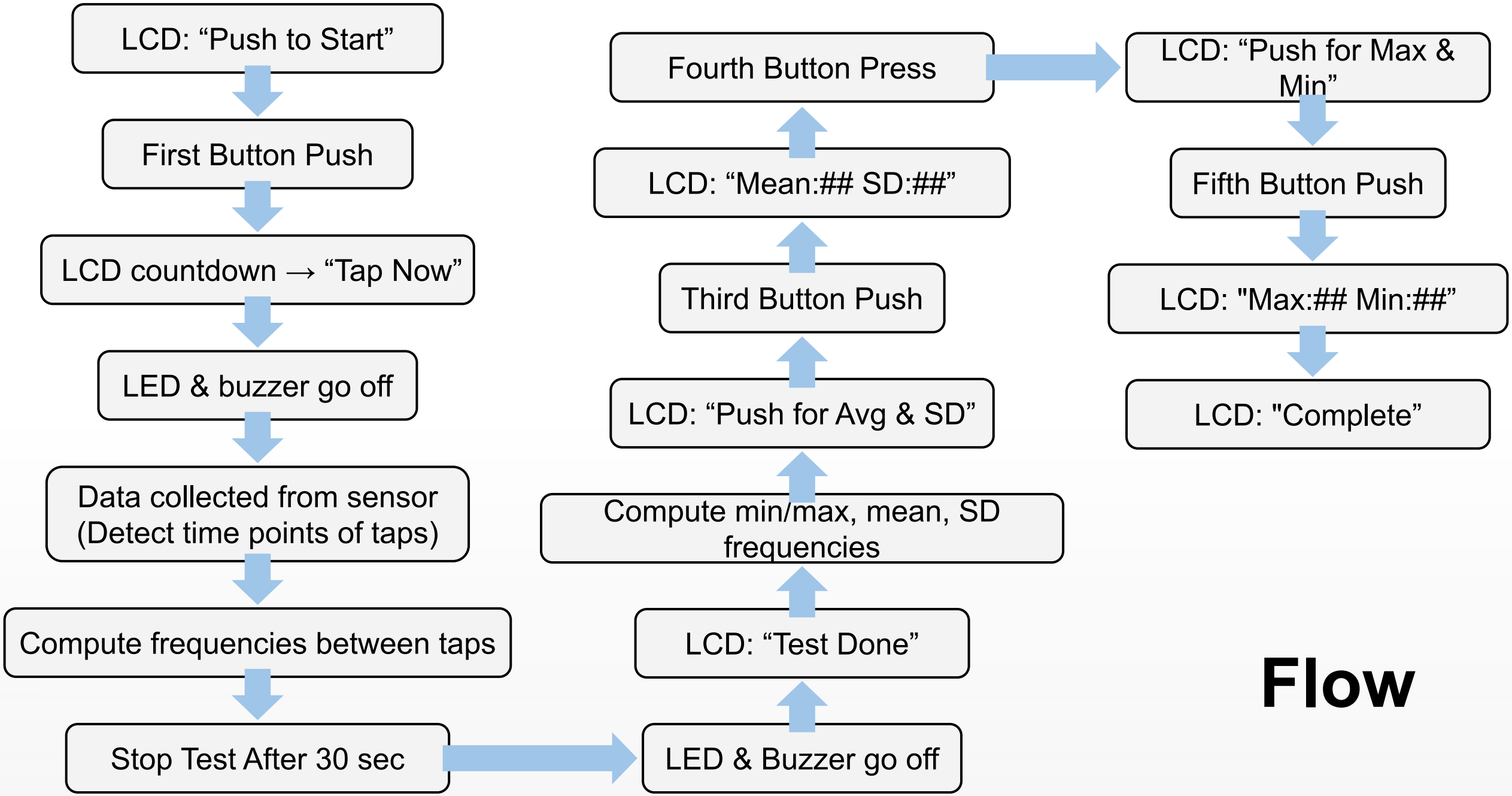
button:
wait_for_press- waits for button to be pressed
is_pressed- determines whether button is pressed

buzzer:
play- plays noise
stop- stops noise

led:
on- turn light on
off- turn light off

display:
blank- turns off all LEDs
countdown- display 5 second countdown
text- update display with text
data- update display with frequency data

sensor:
wait_for_tap- waits for tap
is_tapped- determines whether sensor is tapped
tap_time: determines last time point when sensor was tapped


LCD: “Push to Start”
First Button Push
LCD countdown → “Tap Now”
LED & buzzer go off
Data collected from sensor (Detect time points of taps)
Compute frequencies between taps
Stop Test After 30 sec
LED & Buzzer go off
LCD: “Test Done”
Compute min/max, mean, SD frequencies
LCD: “Push for Avg & SD”
Third Button Push
LCD: “Mean:## SD:##”
Fourth Button Press
LCD: “Push for Max & Min”
Fifth Button Push
LCD: "Max:## Min:##”
LCD: "Complete”
Flow