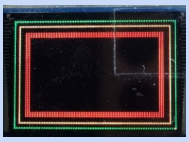
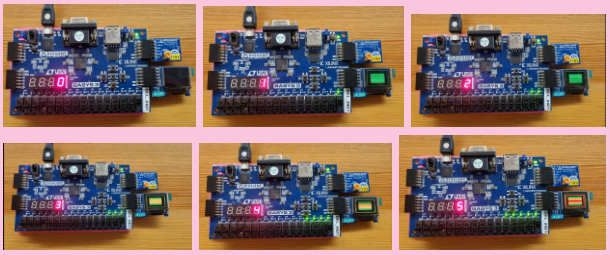
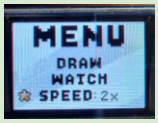
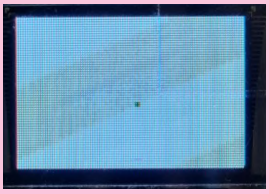
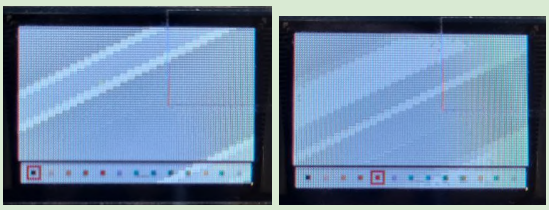
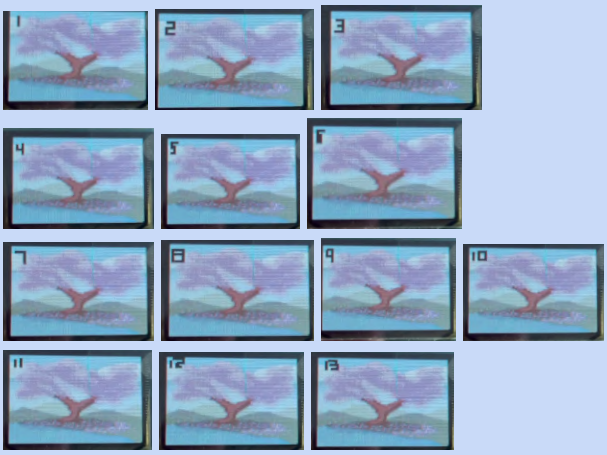
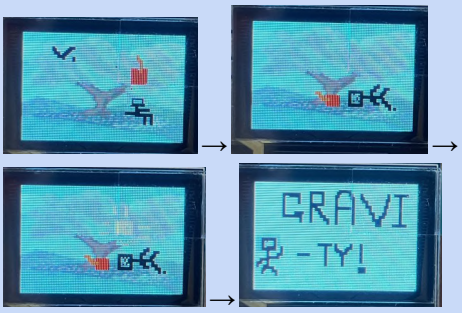
User Guide

Brief Feature Name	Feature Description	Images/Photos
Student A: Ong Zhi Hong OLED Task A Borders	**SW[11] & SW[12]** = 1: Show borders **SW[12]** = 1: Hide borders	 Show borders  Hide Borders
Student B: Alfred Leong OLED Task B Bars	**SW[10] & SW[11] & SW[12]** = 1: Show bars **SW[9] & SW[10] & SW[11] & SW[12]** = 1:Hide orange bar	 Show bars  Hide orange bar
Team Audio Volume Indicator	**SW[0] & SW[12]** = 1: AVI mode	
Student B: Alfred Leong Main Menu	Main Menu is displayed after programming device, where the Star represents user's current selection. **btnU**: moves Star up, capped at Draw option **btnD**: moves Star down, capped at Speed selection When user moves Star to Speed selection option, **btnL** and **btnR** can be used to move left or right respectively to select 1 out of 3 Watch speeds: 0.5x, 1x or 2x speed. There is no right/left limit if **btnL or btnR** is held down. When user moves Star to Draw or Watch option, **SW[14]** = 1: Enters selected option	 Draw option  Watch option  0.5x speed  1x speed  2x speed
Team Draw Mode	Neon green cursor represents current location **btnU, btnD, btnL, btnR**: Used to move cursor up, down, left and right respectively When only **SW[14]** = 1 (to enter Draw mode), user is in Move state ie. moves cursor around, but nothing will be drawn on the screen **SW[2] & SW[14]** = 1: Continuous Draw state ie. selected colour will be displayed along the cursor's path while moving cursor around **SW[3] & SW[14]** = 1: One Pixel Draw state ie. when **btnC** is pressed, selected colour will be displayed at cursor's location **SW[1] & SW[2] & SW[14]** = 1: Erase state ie. colour will be erased along the cursor's path, returning to white colour **SW[14] & SW[15]** = 1: Clears screen of all colours, displays a white screen Default white background can also be replaced by 3 custom backgrounds with these steps. 1. **X & SW[14] & SW[15]** = 1 2. Switch off **SW[15]** 3. Switch off **X** **X = SW[6] & ~SW[7]**: Desert **X = ~SW[6] & SW[7]**: Oasis **X = SW[6] & SW[7]**: Sakura Tree	 Start/Clear Screen  Continuous Draw state  One Pixel Draw state  Erase State  Drawing with custom background

Student B: Alfred Leong Colour Menu in Draw Mode	While in Draw Mode, **SW[13] & SW[14]** = 1: Display Colour Menu **btnL and btnR** can be used to move to select 1 out of 13 colours, capped at the most left and right. Selected colour is indicated by a red border. When **SW[13]** is turned off, the user can start to draw using the selected colour.	 Navigating colour menu with btnL and btnR
Student A: Ong Zhi Hong Image Saving and Compression	While in Draw Mode, **SW[4] & SW[14]** = 1: Compress and save current screen as a frame **SW[5] & SW[14]** = 1: Delete most recent frame Using BRAM for 7.25 frames worth of memory, the module can store 13 frames of memory in bad cases where the frames are rather detailed with adjacent pixels having different colours very often (tested with sakura tree). For simpler drawings with just our provided colour palette, much more frames can be stored.	
Student A: Ong Zhi Hong Watch Mode (Reconstruct saved frames)	After selecting desired Watch speed, move to the Watch option in the Main menu and turn on **SW[14]** to enter Watch Mode. Saved frames will start to play repeatedly from frame 1 to frame n based on the selected speed, where n = number of saved frames. Selected speed of 0.5x has an interval of 0.25s, 1x has an interval of 0.5s and 2x has an interval of 1s per frame.	 Watching frame 1 to frame n, where n = 4
Team Noise Detector of Area over time	Detects if an environment is noisy or not by displaying preset images. The order of display is Desert → Oasis → Sakura Tree. For every X seconds that passes, if input mic volume has not gone above the next level's threshold value, the OLED screen will change display. If input mic volume goes above the threshold value of current level at any point, display will go back by one level ie. Oasis → Desert. The deeper the level, the lower the threshold value ie. Sakura Tree has the lowest threshold value. **SW[0] & ~SW[1]** = 1: X = 3600 **SW[0] & SW[1]** = 1: X = 10	 Watching Desert → Oasis → Sakura Tree

References: Single Port BRAM Module Code from element14. (Dual port BRAM module is adapted from this)
https://community.element14.com/challenges-projects/design-challenges/summer-of-fpga/b/blog/posts/number-plate-recognition-3-implementing-block-ram-using-verilog