

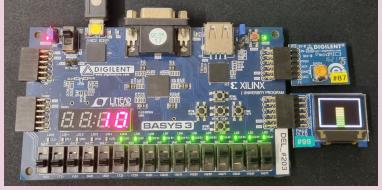
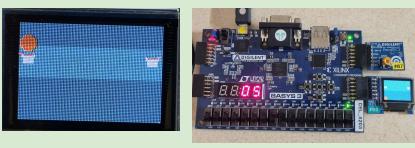
## S2\_16\_Lee Keng Yong Joshua\_Muhammad Ashraf B Mohamad J\_Report

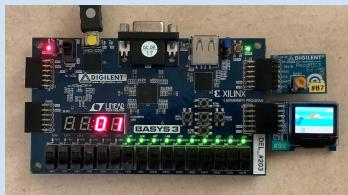
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**Lab Session: Tuesday A.M.**

**Group ID: S2\_16**

Feature	Feature Marks For	Input Devices	Feature Description	Images / Photos
Real-Time Audio Volume Indicator	Joshua	SW[0], SW[1], MISO	SW[0]: If '0', LED[0:15] will indicate the amplitude of the sound that MISO is registering. If '1' LED[0:11] will all light up based on the value of sample[11:0]. SW[1]: If '0', an[2:3] will display the amplitude volume from 0-15. If '1', an[3] will display, L, M or H depending on the volume amplitude.	
Graphical Visualisations and Configurations	Ashraf	SW[2], SW[3], SW[4], SW[5], btnL, btnR, btnC	SW[2]: If '1', on border else off border SW[3]: If '1', border is 3 pixel thick else border is 1 pixel thick SW[4]: If '1', Volume Bar is displayed else off Volume Bar SW[5]: If '1', Alternate Colour Theme is displayed for Graphical Visualisation else Default Colour Theme When btnC is pressed, the screen will reset itself. When btnL or btnR is pressed, the volume bar will move left or right respectively until it has reached either end of the OLED screen. (SW [6:15] has to be off for the visualisation to be displayed on OLED)	
User-Friendly Sound Display and Entertainment System	Team	SW[0], SW[1], SW[2], SW[3], SW[4], SW[5], btnL, btnR, btnC, MISO	This feature integrates both Real-Time Audio Volume Indicator and Graphical Visualisation and Configurations features. Users can refer to the guides mentioned above to set the OLED, AN and LED according to their desired preference. MISO: When MISO registers a sound, depending on which switches are activated, all the LED, AN and OLED will display the relevant information as picked by the user.	
Volume Wave	Ashraf	SW[6], MISO	SW[6]: If '1' while SW[7:15] are '0', OLED will display Volume Wave. When a sound is captured by MISO, its volume will be displayed on the leftmost bar on the OLED. The volume level will continuously be passed to the adjacent volume bars until the rightmost bar. The leftmost bar will continue to show the current volume level of the sound detected by MISO.	
Pikachu Mask	Ashraf	SW[7], MISO	SW[7]: If '1' while SW[8:15] are '0', Pikachu's face will appear. When MISO captures an increase in volume (e.g. when it is blown at), Pikachu will wear a mask with increasing levels. At the loudest volume level captured, Pikachu will wear a full face mask.	
Basketball Game	Ashraf	SW[8], btnL, btnR, btnC, MISO	SW[8]: If '1' while SW[9:15] are '0', Basketball Game will start. Users can blow into the mic to lift the ball and use btnL to move the ball left and btnR to move the ball right. Users will aim to drop the ball between the hoops located on the sides of the OLED display. When the ball successfully goes through either hoop, the points on the seven segment display will increase by 1. Users can also reset the score to 00 by pressing btnC.	

Dinosaur Game	Joshua	SW[9], MISO, btnC, btnU, btnD	<p>SW[9]: If '1' while SW[10:15] are '0', OLED will display Dinosaur Game. Press btnC to begin playing the game. Produce sounds more than 5 units, defined in part A, into the microphone to make the dinosaur jump to avoid the obstacles that are coming in its way. If the user produces a sound of 15 units, and the dinosaur hits the top edge of the screen, the user may no longer produce any volume to cause the dinosaur to jump until it touches the ground again. btnU and btnD can also be used to increase or decrease the height of the block respectively. If the dinosaur comes into contact with an obstacle, the screen will turn white and the user will have to press btnC to restart the game. If the dinosaur successfully clears an obstacle, the 7-seg display will increase by 1 up to 99, and will display "00" when resetted.</p>	 
Ping Pong Game	Team	SW[10], SW[11], MISO, btnL, btnD, btnR, btnU, btnC	<p>SW[10]: If '1' while SW[11:15] are '0', OLED will display Ping Pong Game. If SW[11] is '0', the game will be in single player mode where the player (left paddle) will play against the AI (right paddle). The player can use btnU and btnD to move the paddle up and down respectively. If SW[11] is '1', the game will be in two-player mode. Player 1 (left paddle) can use btnL and btnD to move the paddle up and down respectively while Player 2 (right paddle) can use btnU and btnR to move the paddle up and down respectively.</p> <p>Features in both modes: The scores for each player and AI will be displayed on the seven segment display and players can play up to 10 points. When a player scores a point (ball touches the vertical side of the OLED), the ball will return to the centre and player can press btnC to start moving the ball. When a player reaches 10 points, the current game will stop and the winner will be displayed on the seven segment display (e.g. -P1-). To restart the game, the player can press btnC for 3 seconds. The game can also be paused by pressing btnC for a short amount of time. There are 3 levels of ball speed in both player modes and players can select the mode by making a loud sound to the MISO (e.g. snapping fingers). The levels are indicated by background colour, green, yellow, red, in order of slowest ball speed to fastest.</p>	   

### Feedback:

This project has been a fun experience overall. It has really allowed us to explore the various designs that we can implement on the FPGA with the addition of just a microphone and OLED display. It was a good summation of all the knowledge we have learnt from previous assignments where we learnt to use clocks and combinational/sequential logic. However, one area of improvement would be to provide each student with a pair of microphone and OLED display if possible. This is so that the students can produce even better designs or improvements without having to wait for their partner to hand over either one or both of the items, especially given the climate of the pandemic. The teamwork part can still be present even if each student has a full set of equipment but it makes the individual work easier as compared to one student not being able to quickly test with a proper set of equipment when needed.