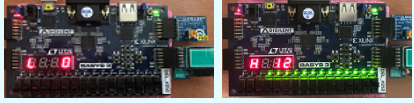

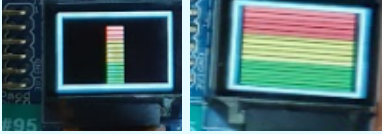

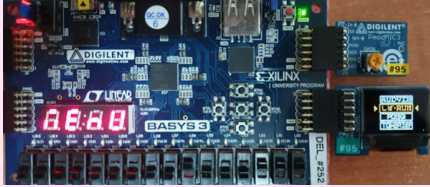
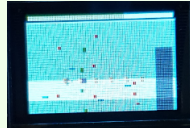
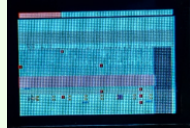
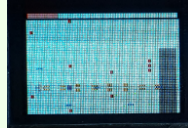
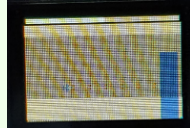
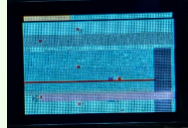



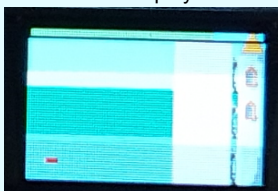


Quick Start Guide:

Feature	Feature Marks For	Input Devices	Feature Description	Images/Photos
Real Time Audio Volume Indicator	Marcus	PmodMIC3 sw[1:0]	7-seg displays volume, from 0 to 16. sw[0]: Displays peak volume if ON or mic_in if OFF. sw[1]: Displays L/M/H on 7 seg, depending on peak volume if ON	
Graphical Visualisations and Configurations	Yijie	PmodMIC3 sw[6:2]	sw[3:2]: Controls border width: <ul style="list-style-type: none"> 2'b00 : hide border 2'b01 : 1 pixel 2'b10 : 2 pixels 2'b11 : 3 pixels sw[5:4]: Controls color scheme: <ul style="list-style-type: none"> 2'b00 : default 2'b01 : blue 2'b10 : green 2'b11 : purple sw[6]: Displays volume OLED bars if ON	 Border Sizes  Color Themes(Blue, Green, Purple)
Audio Visualiser (AUDVIS) Improvements	Marcus	PmodMIC3 btnC btnL btnR btnU btnD	btnC: PRESS to reset changes, HOLD to exit to menu. btnL: PRESS to move volume bar 1 pixel to left,, HOLD to move volume bar 24 pixels a second to left. btnR: PRESS to move volume bar 1 pixel to right,, HOLD to move volume bar 24 pixels a second to right. btnU: PRESS to increase width of volume bar by 2 pixels, HOLD to increase width of volume bar by 48 pixels a second. btnD: PRESS to decrease width of volume bar by 2 pixels, HOLD to decrease width of volume bar by 48 pixels a second. Note: Changing the border size will resize/ displace the volume bar if the volume bar would overlap the border.	
AUDVIS Waveform Visualisation	Yijie	PmodMIC3 sw[7]	Description: In this mode, AUDVIS displays a 24hz waveform representing volume, instead of a single 10hz volume bar. Other than the buttons, AUDVIS controls apply to this mode as well. sw[7]: Toggles to this mode from AUDVIS if ON.	
Menu	Team	sw[5:4] btnC btnU btnD	7-seg displays MENU. sw[5:4]: Controls color scheme: <ul style="list-style-type: none"> 2'b00 : default 2'b01 : blue 2'b10 : green 2'b11 : purple btnC: Enters selected feature. btnU: Moves selection up. btnD: Moves selection down.	
ShibaRun	Team	PmodMIC3 sw[8:6] btnC btnL btnR btnU	7-seg displays score. Score increases by 10/s. Game Description: Shiba has to jump to avoid obstacles. Obstacle speed increases over time. sw[6]: Pauses the game if ON. sw[7]: Engages easy mode if ON. Larger gaps in the obstacles. sw[8]: Engages cheat mode if ON. Shiba magically phases through obstacles. btnC: PRESS to reset game, HOLD to exit to menu. btnL: HOLD to move shiba 24pixels/s to the left. btnR: HOLD to move shiba 24pixels/s to the right. btnU: PRESS for shiba to jump, HOLD to slow shiba's descent. PmodMIC3: While btnU is held, making noise will cause shiba to fly.	  Easy Mode Hard Mode
Secret Code	Yijie	btnC btnL btnD btnU btnR	From the menu, press the buttons U-D-L-R-C-C-L-R in order and within a 0.33s interval between each press to enter a secret game.	

Secret Game	Yijie	PmodMIC3 sw[2:1] sw[8:6] btnC btnL btnR btnU btnD	7-seg displays SCRT. Game Description: Control a fighter jet and defeat the boss while dodging all enemy attacks. Boss has 5 attacks in total; normal, spread, homing and wave bullets, as well as a beam attack. sw[1]: Deploys BOMB if flipped to ON. (sw[1] has to be flipped from OFF to ON). BOMB destroys all enemy projectiles. Single-use. sw[2]: Deploys BEAM if flipped to ON. (sw[2] has to be flipped from OFF to ON). After charging, it deals heavy damage to the boss. Single-use. sw[6]: Pauses the game if ON. sw[7]: Engages easy mode if ON. Boss will not utilise homing, wave and beam attacks. sw[8]: Engages cheat mode if ON. Jet magically phases through enemy attacks, unlimited BOMB and BEAM. btnC: PRESS to reset game, HOLD to exit to menu. btnL: HOLD to move jet 24pixels/s to the left. btnR: HOLD to move jet 48pixels/s to the right. btnU: HOLD to move jet 48pixels/s upwards. btnD: HOLD to move jet 48pixels/s downwards. PmodMIC3: Bullets fired by the player jet become bigger and do more damage depending on volume level. Size of the bullet is determined by volume at instantiation.	 Gameplay  Boss Beam Attack  Bullets@max vol  Player BOMB  Player BEAM <div>Boss Attacks: -Blue: Normal -Red: Spread -Purple: Homing -Green: Wave -Pink: Beam</div>				
PONG!	Team	PmodMIC3 sw[6] btnC btnL btnR	7-seg displays PONG Game Description: Control a paddle and play single-player PONG against the computer controlled-opponent. Ball travels 24pixels/s in each direction (up, down, left, right), by default. Upon collision with the edge of the paddle (marked in yellow), the ball travels at a steeper angle (48 pixels/s in left or right direction). sw[6]: Pauses the game if ON. btnC: PRESS to reset game, HOLD to exit to menu. btnL: HOLD to move the user's paddle 24pixels/s to the left. btnR: HOLD to move the user's paddle 24pixels/s to the right. PmodMIC3: When attacking, the user can blow into the mic (to increase volume level drastically) to simulate blowing the ball. Ball will travel 72pixels/s in up direction.	 Gameplay  Hitting ball with yellow edges of paddle causes steeper ball travel				
Tower Defence	Marcus	PmodMIC3 sw[6] btnL btnU btnC btnD	7-seg displays 2 details: <table><tr><td>Number of force fields (F)</td><td>F</td><td>Score</td><td>Score</td></tr></table> Game Description: Defend the tower by activating the soldiers at the defence line whenever an enemy arrives. Enemies come randomly in three different lanes (air, land, sea) at gradually increasing speeds and deal increasing damage to the tower. Game is won when more than 50 enemies are defeated. sw[6]: Pauses the game if ON. btnL: PRESS to reset game, HOLD to exit to menu. btnU: Activates the air soldier to kill the enemy if in range. btnC: Activates the land soldier to kill the enemy if in range. btnD: Activates the sea soldier to kill the enemy if in range. PmodMIC3: Creates a force field which protects the soldiers and tower by killing enemies on contact. Force fields generate once every 5.29s, and they last 1 second.	Number of force fields (F)	F	Score	Score	 Gameplay  Purple force field activated in front of tower
Number of force fields (F)	F	Score	Score					

Feedback:

This project was extremely fun as it gave us a lot of exposure to how different systems like the PmodMIC3 and Oled display can be integrated with the Basys3 FPGA. Growing up playing console games such as on the PlayStation Portable (PSP), this project also gave us a chance to programme simple 8 bit-style games and features on a console-like platform. However, one improvement for this would be the project duration. We feel that more time should be given such that students are able to create more interesting and intricate features, and this could possibly be achieved by reducing time given for lab 1 and 2 assignments, as they were relatively straightforward. Also, another improvement could be providing one set of PmodMIC3 and Oled Display screens for each of the students, as we found it quite hard to work on the team features.

References:

<https://ee-programming-notepad.blogspot.com/2016/10/16-bit-color-generator-picker.html>
<https://javl.github.io/image2cpp/>

//for color codes

//for conversion of images to .mem files