


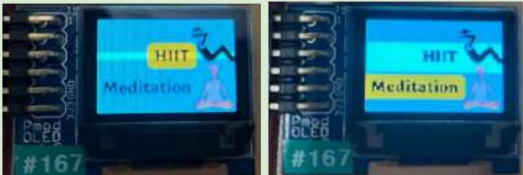





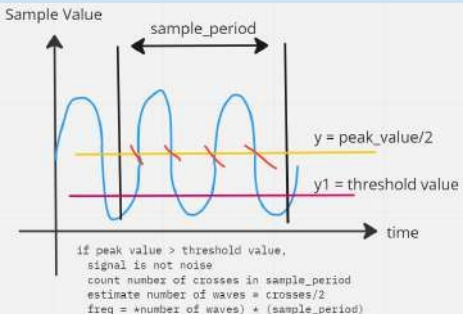

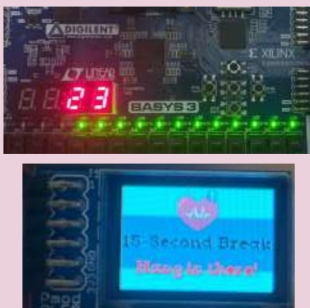




Feature	Description	Images/Photos
Student A - Nicholas: OLED Basic Task A + AVI2A	Enable by switching on sw[0]. Press the UP button successively with a 3s delay to draw up to 4 green borders before returning to the originally drawn borders. Created 6 different ranges for the volume levels and displayed them on LD0 to LD4.	
Student B - Lip Kuang: OLED Basic Task B + AVI2B	Enable by switching on sw[1]. Press the DOWN button successively with a 5s delay to draw up to 5 rectangles before returning to the originally drawn borders. A value between 0 and 5 is displayed AN0 of the 7-segment display.	
Team: AVI1 +AVI3	Find peak intensity value within regular time intervals and displayed levels 0 to 5 on the OLED Display based on real-time volume level.	
Student B: Chng Lip Kuang - Personal Improvement Features		
Main Menu Functionality	Toggleable main menu screen. Users can toggle between the HIIT and meditation options . User begins with the Meditation option. To switch to the HIIT option, press btnU. To switch back to the Meditation option, press btnD. Press btnC to select the feature the user is currently on.	
Master reset state	Enable by switching on sw[15]. Sets all registers back to their original values of 0, 1 etc. Each time a reset is done, OLED screen will display the default main menu screen and all functions will be reset to their original states .	
Menu State Indicator	Displays “NENU”, which stands for menu on the 7-segment display while the user is in the main menu . Displays “DEBG” whenever sw[0] or sw[1] is switched on(OLED tasks A and B) to represent that debug functions are currently in use .	
HIIT Landing Page + Routine Picker	From the landing page, the user can enter the routine picker page. From there, choose between two HIIT workout routines . Each routine has a different set of exercises. Press btnU, btnD to toggle between routine 1 and routine 2.	
Student A: Yek Jin Teck, Nicholas - Personal Improvement Features		
Meditation Menu	Choose between two options for the meditation exercise. Press the btnU and btnD respectively to toggle between EASY and HARD meditation exercises. EASY meditation requires humming at a lower frequency, while HARD meditation requires humming at a higher frequency.	
Meditation Feature	To meditate, one must hum at a certain relaxing frequency range into the device’s microphone. The device will detect the humming frequency and instruct the user to go up in pitch, down in pitch or maintain their pitch as necessary via the OLED display.	

	<p>The feature uses a zero crossing frequency counting approach. It counts zero-crosses with a sample_period 0.005s and approximates frequency via $f = (\text{crosses}/2) * (\text{sample_period})$. It is resistant to changing amplitude and ambient noise by filtering out signals that are too soft and dynamically setting the sampling's midpoint</p>	
Meditation Visual Helpers	<p>The frequency state is displayed on the 7-Segment display and LEDs for the user to easily identify what frequency they are humming at and what adjustments they need to make.</p> <p>The segment display shows concise instructions based on the detected frequency. It shows HI when frequency is too low, LO when the humming is too high, and "--" otherwise.</p> <p>The LEDs correspond to the binary value of the frequency that the meditator is humming at.</p>	
Team Improvement Features		
HIIT Countdown	<p>The HIIT countdown has 2 states: WORK and REST. The segment display shows the time remaining for the HIIT set. For better user experience, a progress bar is made using the LEDs are all lit up and slowly turn off sequentially as the time runs out. The HIIT workout is split into 4 sets of 30s work, 15s rest Work Cycle.</p> <p>Once the WORK phase is done, the REST phase kicks in. It will count down to 15s. The process is repeated until all exercises have been completed.</p>	
HIIT Exercise Display	<p>For a rich user experience, exercises are displayed on the OLED with animation to instruct the user on what exercise to do and how to do it.</p> <p>There are 4 exercises for each routine, with a 15s break in between each working set. Each exercise is unique and helps users to achieve a well-rounded workout.</p>	
HIIT End Screen	<p>When the HIIT execution has terminated, to improve user friendliness an end screen is displayed with instructions to go back to the main menu.</p>	

Feedback:

Nicholas: The lab components were very fun and useful in consolidating what we have learnt tangibly. Sometimes the lab feels quite disconnected from the theory. For part 2 lecture, “completed” slides could be released with all the diagrams at the end of the week to benefit those who cannot draw the diagrams nicely (no ipad or stylus). This will help revision greatly.

Lip Kuang: Overall it is a good learning opportunity to learn more uses of Vivado outside of what was taught during labs. Similarly, I feel that the lab component is quite disconnected from what is taught during tutorials.