Lab Session: Wednesday, 9 am
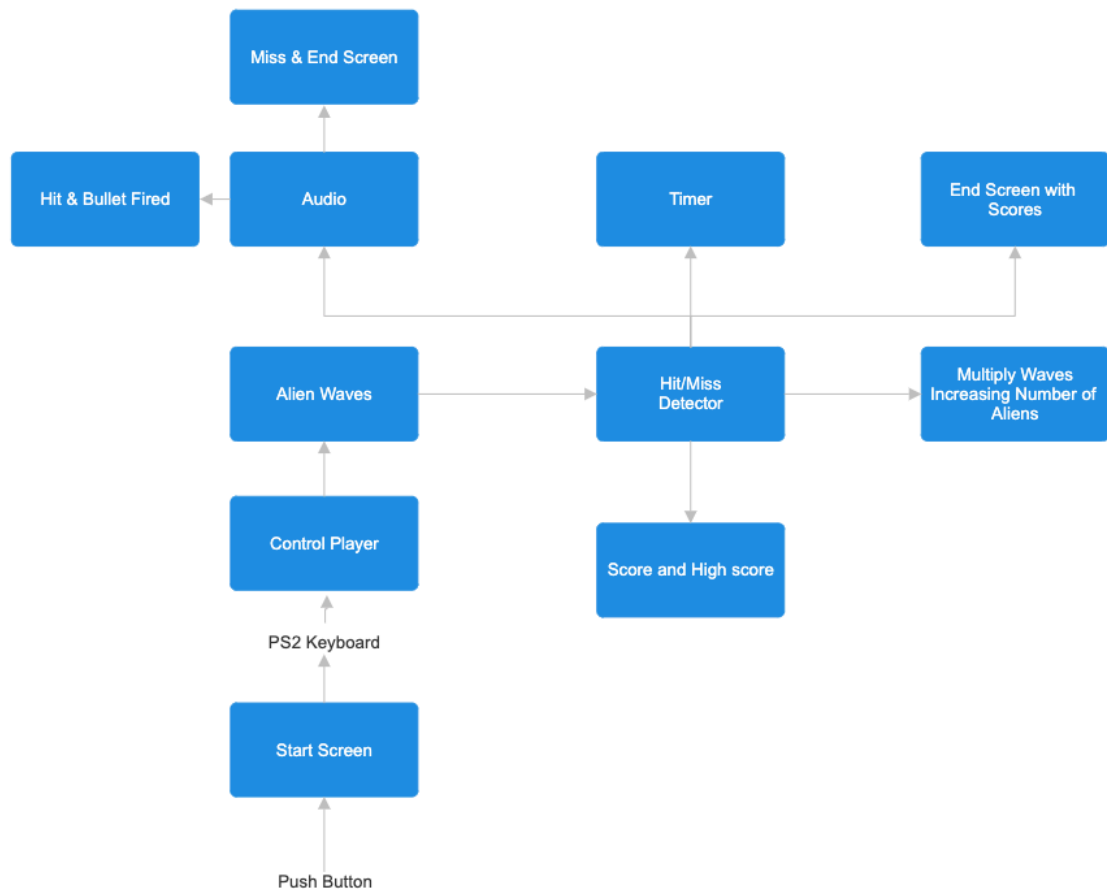Group 16: Mohammed Thariq Pasha, Pavel Smolovich

Space Invaders

Our project is a simplified version of the classic *Space Invaders* arcade game implemented on the DE1-SoC board using C. The game uses **VGA output**, a **PS/2 keyboard** for player input, **HEX- displays** for score tracking, and audio output for enhanced user experience. The objective is to shoot down aliens by controlling a player character at the bottom of the screen.

The player can move left and right using the 'A' and 'D' keys and shoot bullets by pressing the spacebar. Aliens are falling from the top of the screen, and the objective is to hit them to increase the player's score, audio sound effects are played to notify the player whether they hit or missed an alien. As the rounds progress the waves of aliens increase, making the game progressively more challenging. The score is displayed in real-time on the HEX displays in base 10 format.

How to Use

1. Compile and load the program onto the DE1-SoC board.

2. Press Key 0 to start the game.

3. Use the '**A**' and '**D**' keys to move the player left and right.

4. Press the **spacebar** to shoot a bullet upward. If you miss, wait until it reaches the top before shooting again. Aim carefully!

5. Hit any of the aliens with a bullet to earn a point.

6. Your score will appear on the top right of the VGA display.

7. A player can get as many as points possible in a minute or until an Alien reaches the end (which is Earth)

8. The Highscore will appear on the **HEX display.**

Block Diagram of Our Game

Miss & End Screen

Hit & Bullet Fired

Audio

Timer

End Screen with Scores

Alien Waves

Hit/Miss Detector

Multiply Waves Increasing Number of Aliens

Control Player

Score and High score

PS2 Keyboard

Start Screen

Push Button

Attribution Table

Contributor	Task Completed	Description of Task
Pavel Smolovich	Player movement	Dynamic player movement left and right on the bottom of the screen in real time controlled by the ps2 keyboard 'a' and 'd' keys.
	Bullet Firing	Dynamic bullet fired from the player from their current location using the ps2 keyboard spacebar key.
	Hit Detection	Dynamic boundaries of the aliens are detectable and checked whether a bullet is entered into its current location.
	Score Display	Display the current score of the player onto the DE1SoC 7-segment displays. Incrementing with each alien hit.
Thariq Pasha	Graphics Rendering, (making the waves and the Start and End Screen)	I made the start and end screens by polling them with key buttons (explained later) so the user could navigate to play the game.
		The waves were made to make the game more complex, so once a wave was over, the next wave would appear with more aliens and fall much faster!
	Score Display	Display the current Score while the game is being played, and updates when an alien is hit. The score and high score are also displayed on the end screen
	Audio	I was able to use audio for a bullet shot and when an alien died. I also used the Wilhelm scream from class once the player loses.
	Timer and HEX	Added a 60-second timer on the game to increase the intensity, if the player is still alive, game ends after 60 seconds. I implemented the timer and high score, both of which can be seen on the HEX
	KEY Buttons (For Start/End)	KEY 0 starts the game, and KEY 1 takes the user back to the home screen after they view the end screen.