UNIVERSITI UTARA MALAYSIA

SCHOOL OF COMPUTING

COLLEGE ARTS AND SCIENCE

STTHK2123 INTERACTION SYSTEMS & TOOLS

HIGH FIDELITY REPORT

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1. Introduction

The Enhanced Space Shooter project represents a significant evolution from traditional arcade-style games into the realm of modern interactive entertainment, integrating emerging technologies to deliver an immersive, intuitive, and engaging user experience. According to Ismail and Zin (2020), gesture detection systems combined with adaptive feedback mechanisms can significantly enhance user experience and immersion in digital games.

Building upon the foundational work outlined in our earlier project proposal, this high-fidelity report provides an in-depth look at the design, architecture, and implementation strategies used to bring our vision to life. The project emphasizes a user-centric design philosophy, ensuring that every element of the game, from gesture calibration to feedback mechanisms is built with the player's experience in mind. Players can interact with the game using either a keyboard or hand gestures, enhancing accessibility and promoting engagement through a natural interface (Nguyen, 2021).

The high-fidelity design phase focuses on creating detailed, interactive prototypes that simulate the final product's look, feel, and functionality. These prototypes go beyond static wireframes to demonstrate real-time feedback, control flow, and user interaction sequences. The complete user journey is carefully mapped beginning with the initial system calibration and tutorial, progressing through increasingly difficult levels, and culminating in leaderboard submissions that promote competitiveness and replayability.

This report encompasses multiple key components of the project which are user research and behavioural analysis that inform design decisions, requirement gathering and classification into functional and non-functional categories; system modeling, including UML diagrams to visualize actor-system relationships and backend processes; and prototyping and development, which showcase user interface designs, interaction mechanics, and control systems. Additionally, it outlines evaluation and testing strategies, including user persona profiling, A/B testing for interface alternatives, and usability analysis.

Overall, the Enhanced Space Shooter project reflects a holistic approach to game development, one that merges classic gameplay dynamics with modern interaction systems, ensuring that the final product is not only technically sound, but also emotionally engaging, cognitively stimulating, and socially rewarding.

2. Survey / Data gathering

2.1. Interaction aspects

After the process of development, the Space Shooter game incorporates a variety of interaction elements that focus on the cognitive, emotional, and social interaction aspects.

Section in Game	Cognitive Aspect	Emotional Aspect	Social Interaction Aspect
Main Menu Interface	During decision making, players must choose whether to enable Hand Gesture Mode, Keyboard Mode, or Tutorial Mode, and when to press Start or view the Leaderboard. This involves executive function and option evaluation.	The vibrant space-themed background, animated asteroids, and planet Earth appeal to the player's sense of excitement and adventure, enticing them towards the emotional experience and anticipation of the gameplay.	-
Hand Detection Screen	Focusing on the attention process, the user needs to pay attention to the screen and adjust their hand placement based on visual feedback such as green box and error message. This requires sustained attention and adaptive response to visual cues.	Visual feedback (green bounding box for success, error messages for failure) cause emotional reactions from satisfaction when detection works to frustration when it fails, affecting confidence and engagement from the player.	-
Hand Gesture Tutorial Screen	During the learning process, the players must learn how to learn and execute the Shaka sign, which requires fine motor skills and hand-eye	Successfully completing the tutorial and seeing the "Tutorial Complete" confirmation provides a sense of accomplishment and	-

	coordination, as well as the formation of a procedural memory.	readiness, building confidence for actual gameplay.	
Level Up System	In the decision making process, players have to decide when best to collect power-ups (shield versus lightning bolts) or plan which targets to prioritize (weaker versus stronger meteors based on color coding). All of this requires executive function and strategy.	That "LEVEL UP" indicator and those visual changes (growth of the spaceship and new meteor colors) also fulfil the promise of progress and achievement, engendering positive feelings of excitement and satisfaction.	-
Leaderboard UI	-	Players often get feelings of accomplishment, pride, or motivation to improve when they see their names on leaderboards (or personal scores). Hence, provoking an emotional investment into future sessions.	Players could compare scores with others, thus promoting a social competition among friends and engagement through shared achievement display.

2.2. List of requirement

Functional and Non-Functional Requirements

The following table 3.5.1 is the functional and non-functional requirements for Space Shooter Game System (SSGS). Each requirement is either a mandatory (**M**), or desirable (**D**), or an optional (**O**).

M – Requirement that the system must do

D – Requirement that the system preferably do

O – Requirement that the system may do

SPACE SHOOTER GAME SYSTEM

FUNCTIONAL REQUIREMENTS (SSGS)

No	Requirement ID	Requirement Description	Priority
	SSGS_01	**Main Menu navigation**	
Basic flow:			
1.	SSGS_01.1	User can choose option from the main page: 1. Leaderboard option 2. Gameplay option	M

No	Requirement ID	Requirement Description	Priority
2.	SSGS_01.2	When the user chooses the Leaderboard option, the system will go to **SSGS_05.**	M
3.	SSGS_01.3	When the user chooses the Gameplay option, the system will go to **SSGS_03**.	M
4.	SSGS_01.4	If there is no selection, the system will play the background music.	D
5.	SSGS_01.5	The system enables users to choose whether to play with keyboard mode or hand gesture mode.	M
6.	SSGS_01.6	The users can choose to turn on or off the tutorial mode.	M

No	Requirement ID	Requirement Description	Priority
	SSGS_02	**Hand gesture detection**	
Basic flow:			
1.	SSGS_02.1	The user turns on the toggle slider as well as the camera.	M
2.	SSGS_02.2	The system detects the user's hand before the game starts.	M

3.	SSGS_02.3	The user clicks the start button to start the game and place the hand toward the camera.	M
4.	SSGS_02.4	The user shows a Shaka sign and holds their hand in a neutral, upright position to keep the spaceship stationary.	M
5.	SSGS_02.5	The user rotates the hand to the left to control the spaceship's movement to the left.	M
6.	SSGS_02.6	The user rotates the hand to the right to control the spaceship's movement to the right.	M
7.	SSGS_02.7	The system controls the spaceship to shoot the meteor automatically when the meteor approaches the spaceship.	D
Exceptional flow:			
6.	SSGS_02.4.1	The system will display an error message to notify the user, if the camera cannot detect the hand.	D
7.	SSGS_02.4.2	If the user turns off the toggle slider, the system will go to **SSGS_06.**	D

No	Requirement ID	Requirement Description	Priority
	SSGS_03	**Tutorial system**	
Basic flow:			
1.	SSGS_03.1	The system displays the Shaka sign and tells the user to follow the hand gesture.	M
2.	SSGS_03.2	The user shows a Shaka sign and holds their hand in a neutral, upright position to keep the spaceship stationary.	M
3.	SSGS_03.3	The system displays the hand gesture that turns to the left and tells the user to follow the hand gesture.	M
4.	SSGS_03.4	The user tilts the hand to the left to control the spaceship's movement to the left.	M
5.	SSGS_03.5	The system displays the hand gesture that turns to the right and tells the user to follow the hand gesture.	M
6.	SSGS_03.6	The user tilts the hand to the right to control the spaceship's movement to the right.	M
7.	SSGS_03.7	The system displays the tutorial has been completed.	M

No	Requirement ID	Requirement Description	Priority
8.	SSGS_03.8	The system starts the game.	M

No	Requirement ID	Requirement Description	Priority
	SSGS_04	**Level Up**	

Basic flow:

No	Requirement ID	Requirement Description	Priority
1.	SSGS_04.1	The system will track the player's score in real-time during gameplay.	M
2.	SSGS_04.2	The system will trigger a level up when the score reaches a specific score.	M
3.	SSGS_04.3	The system should display a "LEVEL UP" indicator on screen upon leveling up.	D
4.	SSGS_04.4	The system will apply leveling up gameplay changes (e.g., firing rate, defense upgrade and size of spaceship) At score 1000: A blue meteor requires 2 hits to destroy. At score 2000: A green meteor requires 3 hits to destroy. At score 3000: A pink meteor requires 4 hits to destroy.	M

No	Requirement ID	Requirement Description	Priority
5.	SSGS_04.5	The meteors in the gameplay will become faster and more difficult when the score increases.	M
6.	SSGS_04.6	The system will provide visual and audio feedback when the player levels up.	M

No	Requirement ID	Requirement Description	Priority
	SSGS_05	**Leaderboard**	

Basic flow:

No	Requirement ID	Requirement Description	Priority
1.	SSGS_05.1	The system displays the leaderboard after the player finishes a game.	M
2.	SSGS_05.2	The user should enter their name upon game completion.	M
3.	SSGS_05.3	The user's name and score will be saved into a database.	M
4.	SSGS_05.4	System loads the existing leaderboard from the database when the game starts.	M

No	Requirement ID	Requirement Description	Priority
5.	SSGS_05.5	The system should sort the leaderboard by score in descending order.	M
6.	SSGS_05.6	The system displays the top 6 highest scores, the latest user's score, along with the ranking.	M

No	Requirement ID	Requirement Description	Priority
	SSGS_06	**Keyboard detection**	
Basic flow:			
1.	SSGS_06.1	The system detects the keyboard action.	M
2.	SSGS_06.2	The user presses the "Rightwards Arrow" button to control the spaceship move to the right.	M
3.	SSGS_06.3	The user presses the "Leftwards Arrow" button to control the spaceship move to the left.	M
4.	SSGS_06.4	The user presses the "Space" button to control the spaceship to shoot.	M

NON-FUNCTIONAL REQUIREMENTS (SSGS)

No	Requirement ID	Requirement Description	Priority
	SSGS_07	Reliability	
Basic flow:			
1.	SSGS_07.1	The system must be able to detect the predefined hand gesture with the correctness above or equal 95%.	M
No	Requirement ID	Requirement Description	Priority
	SSGS_08	Usability	
Basic flow:			
1.	SSGS_08.1	The hand gesture should be easy to avoid user fatigue.	D
2	SSGS_08.2	The hand gesture should allow the user to learn and understand after completing the tutorial.	D

2.3. UML model

Use Case Diagram
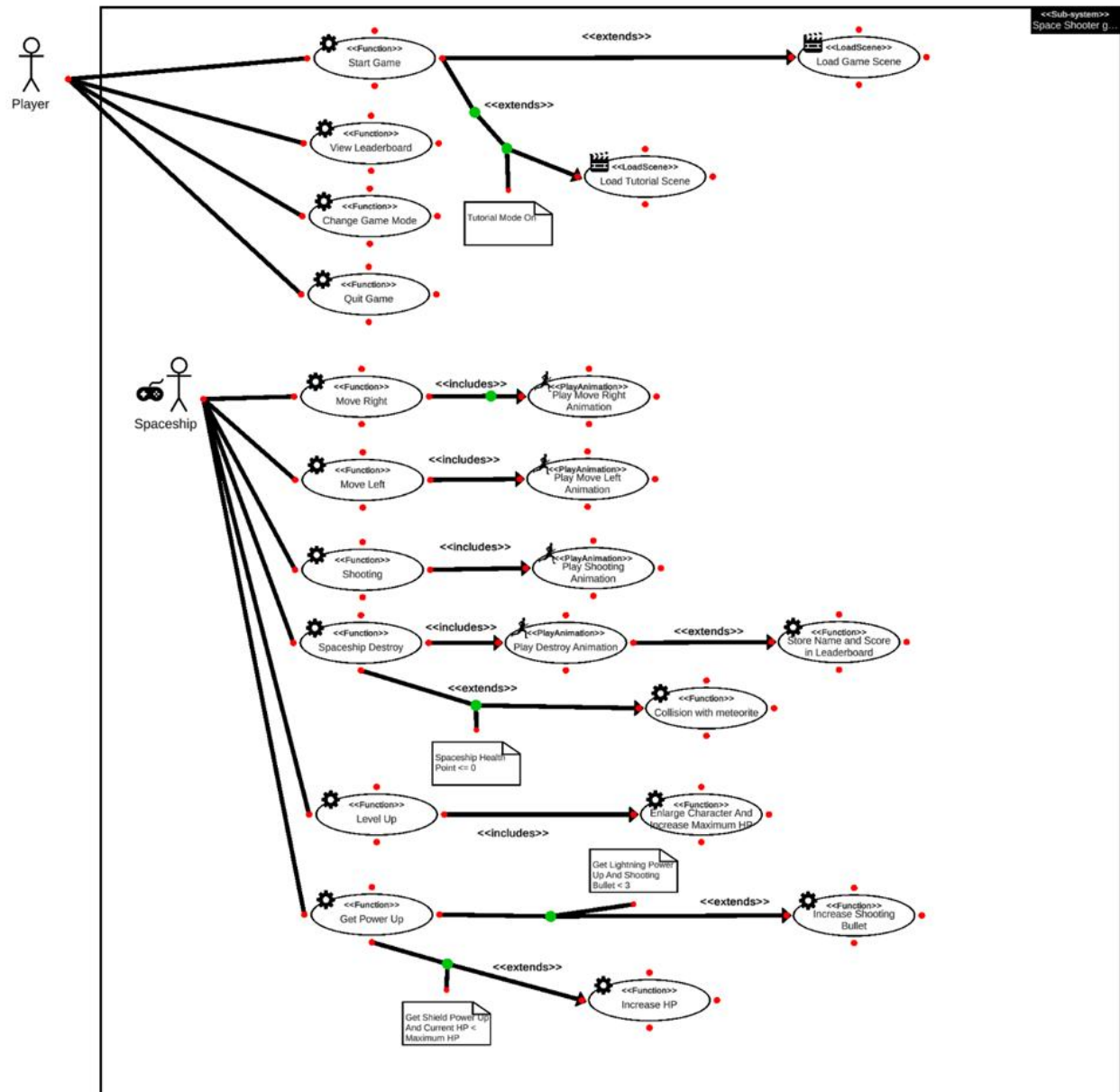
Activity Diagram
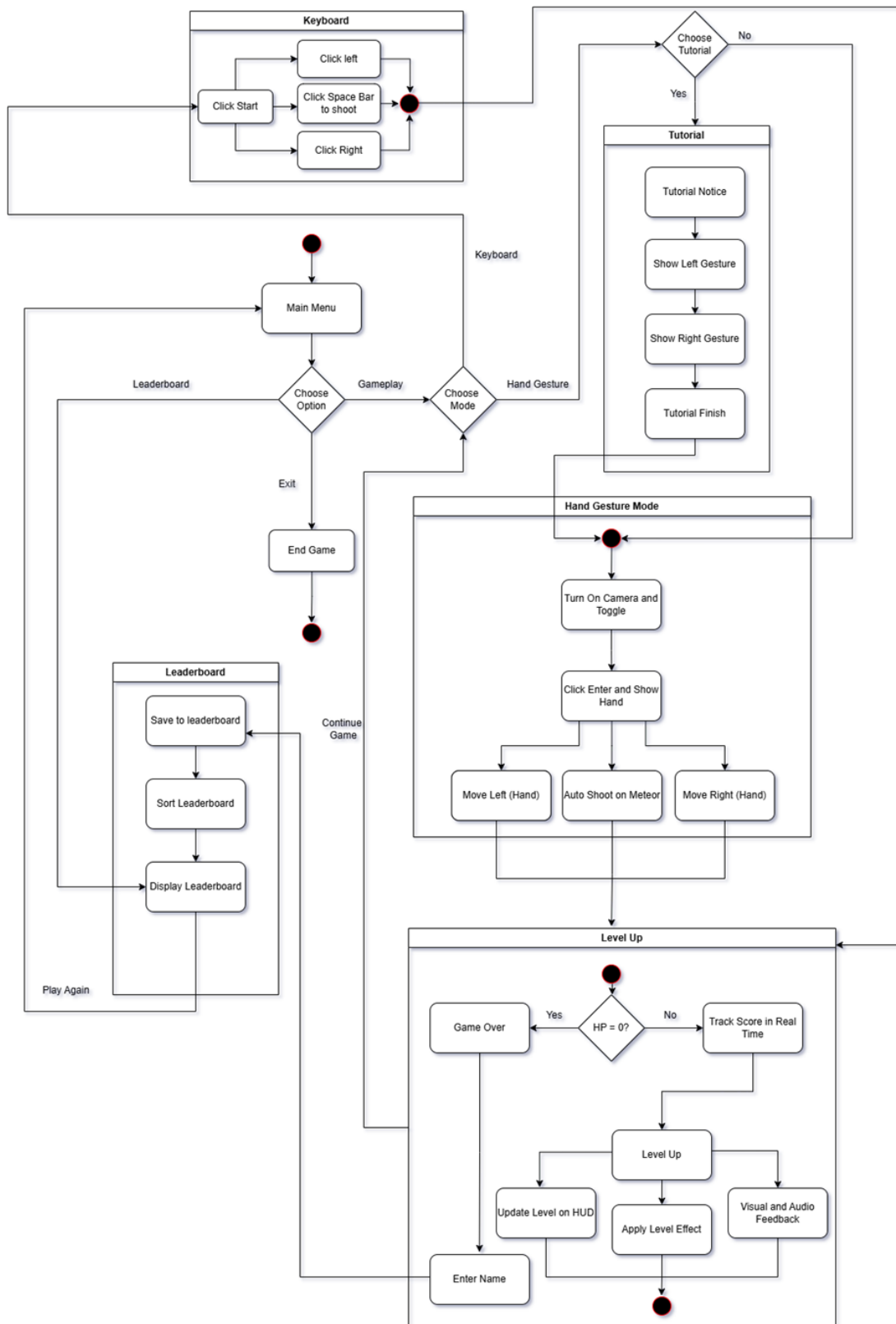
3. Progress Development and Analysis

3.1. High-fidelity design

3.1.1 Design of experiment

The games being tested based on user satisfaction about the gameplay relate to power up system, leaderboard and control game system. The game also tested usability, response time and interaction with users' reaction to the game environment and performance. Based on the experiment, A/B testing method is used to check the game interface.

A/B Testing Framework:

(1) Main Menu
- Design A: Toggle switch design interface and its functionality
- Design B: Radio button design interface and its functionality
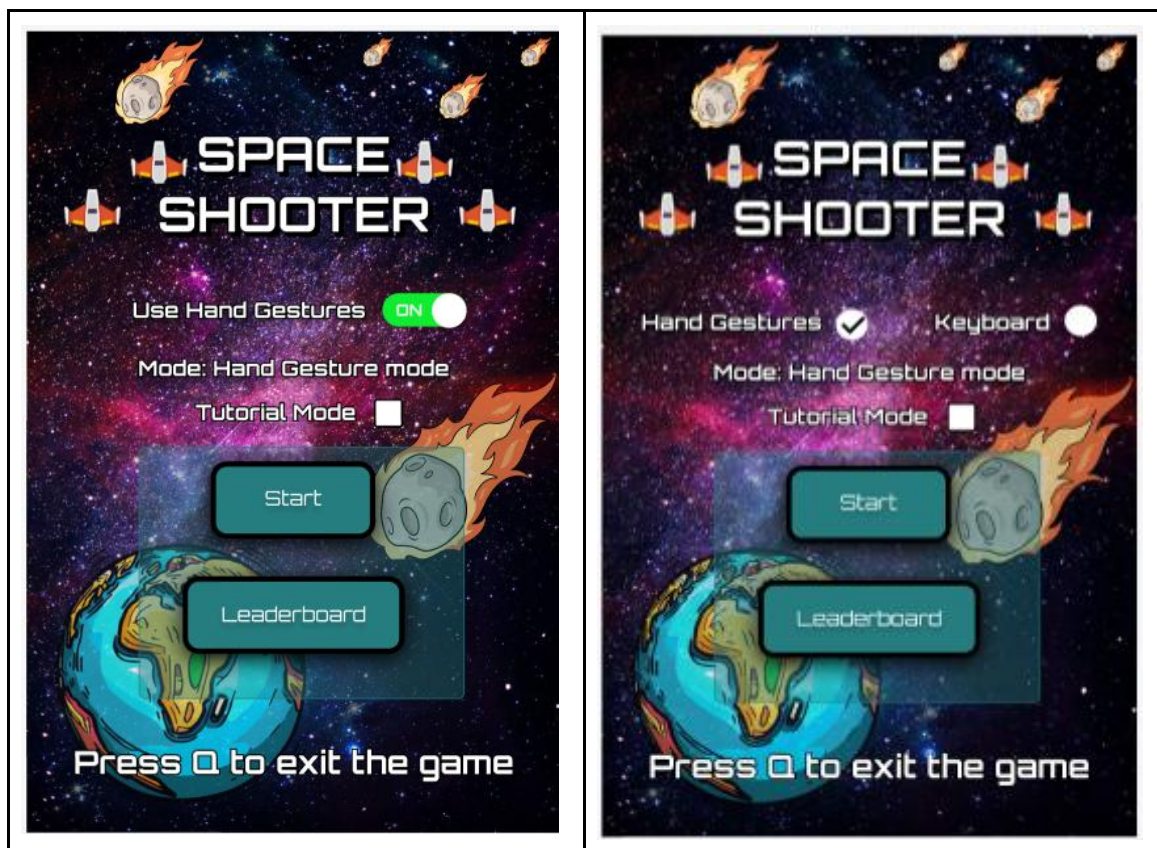
(2) Level Up

- Design A: The indicator that shows the number of shoots needed to break the meteors.
- Design B: There is no indicator provided.
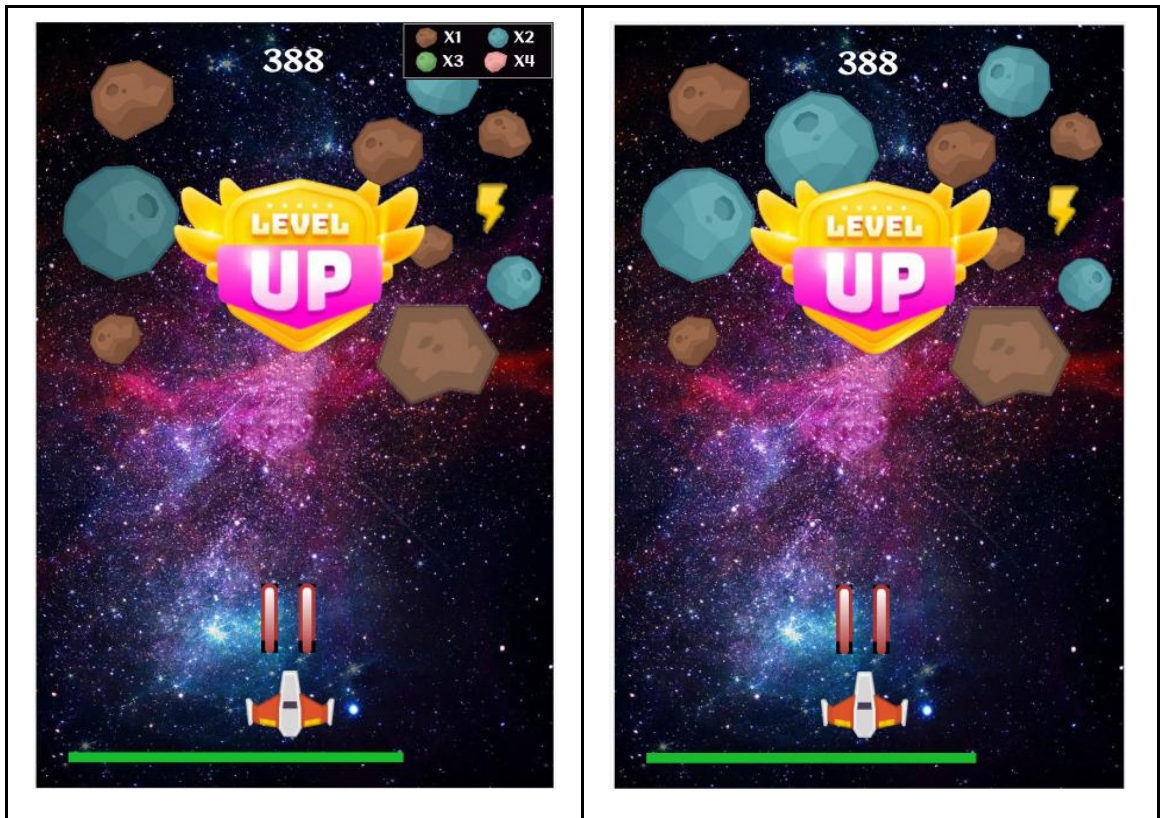
(3) Leaderboard

- Design A: Leaderboard that states ranking from top 6 and current ranking
- Design B: Leaderboard that states ranking from top 6 only.
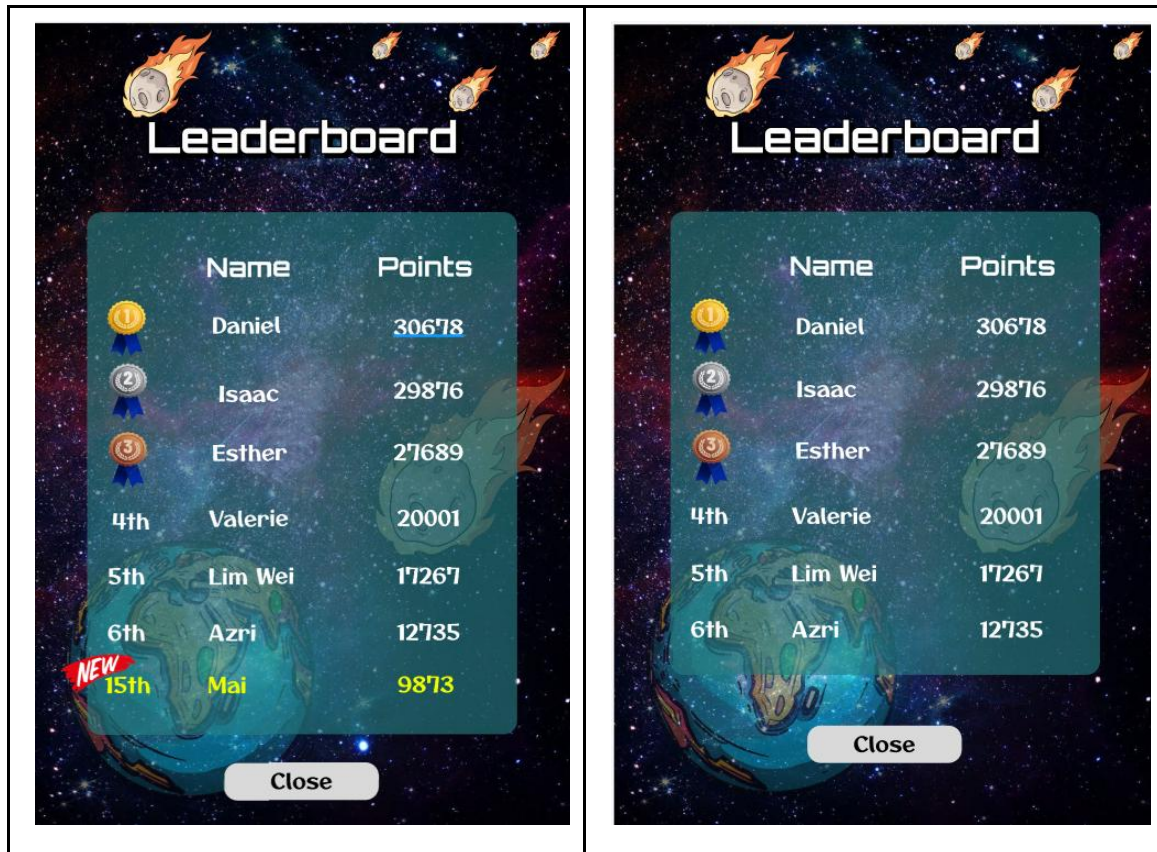
Sample Size: 3 participants across two test groups that are people in the range age of 13 - 34 years old.

Duration: 10 minutes per sessions

Evaluation Method: User Interviews

Title of Protocol:

Space Shooter New Version – Player Experience Interview

Purpose:

The primary goal was to gain insights into how players perceived and interacted with the enhancements made to the game, focusing on control usability, the level system, and the leaderboard. These insights would guide final improvements and assess the overall effectiveness of the new features.

Timing:

Interviews were conducted during two stages:

- **Low-fidelity prototype phase** (to gather formative feedback)
- **Post-development phase** (to validate the final version)

Participants:

3 players participated in both rounds of testing and interviews.

Setup Details:

- **Time of Interview:** 8:30 - 1.00pm
- **Date:** 11 June 2025
- **Place:** INASIS UUM (SME Bank, Bank Rakyat, YAB)
- **Name of Interviewee:** 1. Ch'ng Zhi Xuan

           2. Judd Maran John Adu

           3. Amir Faris bin Jafar

Interview Structure and Key Themes

1. **Warm-up Question:** To build rapport and understand player background:
- Prior experience with arcade games
- Frequency of gaming per week
- Familiarity with gesture-based controls

2. **Control & Usability:** Focused on evaluating the ease of using hand gesture controls and comparing them to traditional keyboard input:
- Difficulty/ease in controlling the spaceship using gestures
- Preferred control method and reasons for preference
  Suggestions for improvement

3. **Level System:** Assessed how players experienced level progression:

- Whether increasing difficulty felt rewarding
- Clarity of level-up events and emotional response to them

4. **Leaderboard:** Explored the motivational impact of the ranking system:

- Whether it encouraged players to improve their performance
- Interest in replaying the game to beat their score

5. **General Experience:** Captured open feedback on the overall game experience:

- Most enjoyable parts of the enhanced version
- Frustrating or confusing aspects
- One thing the player would improve

6. **UX Design Principles**

- **Useful:** Did this game successfully entertain you and give you the gaming experience you were looking for?
- **Usable:** Can you efficiently learn and execute the Shaka gesture controls without excessive frustration?
- **Desirable:** Do the visual elements and progression systems create a compelling emotional journey that motivates continued play?
- **Findable:** How easy was it for you to find and understand the game information you needed?
- **Accessible:** How comfortable were the physical requirements of playing this game?
- **Credible:** How much did you trust that the game was accurately responding to your actions and fairly tracking your performance?
- **Valuable:** Does this game offer something valuable that you can't get from other games?

6. **Wrap-up:** Each interview concluded with:

- A thank you to the participant

- A small token of appreciation (e.g., snacks)

- A reminder about how their feedback contributes to the game's development

Outcomes

The interviews provided rich, qualitative data that highlighted key strengths and pain points of the game. Insights from players helped refine the areas of gesture calibration and tutorial clarity, enhancing player feedback during level-up, improving motivation through leaderboard visibility, and balancing difficulty progression for more engagement. These user-centered findings informed final design decisions, ensuring the Enhanced Space Shooter is both engaging and accessible to different player types.

3.1.2 UI prototype

Main Menu Interface

Design A:
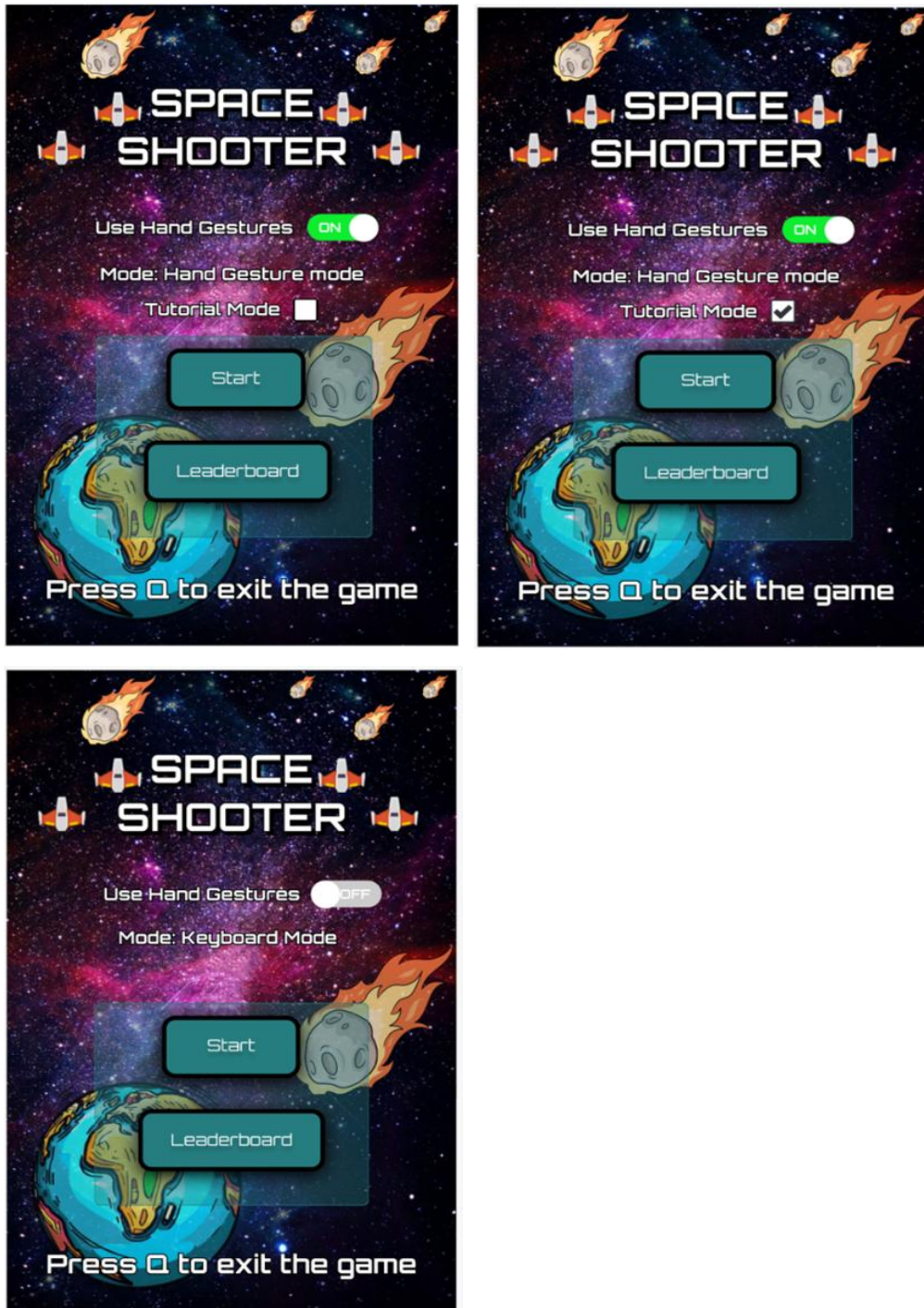
Design B:

The main menu displays options like Start, Leaderboard and Exit, along with a toggle for Hand Gesture Mode, supporting both gesture and keyboard input. It also includes a checkbox for Tutorial Mode to turn the tutorial on or off, and a reminder: "Press Q to exit the game."

Hand Detection Screen

This screen displays the hand detection process in the game using a live camera feed. On the left, the system actively scans for a hand with a progress bar and the prompt: *"Wave your hand in front of the camera."* If a hand is detected, the game continues. If no hand is detected, an error message prompts the user with options to "Try Again" or "Cancel", ensuring a smooth and guided user experience. Ensures the player knows if they are out of frame or the camera is blocked.

In the gesture tutorial screen, three different hand gestures are demonstrated to control the movement of the spaceship.
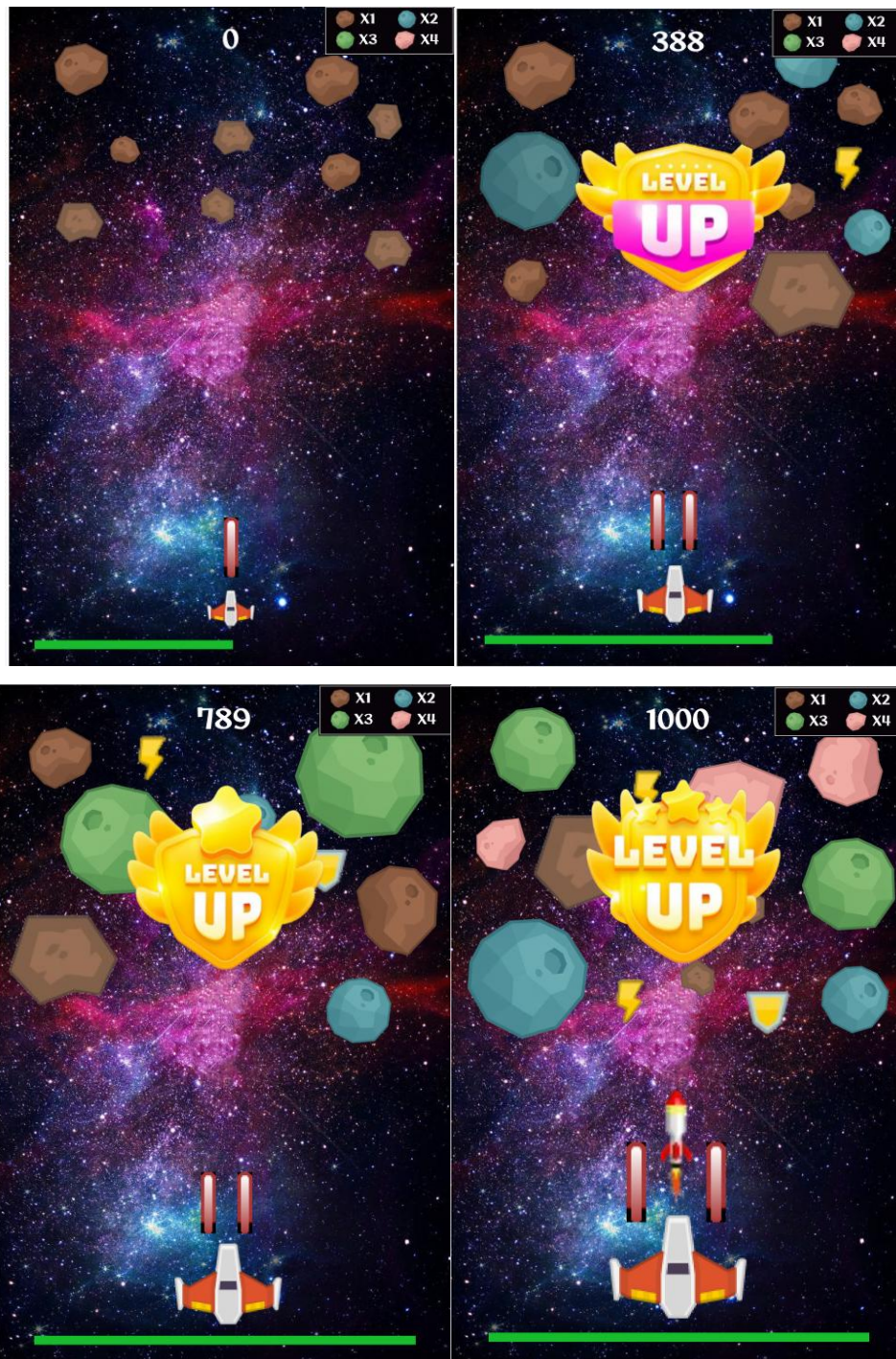
Movement Control:

To navigate the spaceship, players use the Shaka sign gesture, where the thumb and little finger are extended while the other fingers are folded. Holding the hand in a neutral, upright position keeps the spaceship stationary. Tilting the hand to the right moves the spaceship to the right, and tilting it to the left moves it to the left.
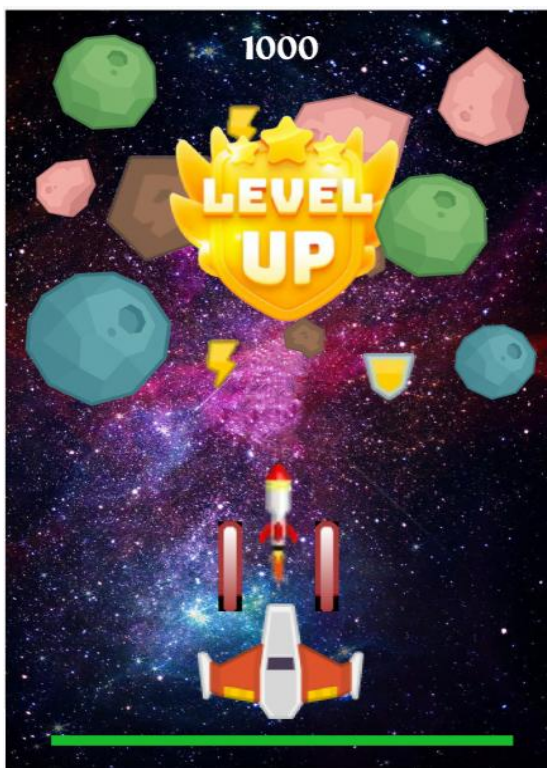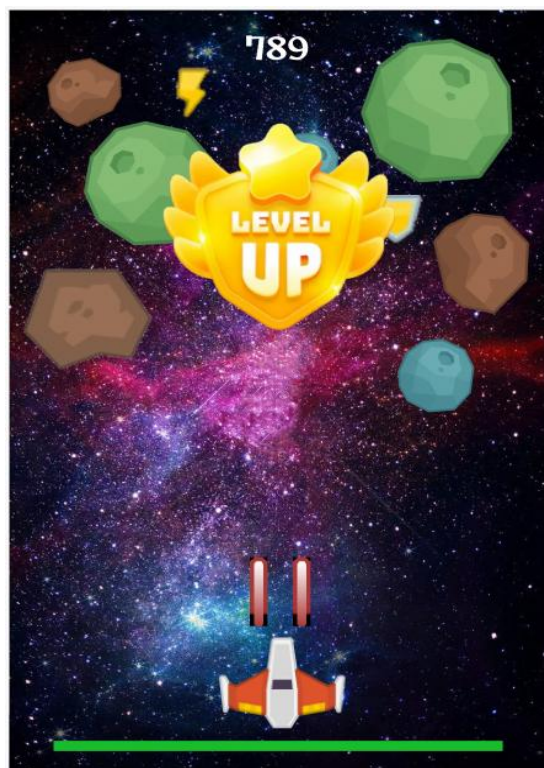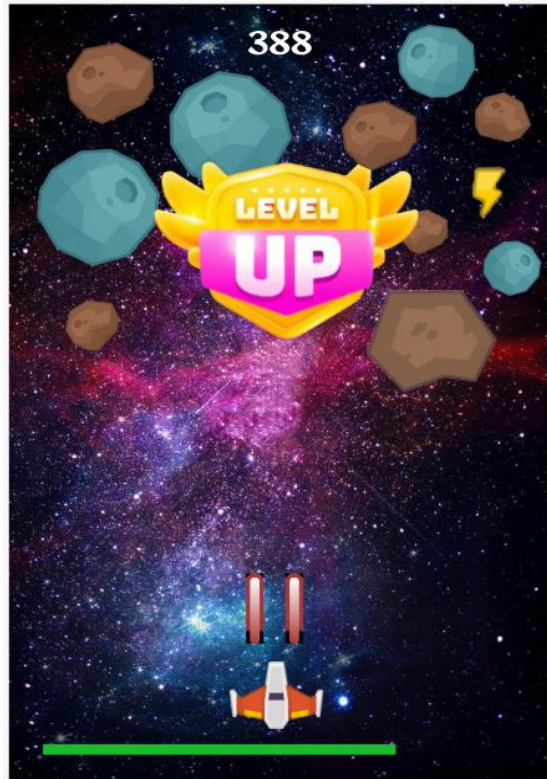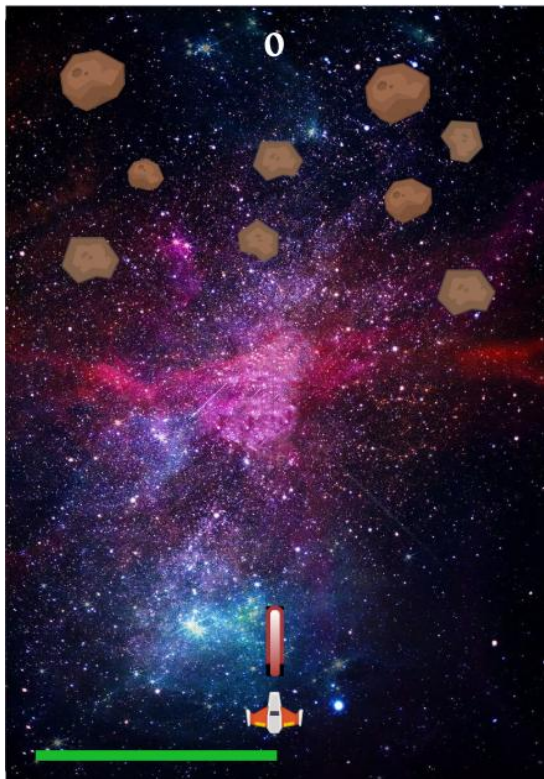
A screen appears to indicate that the player has successfully completed the tutorial, confirming their readiness to proceed to the actual gameplay.

Level Up

Design A:

Design B:

These show the level-up process in the game. As the player levels up, the spaceship grows larger and meteors appear in different colors, each requiring more shots to destroy. The game becomes progressively faster and more challenging, with meteors increasing in speed and number. Health increases with each level, but getting hit by meteors reduces it. Shield power-ups restore health, and lightning bolts increase bullet count, up to three bullets. The score is based on survival time and meteors destroyed. A "LEVEL UP" indicator appears on screen, and a hint in the top-right corner shows the meteor color and its required hits: brown requires 1 shot, blue 2 shots, green 3 shots, and pink 4 shots.

Leaderboard UI

Design A:
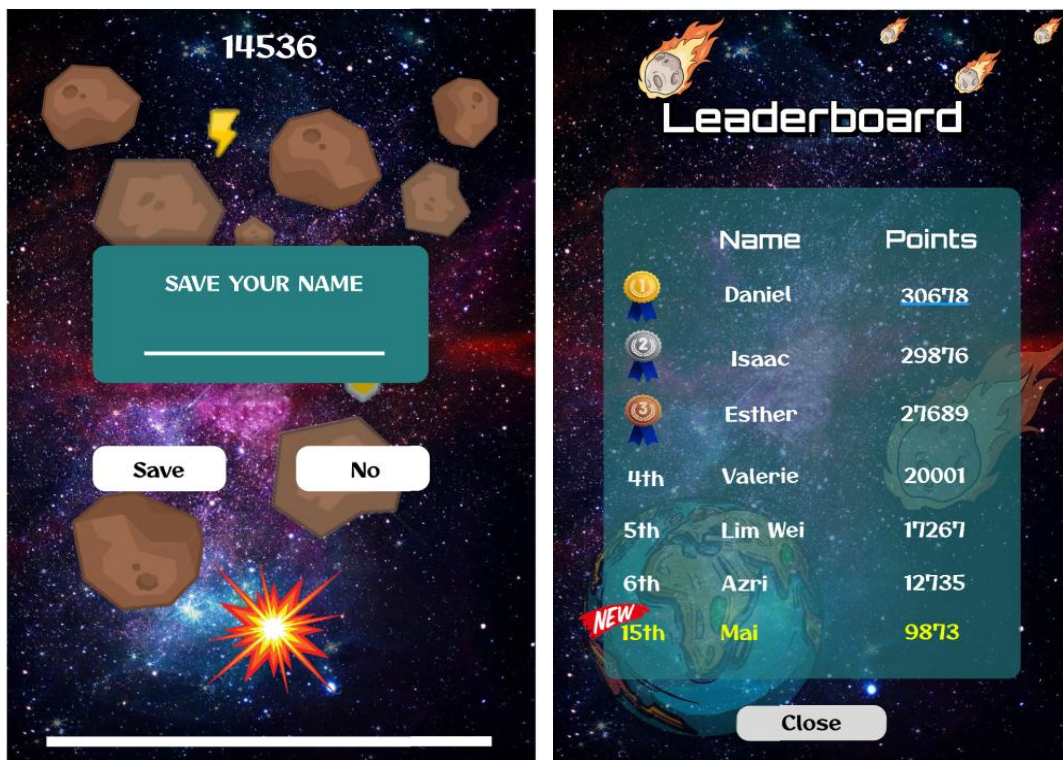
Design B:
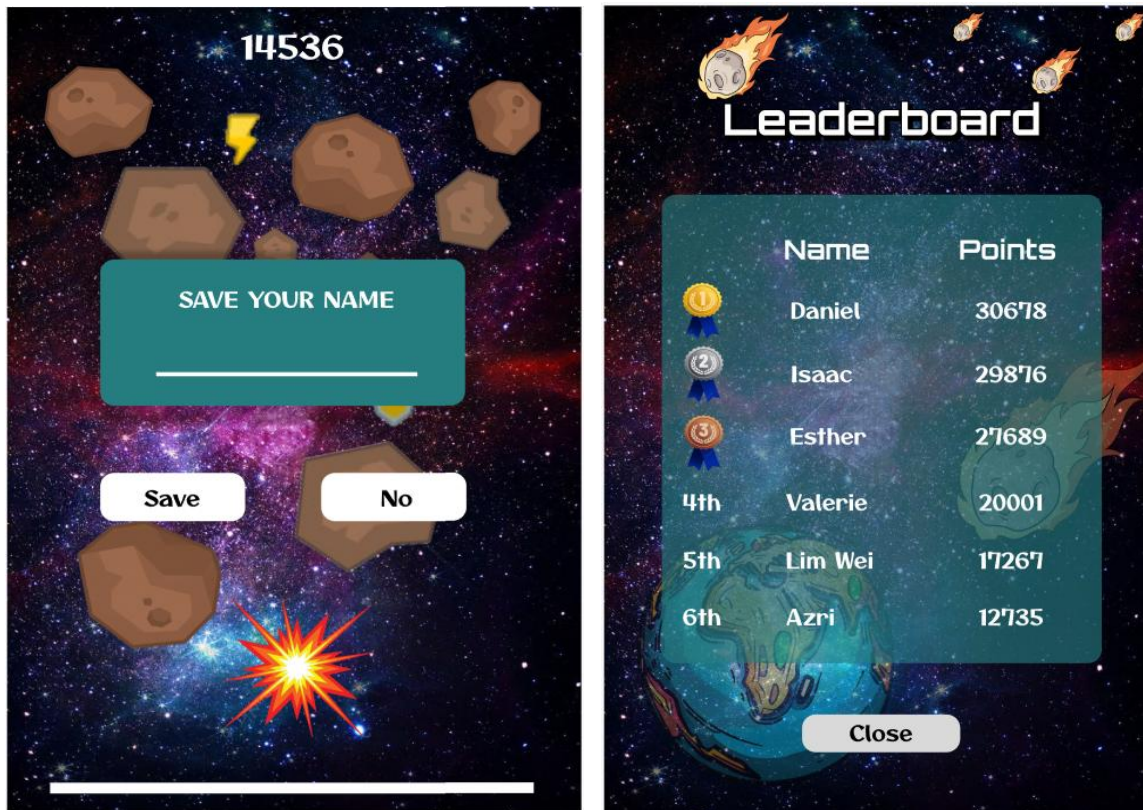
After completing a game session, the player is taken to the Save Name screen, where they can enter their name to save their score. Once submitted, the result is added to the leaderboard, which displays the top six player scores. If the player's score is not within the top six, their individual ranking and score are still shown below the leaderboard. This screen encourages replayability and competition by highlighting high scores and ranking all players based on performance.

3.1.3 User Persona

Persona 1

Full name: Ch'ng Zhi Xuan

Age: 22

Program: Bachelor of Science with Honors (Business Mathematics)

Background:

Zhi Xuan is an undergraduate student who is an experienced gamer. Despite a busy academic schedule, he dedicates time to gaming three days a week. He has a deep passion for games, especially titles like PUBG and Honor of Kings (HOK).

Goals:

- Discover new strategies or methods to enhance gameplay.
- Discover new strategies to boost performance in competitive settings.

Challenges:

- Sometimes finds it difficult to quickly discover or interact with new game control layouts.
- Struggles with discovering hidden or non-intuitive interface elements

Behaviour:

- Regularly plays games as a form of stress relief.
- Engages in short, focused gaming sessions—typically around 10–15 minutes.
- Frequently explores new techniques or strategies to improve gameplay.

Persona 2

Full name: Judd Maran John Adu

Age: 23

Program: Bachelor of Education with Honors (Business Administration)

Background:

Judd is a final-year student with a strong interest in interactive learning and gamified experiences. He enjoys playing video games in his free time, usually around twice a week, as a way to relax and unwind from his academic responsibilities. While he's familiar with classic arcade games like Space Shooter, this was his first experience using hand-gesture controls in gaming. His openness to trying new technologies reflects his curiosity and adaptability.

Goals:

- To enjoy casual gaming experiences that offer progression and competition
- To explore innovative game control systems like gesture-based interaction

Challenges:

- Limited exposure to advanced gaming features like gesture controls
- Prefers simplified control schemes because complex controls may reduce enjoyment

Behaviour:

- Plays video games casually around 2 days a week
- Motivated by leaderboards and competition with friends
- Responds positively to clear tutorials and structured gameplay progression

Persona 3

Full name: Amir Faris bin Jafar

Age: 22

Program: Bachelor of Finance with Honors

Background: Amir is an undergraduate student who spends most of his time playing video games, especially competitive ones, and enjoys playing with his friends. He becomes highly competitive when it comes to winning.

Goals:

- Enjoy competitive games and deliver the best performance during gameplay
- Beat high scores and reach the top of the leaderboard

Challenges:

- Climbing the ranking leaderboard takes a lot of time
- Gets bored after a few rounds if there is no level-up system or other competitive elements

Behaviour:

- Plays video games whenever he doesn't have class
- Highly motivated to become the top scorer in the game

3.1.4 Overall coding (Snippet)

Set Parameter

```python
WIDTH = 400
HEIGHT = 600
FPS = 60
POWERUP_TIME = 5000
BAR_LENGTH = 100
BAR_HEIGHT = 10

# Define Colors
WHITE = (255, 255, 255)
BLACK = (0, 0, 0)
RED = (255, 0, 0)
GREEN = (0, 255, 0)
BLUE = (0, 0, 255)
YELLOW = (255, 255, 0)
LIGHTGREEN = (38,125,128)
LIGHTGRAY = (220, 220, 220)
BLUE = (0, 120, 215)
TEAL = (0, 128, 128)
#new added constant
StartButton = pygame.Rect(146, 326,115,50)
LeaderboardButton = pygame.Rect(126, 412,158,50)
CloseButton = pygame.Rect(142, 550,115,28)
Top6AndNewScoreList = []
SaveButon = pygame.Rect(66,347,101,36)
NoButton = pygame.Rect(220,347,101,36)
# Hand detection dialog buttons
TryAgainButton = pygame.Rect(100, 400, 80, 35)
CancelButton = pygame.Rect(220, 400, 80, 35)
# global score
score=0
mobs = pygame.sprite.Group()
max_mobs=10
gesture_app = None
level_shown = 1
level_display_time = 0
current_level_image = None
"""""""""""""""""""""""""""""""""""""""""""""""""""""""""""""
```

At the beginning of the code, essential global parameters are initialized for use throughout the entire program. These variables control key aspects of gameplay and system configuration.

Main Game Function

```python
def main():
    game_loop()

    waiting = True
    while waiting:
        for event in pygame.event.get():
            if event.type == pygame.QUIT:
                waiting = False
            if event.type == pygame.KEYUP:
                waiting = False

    # Cleanup
    if gesture_app:
        gesture_app.disable_gestures()
    pygame.quit()

if __name__ == "__main__":
    main()
```

The main game function initiates the game loop by calling the game_loop() function. During this loop, the system continuously checks for specific user inputs such as pressing the Q or Esc keys to exit the game.

Game_Loop Function

```python
def game_loop():
    global all_sprites, player, mobs, bullets, powerups, score, level_shown, current_level_image, level_display_time,gesture_app
    gesture_enabled = False
    running = True
    menu_display = True
    while running:
        if menu_display:
            gesture_enabled= main_menu()
            if not gesture_enabled:
                gesture_app.stop()
            getReady()
            pygame.time.wait(3000)

            #Stop menu music
            pygame.mixer.music.stop()
            #Play the gameplay music
            pygame.mixer.music.load(path.join(sound_folder, 'tgfcoder-FrozenJam-SeamlessLoop.ogg'))
            pygame.mixer.music.play(-1)      ## makes the gameplay sound in an endless loop

            menu_display = False

            ## group all the sprites together for ease of update
            all_sprites = pygame.sprite.Group()
            player = Player()
            all_sprites.add(player)

            ## spawn a group of mob
            mobs = pygame.sprite.Group()
            for i in range(10):        ## 10 mobs
                newmob(mobs)

            ## group for bullets
            bullets = pygame.sprite.Group()
            powerups = pygame.sprite.Group()
            #### Score board variable
            score = 0
## as there will be no mob_elements left out |
for hit in hits:
    hit.hit_points-=1
    if hit.hit_points <= 0:
        score += hit.radius        ## give different scores for hitting big and small metoers
        random.choice(expl_sounds).play()

        expl = Explosion(hit.rect.center, 'lg')
        all_sprites.add(expl)
        if random.random() > 0.9:
            pow = Pow(hit.rect.center)
            all_sprites.add(pow)
            powerups.add(pow)
        newmob(mobs)         ## spawn a new mob
    hit.kill()
    newmob(mobs)

## ^^ the above loop will create the amount of mob objects which were killed spawn again
#########################

## check if the player collides with the mob
hits = pygame.sprite.spritecollide(player, mobs, True, pygame.sprite.collide_circle)        ## gives back a list, True makes the mob element disappear
for hit in hits:
    player.health -= hit.radius * 2
    expl = Explosion(hit.rect.center, 'sm')
    all_sprites.add(expl)
    newmob(mobs)
    if player.health <= 0:
        player_die_sound.play()
        death_explosion = Explosion(player.rect.center, 'player')
        all_sprites.add(death_explosion)
        # running = False       ## GAME OVER 3:D
        player.hide()
        player.lives -= 1
        player.health = 100
```

Within the game_loop() function, the main menu is displayed. When the user selects "Start", the system initializes the main character and all non-player characters (NPCs). Collision detection is activated to ensure that interactions between the player, meteors, and power-ups behave as intended (e.g., allowing the player to destroy meteors or collect power-ups).

Main_Menu Function

```python
elif event.type == pygame.MOUSEBUTTONDOWN:
    mouse_pos = pygame.mouse.get_pos()

    # Check if Start button clicked
    if start_button.collidepoint(mouse_pos):
        if gesture_toggle:
            # Check if tutorial mode is enabled
            if tutorial_toggle:
                # Start tutorial mode first
                gesture_app.run()
                tutorial_success = show_tutorial_mode()
                if tutorial_success:
                    return gesture_toggle
                else:
                    # Tutorial was cancelled, return to main menu
                    continue
            else:
                # Show hand detection dialog before starting gesture mode (no tutorial)
                if show_hand_detection_dialog():
                    if gesture_app:
                        gesture_app.run()
                    return gesture_toggle
                else:
                    # User cancelled or hand detection failed
                    continue
        else:
            # Start keyboard mode directly
            return gesture_toggle

    # Check if Leaderboard button clicked
    if leaderboard_button.collidepoint(mouse_pos):
        # Show leaderboard (functionality to be added)
        displayLeaderboard()
```

In the main_menu() function, the user chooses between two control modes: hand gesture or keyboard. If the gesture mode is selected, an additional option allows the user to activate the tutorial. When hand gesture mode is enabled, the camera is initialized and begins detecting hand movements in real time.

Show_Tutorial_Mode Function

```python
# Tutorial steps with corresponding background files
tutorial_steps = [
    {
        "title": "Hold to stay",
        "instruction": "Keep your hand steady in front of camera",
        "gesture_type": "hold",
        "background": "tm_hold.png"
    },
    {
        "title": "Try to move left",
        "instruction": "Move your hand to the left",
        "gesture_type": "left",
        "background": "tm_left.png"
    },
    {
        "title": "Try to move right",
        "instruction": "Move your hand to the right",
        "gesture_type": "right",
        "background": "tm_right.png"
    }
]
```

The tutorial mode consists of three instructional steps. Each step displays a title, clear instructions, and an illustrative image. Upon completing all steps, the system transitions directly to gameplay, confirming that the player is ready.

Show_Hand_Detection_Dialog Function

```python
def show_hand_detection_dialog():
    """Show hand detection dialog with timeout and styled error message"""
    if not check_camera_permissions():
        return show_camera_error_dialog()

    # Initialize hand detector
    detector = HandDetector()
    if not detector.start_detection():
        return show_camera_error_dialog()

while True:
    current_time = pygame.time.get_ticks()
    elapsed_time = current_time - start_time

    # Check if timeout reached
    if elapsed_time > detection_timeout:
        print("Detection timeout reached")
        detector.stop_detection()
        return show_styled_no_hand_detection_dialog()

    # Check if object detected
    if detector.object_detected:
        print("Object detected - showing success")
        detector.stop_detection()
        show_hand_detected_success()
        return True  # This will start the game
```

When the player selects gesture mode and starts the game, the camera is initialized. The program checks for proper camera access permissions and ensures the camera functions correctly. If a hand is detected, the game starts automatically. If no hand is detected within 8 seconds, the system displays an error and prompts the user to either "Try Again" or return to the main menu.

.

Save Record

```python
        elif event.type == pygame.MOUSEBUTTONDOWN:
            if saveNameRect.collidepoint(event.pos):
                active = True
            if SaveButon.collidepoint(event.pos):
                if user_text != '':
                    if not checkDuplicateName(user_text):
                        AddRecordInDatabase(user_text, score)
                        displayLeaderboard()
                        return
                    else:
                        message = 'The name has been used'
                else:
                    message = 'Please key in your name'
            if NoButton.collidepoint(event.pos):
                displayLeaderboard()
                return

def AddRecordInDatabase(name, score):
    saveTime = int(time.time())

    try:
        conn = pyodbc.connect(
            'DRIVER={ODBC Driver 17 for SQL Server};'
            'SERVER=localhost;'
            'DATABASE=LeaderboardSpaceShooter;'
            'Trusted_Connection=yes;'
        )
        cursor = conn.cursor()

        # Fixed: Parameters should be passed as a tuple
        cursor.execute('INSERT INTO Leaderboard VALUES(?,?,?)', (name, score, saveTime))

        # Important: Commit the transaction
        conn.commit()

        print(f"Record added successfully: {name}, {score}, {saveTime}")

    except pyodbc.Error as e:
        print(f"Database error: {e}")

    finally:
        cursor.close()
        conn.close()
```

After the game ends, the system prompts the player to save their score and username to the database. The system also checks for duplicate usernames to maintain data integrity. If the player chooses not to save, the game proceeds to display the leaderboard.

Leaderboard

```python
def displayRanking():
    latestPlayerRanking =updateTop6AndNew()
    start_y = 215
    spacing = 47
    if not Top6AndNewScoreList:
        draw_text(screen, "No records found", 24, WIDTH // 2, start_y, color=WHITE)
        pygame.display.update()
        return

    for i, row in enumerate(Top6AndNewScoreList):
        name = row.name
        point = row.score
        point_str = str(point)
        y = start_y + i * spacing

        if i == 0:
            screen.blit(gold_image, (53, y - 14))  # adjust -14 for medal center align
        elif i == 1:
            screen.blit(silver_image, (53, y - 14))
        elif i == 2:
            screen.blit(bronze_image, (53, y - 14))
        elif i==6:
            draw_text(screen, f"{latestPlayerRanking}th", 18, 70, y)
            newBatch = pygame.image.load(path.join(img_dir, 'newbatch.png')).convert()
            newBatch = pygame.transform.scale(newBatch,(52,29))
            newBatch.set_colorkey(BLACK)
            screen.blit(newBatch,(18,y-14))
        else:
            draw_text(screen, f"{i+1}th", 18, 70, y)

        draw_text(screen, name, 18, 130, y,align='topleft')
        draw_text(screen, point_str, 18, 260, y,align='topleft')
```

The leaderboard is updated in real time, displaying the top six highest scores. If the player's score does not rank in the top six, their name and score are still shown along with their relative ranking, ensuring personalized feedback and motivation for replay.

3.1.5 Analysis

Based on the interview, all respondents are familiar with arcade-style games, all are new to hand-gesture controls, making their positive user feedback meaningful. In the aspect of control, gesture control was generally welcomed and considered innovative, but the keyboard remains preferred by experienced PC users. In terms of the level up aspect, most of the respondents admit that visual and gameplay changes when they level up were engaging for the player. Moreover, positive feedback is provided from the respondents due to the meteors indicator clearly showing the number of shoots needed to break the meteors in Design A. Additionally, the leaderboard aspect is the primary motivator for competition to improve self- score. Design A, which presents the current player ranking if it is below rank 6 received positive feedback from most all respondents. An analysis of the interviews showed that Design A was preferred, due to its better UI and the player feedback aspects. Overall, the hand gesture control is seen as novel and engaging, but improvements are required for clarity on gameplay mechanics, and visibility of inclusive scores for more universal satisfaction.

User reflection

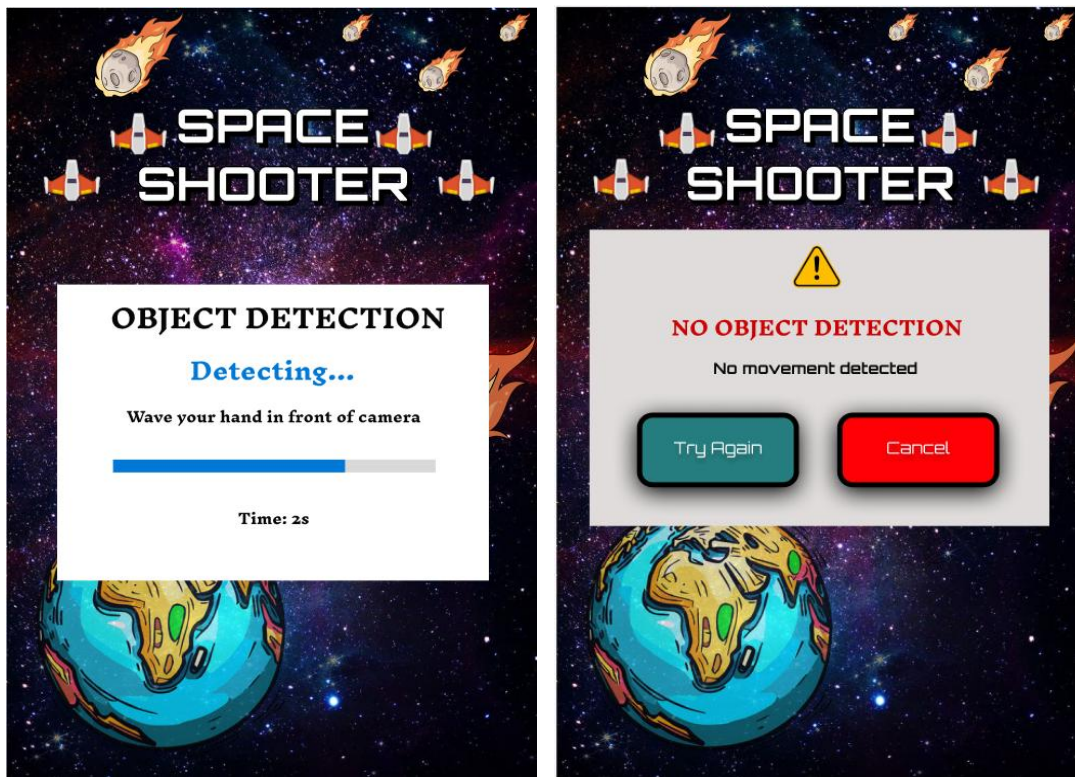| UX Principle	Highlights from Responses
Useful	All respondents found the game entertaining and a new experience.
Usable	Gesture controls are learnable, with minor detection concerns with ambient lighting conditions.
Desirable	Visuals and level progression create emotional engagement to continue playing the game.
Findable	Game options and info are clear and easy to find and access.
Accessible	Short play sessions are generally comfortable, but long playing may lead to physical fatigue.
Credible	Most respondents trust in score and gesture tracking with ambient lighting, but one of the respondents is worried about the wrong and missed hand detection affecting the score and ranking.
Valuable	Gesture control provides a unique, futuristic gameplay not found in typical games.

3.1.6 Output

Main Menu Interface

The main menu displays options like Start, Leaderboard and Exit, along with a toggle for Hand Gesture Mode, supporting both gesture and keyboard input. It also includes a checkbox for Tutorial Mode to turn the tutorial on or off, and a reminder: "Press Q to exit the game."
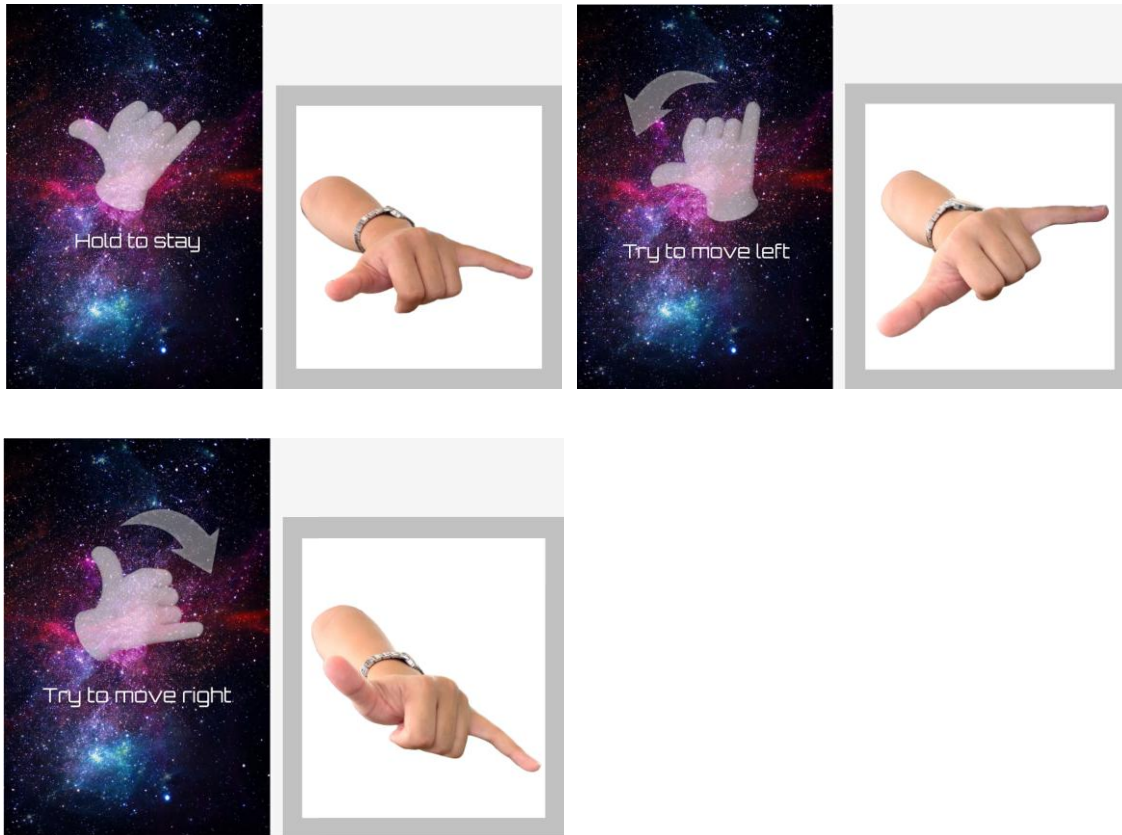
.

Hand Detection Screen

This screen displays the hand detection process in the game using a live camera feed. On the left, the system actively scans for a hand with a progress bar and the prompt: *"Wave your hand in front of the camera."* If a hand is detected, the game continues. If no hand is detected, an error message prompts the user with options to "Try Again" or "Cancel", ensuring a smooth and guided user experience. Ensures the player knows if they are out of frame or the camera is blocked.
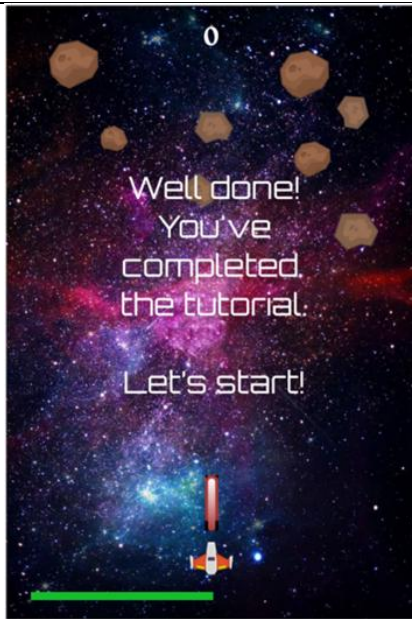
Hand Gesture Tutorial Screen

In the gesture tutorial screen, three different hand gestures are demonstrated to control the movement of the spaceship.
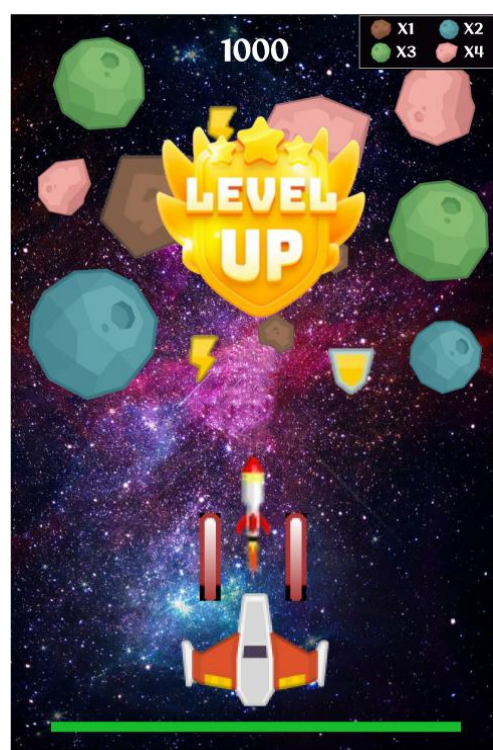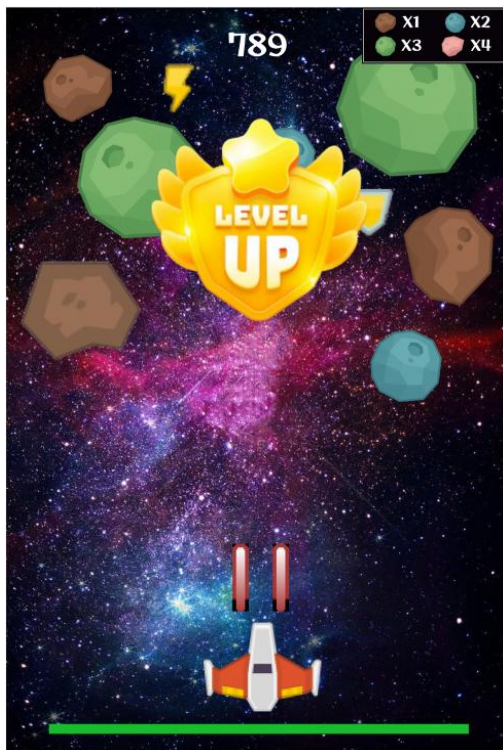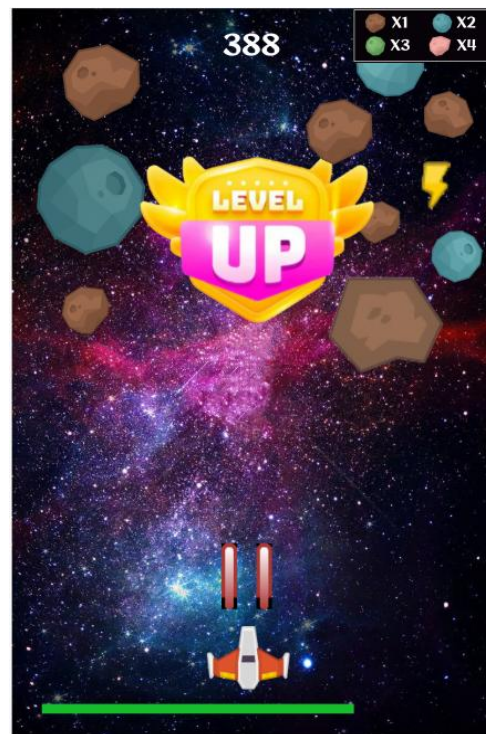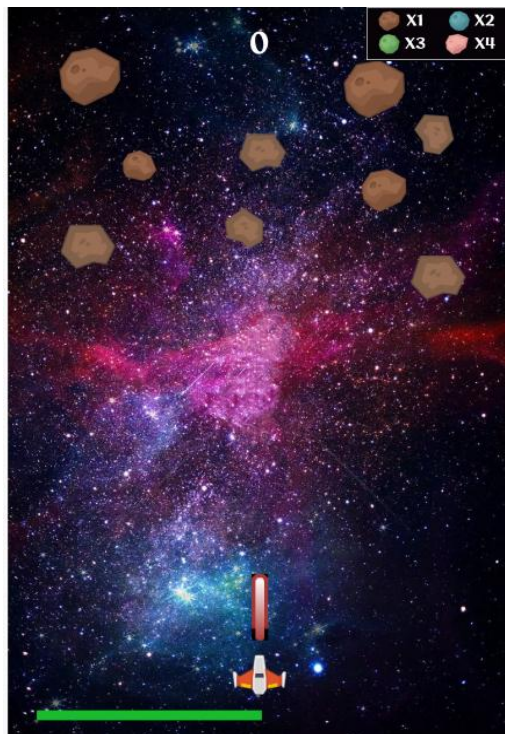
Movement Control:

To navigate the spaceship, players use the Shaka sign gesture, where the thumb and little finger are extended while the other fingers are folded. Holding the hand in a neutral, upright position keeps the spaceship stationary. Tilting the hand to the right moves the spaceship to the right, and tilting it to the left moves it to the left.
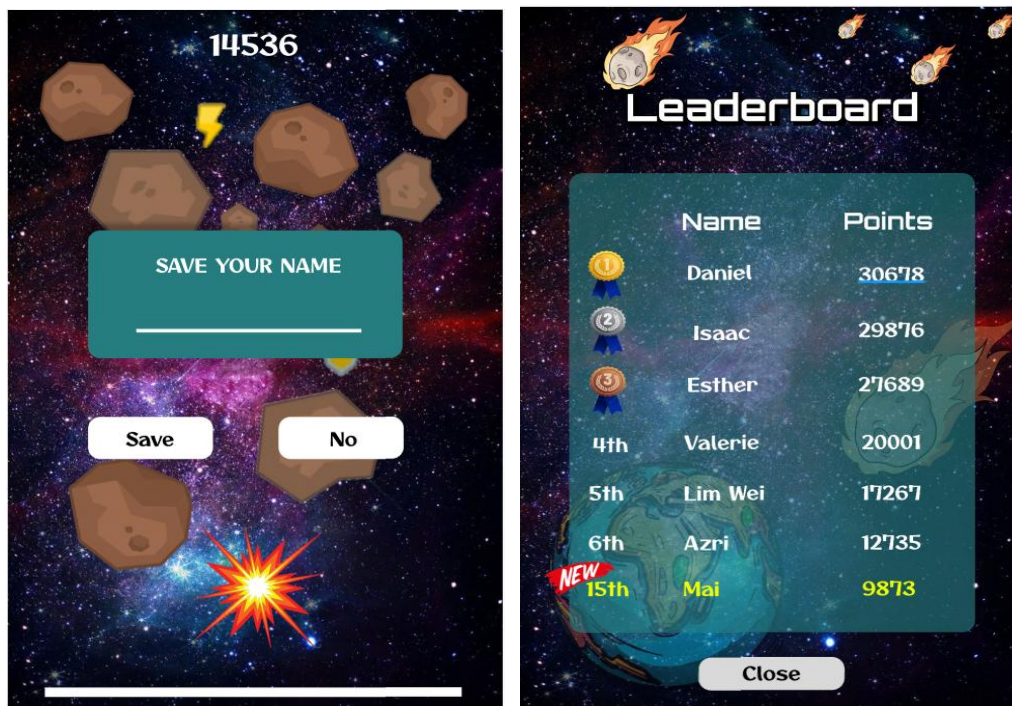
A screen appears to indicate that the player has successfully completed the tutorial, confirming their readiness to proceed to the actual gameplay.

Level Up

These show the level-up process in the game. As the player levels up, the spaceship grows larger and meteors appear in different colors, each requiring more shots to destroy. The game becomes progressively faster and more challenging, with meteors increasing in speed and number. Health increases with each level, but getting hit by meteors reduces it. Shield power-ups restore health, and lightning bolts increase bullet count, up to three bullets. The score is based on survival time and meteors destroyed. A "LEVEL UP" indicator appears on screen, and a hint in the top-right corner shows the meteor color and its required hits: brown requires 1 shot, blue 2 shots, green 3 shots, and pink 4 shots.

Leaderboard UI

After completing a game session, the player is taken to the Save Name screen, where they can enter their name to save their score. Once submitted, the result is added to the leaderboard, which displays the top six player scores. If the player's score is not within the top six, their individual ranking and score are still shown below the leaderboard. This

screen encourages replayability and competition by highlighting high scores and ranking all players based on performance.

3.2. Plan of activities

Previous (Task Distribution Table)

Name	Stage	Task
Daniel Jakson	Proposal	- Executive Summary - Project Methodology - Project Timeline - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Main Menu & Gesture Setup Interface (UI where player enables/configures hand movement detection)
	High Fidelity Design	- Design detailed interface for **Gesture Setup** and **Main Menu**
Tan Hou Ren	Proposal	- Background Study, Problem Statement & Project Objective - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Gameplay Interface with Level-Up UI
	High Fidelity Design	- Design full Gameplay screen with visual assets for level progression

Muhammad Azri Asnawi Bin Kamal Arifin	Proposal	- Development (Project risks and payoffs & Project cost & Evaluation) - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Leaderboard Interface and Game Over Screen
	High Fidelity Design	- Design detailed Leaderboard and Game Over screen with animation or effects to show rank changes, etc. - Add head-up display (HUD) will show the player's level, health status, score, and power-ups during gameplay
Lim Wei	Proposal	- Scope and Limitation of the study - Significance of the report - Expected Output - Read and write 2 Literature Review
	Low Fidelity Design	- Ensure consistency across all wireframes (fonts, layouts, flow) - Add Accessibility Options Wireframe (e.g., hand detection sensitivity, colour modes)
	High Fidelity Design	- Design Settings & Accessibility Screen with toggle controls for gesture calibration and visual/audio options

Maithilly A/P Partiban	Proposal	- Development (Users & Methodology – Double diamond) - Read and write 2 Literature Review
	Low Fidelity Design	- Create User Flow Diagram from gesture setup → gameplay → level up → leaderboard - Build Interactive Prototype (Figma) showing gesture-based transitions (e.g., swipe to shoot, move to navigate.
	High Fidelity Design	- Design a hand gesture icons or indicators to guide the user before the game start

Latest (Task Distribution Table)

Name	Stage	Task
Daniel Jakson	Proposal	- Executive Summary - Project Methodology - Project Timeline - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Main Menu & Gesture Setup Interface (UI where player enables/configures hand movement detection)
	High Fidelity Design	- Design detailed interface for **Main Menu and Hand Detection.** - Identify the final interaction aspect for the latest high fidelity in every section.
Tan Hou Ren	Proposal	- Background Study, Problem Statement & Project Objective - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Leaderboard Interface and Game Over Screen
	High Fidelity Design	- Design detailed **Leaderboard and Game Over** screen with animation or effects to show rank changes, etc. - Add head-up display (HUD) will show the player's level, health status, score, and power-ups during gameplay

		- Analysis the user responses regarding the user testing results.
Muhammad Azri Asnawi Bin Kamal Arifin	Proposal	- Development (Project risks and payoffs & Project cost & Evaluation) - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for the hand gesture mode gameplay
	High Fidelity Design	- Integrate the hand gesture file code that applies the webcam functionality into the SpaceShooter file code. - Identify the design of experiment for the high fidelity report
Lim Wei	Proposal	- Scope and Limitation of the study - Significance of the report - Expected Output - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for Gameplay Interface with **Level-Up UI**
	High Fidelity Design	- Design full Gameplay screen with visual assets for level progression - Create a list of innovations that have been implemented in the project.

Maithilly A/P Partiban	Proposal	- Development (Users & Methodology – Double diamond) - Read and write 2 Literature Review
	Low Fidelity Design	- Sketch wireframe for the tutorial mode
	High Fidelity Design	- Design detailed interface for **Tutorial Mode** - Do a report regarding the evaluation that has been done.

3.3. Clear list of innovations

The Space Shooter enhancement project integrates multiple innovative elements designed to improve the player's engagement and making the game user-friendly. The main innovation is the implementation of a hand gesture recognition system as a primary control mechanism for the game. Through tracking via webcam, very simple and intuitive gestures are used to control the game. This is a shift-away-from-traditional keyboard entries method and physically interacting with the system stands as a layer of interaction, widening greater immersion. More importantly, it opens up accessibility for players with poor motor coordination or undergoing physical rehabilitation, providing a more inclusive gameplay experience.

The other one focuses on a level-up system that works according to player performance. As players progress in the game, their spaceship visually transforms and also acquires abilities like fast firing, better defense, or bigger in size. As a result, increased difficulty in the enemies and environmental challenges balances the game's excitement and rewards. This level-up system fulfills players' psychological needs of competence, autonomy, and relatedness critical to long-term user engagement.

Besides that, the project presents a competitive leaderboard system. It is designed to improve players' replayability and motivation. Scores are calculated based on player performance metrics such as enemies destroyed, and achievements. The leaderboard is real-time based and displays player rankings. It raises a sense of competition and motivates players to continually improve and challenge themselves and others. This positively adds a social aspect to the game, and supports goal-oriented play.

An additional design innovation is the application of a data-driven approach using A/B testing to refine the interface. In particular, two design alternatives were accordingly tested for the gameplay mode selection screen at main menu. In version A, a toggle switch with obvious ON/OFF states was used, whereas version B used radio button style inputs. From the test results, it was revealed that Version A was chosen by players for its clearer visual feedback and simplicity in understanding. This clearly shows a deliberate and evidence-based refinement of the player interface, displaying how design decisions can be exceptionally enhanced by reliance on player feedback and testing.

4. References

Nguyen, T. (2021). *Prototype-Driven Development in Indie Games*. *Interactive Design Journal, 12*(3), 88–102.

Ismail, N. A., & Zin, N. A. M. (2020). *Gesture recognition-based games for learning: A review*. International Journal of Advanced Computer Science and Applications, 11(5), 460–468. https://doi.org/10.14569/IJACSA.2020.0110561

Interview Protocol

Title of Interview Protocol Project: <u>Space Shooter new version</u>

Basic Information About the Interview:

<u>The purpose of this interview is collecting insight from the player about the satisfaction of the enhancement of the Space Shooter game. These enhancements include the control & usability, Level system and Leaderboard.</u>

Time of interview:

Date:

Place:

Name of Interviewer:

Name of Interviewee:

Interview Questions

1. **Warm up question**

   a. Have you played any version of *Space Shooter* or similar arcade games before? (Yes/ No)
   b. How often do you play video games in a week? (1-7 days)
   c. Have you used hand-gesture control in games or apps before? (Yes/ No)

2. **Control & Usability:**

   a. How easy or difficult do you feel to control the spaceship using the provided hand gestures? Any suggestions?
   b. Which control method (keyboard vs gesture) did you prefer? Why?

3. **Level System:**

a. Did the level progression (getting harder over time) feel rewarding?
b. Was it clear when you levelled up? How did it make you feel?

4. **Leaderboard:**

a. Did the leaderboard motivate you to perform better?
b. Would you be interested in playing again to beat your high score?

5. **General Experience:**

a. What part of the enhancement of the game did you enjoy the most?
b. What part of the game did you find frustrating or confusing?
c. If you could improve one thing, what would it be?

6. **UX Design Principles**

a. **Useful:**
   Did this game successfully entertain you and give you the gaming experience you were looking for?

b. **Usable:**
   Can you efficiently learn and execute the Shaka gesture controls without excessive frustration?

c. **Desirable:**
   Do the visual elements and progression systems create a compelling emotional journey that motivates continued play?

d. **Findable:**

How easy was it for you to find and understand the game information you needed?

e. **Accessible:**

How comfortable were the physical requirements of playing this game?

f. **Credible:**

How much did you trust that the game was accurately responding to your actions and fairly tracking your performance?

g. **Valuable:**

Does this game offer something valuable that you can't get from other games?

7. Wrap-up (5 minutes)

a. Thank the participant
b. Offer any small incentive if you have one (e.g., snacks)
c. Remind them how their feedback will be used

Interviewee 1

Interview Protocol

Title of Interview Protocol Project: <u>Space Shooter new version usability interview</u>

Basic Information About the Interview:

<u>The purpose of this interview is collecting insight from the player about the satisfaction of the enhancement of the Space Shooter game. These enhancements include the control & usability, Level system and Leaderboard.</u>

Time of interview: 5.20 pm

Date: 11/6/2025

Place: INASIS SME

Name of Interviewer: Tan Hou Ren

Name of Interviewee: Ch'ng Zhi Xuan

Interview Questions

1. **Warm up question**

a. Have you played any version of *Space Shooter* or similar arcade games before? (Yes/ No)
- Yes

b. How often do you play video games in a week? (1-7 days)
- 3 days

c. Have you used hand-gesture control in games or apps before? (Yes/ No)
- No

2. **Control & Usability:**

a. How easy or difficult do you feel to control the spaceship using the provided hand gestures? Any suggestions?
- The hand gestures mode is easy to use.

b. Which control method (keyboard vs gesture) did you prefer? Why?
- Gestures are better, because using the keyboard is easy to destroy.

3. **Level System:**

a. Did the level progression (getting harder over time) feel rewarding?
- Yes, but I depend on the indicator provided in **Design A** and set my target**.** It really helps me compare **Design B.**

b. Was it clear when you levelled up? How did it make you feel?

- Yes, because the size of the spaceship has become bigger and health points become longer. The size of the spaceship becomes bigger and makes it easier to collide with meteorites but it makes me feel more excited and challenged.

4. **Leaderboard:**

a. Did the leaderboard motivate you to perform better?

- Yes, because I want to get a higher mark compared to others. So, I will think of a different strategy to get a higher mark.

b. Would you be interested in playing again to beat your high score?

- Yes, because I want to get rank number 1 and beat other people.

5. **General Experience:**

a. What part of the enhancement of the game did you enjoy the most?

- I enjoyed the main menu design in **Design A** the most. The toggle switch felt more interactive and engaging compared to the radio button in **Design B**. It provided a smoother and more dynamic experience, which made switching between modes feel more natural and enjoyable.

b. What part of the game did you find frustrating or confusing?

- In **Design B,** the various colors of the meteorite did not directly mention how many times needed to be shot for destroying the meteorite. That confuses me sometimes.

c. If you could improve one thing, what would it be?

- Add the number of shootings needed to destroy the meteorite directly.

6. UX Design Principles

a. **Useful:**

Did this game successfully entertain you and give you the gaming experience you were looking for?

- Yes, I really enjoy playing this game.

b. **Usable:**

Can you efficiently learn and execute the Shaka gesture controls without excessive frustration?

- Yes, I can. But it takes time to detect accurately.

c. **Desirable:**

Do the visual elements and progression systems create a compelling emotional journey that motivates continued play?

- Yes, the icon and the colour selection make me want to play more.

d. **Findable:**

How easy was it for you to find and understand the game information you needed?

- Very easy to understand. Every option is easy to use and identify.

e. **Accessible:**

How comfortable were the physical requirements of playing this game?

- I can move my hand easily. Not very tiring.

f. **Credible:**

How much did you trust that the game was accurately responding to your actions and fairly tracking your performance?

- I trust this game since my score increases every time I shoot and it tracks every meteor that hits my bullet accurately. And the leaderboard saves my data correctly.

g. **Valuable:**

Does this game offer something valuable that you can't get from other games?

- Yes, where I can experience something that I never played before using hand gestures.

Interviewee 2

Interview Protocol

Title of Interview Protocol Project: <u>Space Shooter new version usability interview</u>

Basic Information About the Interview:

<u>The purpose of this interview is collecting insight from the player about the satisfaction of the enhancement of the Space Shooter game. These enhancements include the control & usability, Level system and Leaderboard.</u>

Time of interview: 2.30 pm

Date: 11/6/2025

Place: INASIS Bank Rakyat

Name of Interviewer: Daniel Jakson

Name of Interviewee: Judd Maran John Adu

Interview Questions

1. **Warm up question**

a. Have you played any version of *Space Shooter* or similar arcade games before? (Yes/ No)
- Yes

b. How often do you play video games in a week? (1-7 days)
- 2 days

c. Have you used hand-gesture control in games or apps before? (Yes/ No)
- No

2. **Control & Usability:**

a. How easy or difficult do you feel to control the spaceship using the provided hand gestures? Any suggestions?
- Easy, because there are tutorials before using hand gestures set to guide players.

b. Which control method (keyboard vs gesture) did you prefer? Why?
- Hand gesture set. This is because the hand gesture mode is more advanced compared to the keyboard mode.

3. **Level System:**

a. Did the level progression (getting harder over time) feel rewarding?
- Yes, it made us want to keep playing and motivated us to achieve more as we progressed. The indicator of the number of meteorites also gives a hint to me to hit the meteor in **Design A.**

-

b. Was it clear when you levelled up? How did it make you feel?

- Yes, clear. Because there are changes in the spaceship and the game play once achieved a certain level.

4. **Leaderboard:**

a. Did the leaderboard motivate you to perform better?

- Yes, I can compete with my friend based on the score recorded.

b. Would you be interested in playing again to beat your high score?

- Yes, I make myself perform a new score every time I play. Even though I don't get the high score, I also can challenge myself to improve the previous score that appears like **Design A.**

5. **General Experience:**

a. What part of the enhancement of the game did you enjoy the most?

- The hand gesture mode since it is my first time using that feature. Plus, I love to use the **Design A** main menu compared to **Design B.**

b. What part of the game did you find frustrating or confusing?

- No, all of it is interesting.

c. If you could improve one thing, what would it be?

- I would make the shooting automatic, allowing the user to only focus on moving left and right.

6. UX Design Principles

a. **Useful:**

Did this game successfully entertain you and give you the gaming experience you were looking for?

- Yes, the hand gesture gives me new experience and the level progression keeps me motivated everytime i play it.

b. **Usable:**

Can you efficiently learn and execute the Shaka gesture controls without excessive frustration?

- The guidance is already provided in the game which makes me comfortable and easy to learn before playing the game.

c. **Desirable:**

Do the visual elements and progression systems create a compelling emotional journey that motivates continued play?

- The level-up system makes me feel rewarding and keeps me wanting to play.

d. **Findable:**

How easy was it for you to find and understand the game information you needed?

- It was very easy for me to find and understand the game information.

e. **Accessible:**

How comfortable were the physical requirements of playing this game?

- As someone who rarely plays games, I didn't experience any discomfort or fatigue from the hand gesture mode.

f. **Credible:**

How much did you trust that the game was accurately responding to your actions and fairly tracking your performance?

- The hand detection system worked reliably, and the scoring system felt fair. I just need to make sure my hand is in the correct position and has a good brightness.

g. **Valuable:**

Does this game offer something valuable that you can't get from other games?

- The hand gesture makes it more advanced compared to the traditional keyboard controls.

Interviewee 3

Interview Protocol

Title of Interview Protocol Project: Space Shooter new version usability interview

Basic Information About the Interview:

The purpose of this interview is collecting insight from the player about the satisfaction of the enhancement of the Space Shooter game. These enhancements include the control & usability, Level system and Leaderboard.

Time of interview: 12.18am

Date: 11/6/2025

Place: INASIS Yayasan Al-bukhary

Name of Interviewer: Muhammad Azri Asnawi bin Kamal Arifin

Name of Interviewee: Amir Faris

Interview Questions

1. **Warm up question**

a. Have you played any version of *Space Shooter* or similar arcade games before? (Yes/ No)
- Yes

b. How often do you play video games in a week? (1-7 days)
- 4 days

c. Have you used hand-gesture control in games or apps before? (Yes/ No) Level System
- No

2. **Control & Usability:**

a. How easy or difficult do you feel to control the spaceship using the provided hand gestures? Any suggestions?
- Easy but I rarely play this kind of games that can cause difficulties to me.

b. Which control method (keyboard vs gesture) did you prefer? Why?
- I am a computer user that frequently uses a keyboard and it became easier for me to control it.

3. **Level System:**

a. Did the level progression (getting harder over time) feel rewarding?
- Yes, it made me want to keep grinding and feel addicted to the game.

b. Was it clear when you levelled up? How did it make you feel?

- Yes, clear. Because there are unique changes in spaceship animations and it makes me feel more engaged with the game.

4. **Leaderboard:**

a. Did the leaderboard motivate you to perform better?

- Yes, I can compete with my friend based on the score recorded. Plus, the **Design A** leaderboard provides me with the current score which I can take to improve again.

b. Would you be interested in playing again to beat your high score?

- Yes, it makes me want to get a better score the more I play.

5. **General Experience:**

a. What part of the enhancement of the game did you enjoy the most?

- The newly introduced hand gesture feature makes me want to change my playstyle to something new.

b. What part of the game did you find frustrating or confusing?

- In **Design B**, I was unable to track the score and ranking if I was not in the Top 6.

c. If you could improve one thing, what would it be?

- I would make the game have new super powers like rocket launchers and lasers.

6. **UX Design Principles**

a. **Useful:**

Did this game successfully entertain you and give you the gaming experience you were looking for?

- Yes, it really gave me a new experience.

b. **Usable:**

Can you efficiently learn and execute the Shaka gesture controls without excessive frustration?

- Yes, I can.

c. **Desirable:**

Do the visual elements and progression systems create a compelling emotional journey that motivates continued play?

- The level-up indicators and visual changes give me that sense of accomplishment.

d. **Findable:**

How easy was it for you to find and understand the game information you needed?

- Very easy to find and understand the game information.

e. **Accessible:**

How comfortable were the physical requirements of playing this game?

- The hand gesture detection can function well but I feel very tired after playing for a long time.

f. **Credible:**

How much did you trust that the game was accurately responding to your actions and fairly tracking your performance?

- For a competitive case, it is critical that the hand detection system function consistently to fulfill user trust. Any gesture that comes with a mistake detection or is at worst missed will affect my points and ranking.

g. **Valuable:**

Does this game offer something valuable that you can't get from other games?

- The game offers a competitive vibe and involves modern gameplay mode which is hand gesture.