

MOBILE GAME DEVELOPMENT WITH UNITY

PART III: BUILDING A 3D GAME - ROCKFALL

A UNITY PROJECT FOCUSED ON 3D PHYSICS, COLLISION DETECTION, AND
PLAYER CONTROL MECHANICS

GAME CONCEPT OVERVIEW

- PLAYER CONTROLS A SPACECRAFT DEFENDING A SPACE STATION FROM FALLING ASTEROIDS
- OBJECTIVE: DESTROY ALL INCOMING ASTEROIDS BEFORE THEY HIT THE STATION
- CHALLENGES: INCREASING ASTEROID SPEED, LIMITED AMMO, AND SHIP MOVEMENT CONTROL
- WIN CONDITION: SURVIVE ALL ASTEROID WAVES AND KEEP THE STATION INTACT

CORE GAMEPLAY LOOP

- PLAYER PILOTS A SPACECRAFT USING ON-SCREEN CONTROLS
- AIM AND SHOOT TO DESTROY FALLING ASTEROIDS BEFORE THEY HIT THE STATION
- AVOID INCOMING DEBRIS – COLLISIONS DAMAGE THE SHIP OR THE STATION
- SURVIVE EACH WAVE → CLEAR THE AREA → ADVANCE TO THE NEXT LEVEL

INITIAL PROJECT SETUP

- CREATE NEW 3D UNITY PROJECT NAMED ROCKFALL
- ORGANIZE FOLDERS: ASSETS/SCRIPTS, ASSETS/MODELS, ASSETS/PREFABS, ASSETS/MATERIALS, ASSETS/SOUNDS
- SAVE THE SCENE AS MAIN.SCENE IN THE ASSETS FOLDER
- IMPORT THE PROVIDED SPACESHIP, ASTEROID, AND EXPLOSION ASSETS

DESIGNING THE PROTOTYPE

- CREATE EMPTY GAMEOBJECT: PROTOTYPE SHIP
- ADD 3D MODEL OF THE SPACESHIP AS A CHILD OBJECT NAMED GRAPHICS
- ATTACH RIGIDBODY COMPONENT TO ENABLE PHYSICS-BASED MOVEMENT
- ADD BOX COLLIDER FOR COLLISION DETECTION WITH ASTEROIDS
- TAG MAIN OBJECT AS PLAYER FOR COLLISION AND GAMEPLAY SCRIPTS

PHYSICS SETUP

- USE RIGIDBODY COMPONENTS TO SIMULATE REALISTIC SHIP AND ASTEROID MOVEMENT
- ADD COLLIDERS (BOX OR SPHERE) TO BOTH SHIP AND ASTEROIDS FOR ACCURATE COLLISION DETECTION
- APPLY PHYSICS MATERIALS TO CONTROL BOUNCE OR FRICTION DURING IMPACTS
- ENABLE GRAVITY AND USE FORCE OR IMPULSE FOR ASTEROID MOVEMENT
- ENSURE SHIP'S RIGIDBODY USES CONTINUOUS COLLISION DETECTION TO PREVENT TUNNELING AT HIGH SPEEDS

BUILDING THE SHIP

- SHIP ASSEMBLED FROM MULTIPLE GAMEOBJECT COMPONENTS (CORE, THRUSTERS, WEAPONS)
- EACH PART USES RIGIDBODY AND COLLIDER FOR REALISTIC MOVEMENT AND COLLISIONS
- ATTACH COMPONENTS UNDER A PARENT OBJECT NAMED SHIP FOR UNIFIED CONTROL
- USE SCRIPTS TO HANDLE SHIP THRUST, ROTATION, AND WEAPON FIRING
- VISUAL DETAILS ADDED USING MATERIALS AND LIGHTING TO ENHANCE APPEARANCE

SHIP MECHANICS

- PLAYER CONTROLS SHIP MOVEMENT USING ON-SCREEN JOYSTICK OR KEYBOARD INPUT
- SHIP CAN MOVE HORIZONTALLY AND VERTICALLY WITHIN A LIMITED SPACE
- THRUST MECHANICS CONTROL ACCELERATION AND DECELERATION USING RIGIDBODY PHYSICS
- SHOOTING SYSTEM: PRESS FIRE BUTTON TO LAUNCH PROJECTILES TOWARD FALLING ASTEROIDS
- SHIP ROTATION SLIGHTLY ADJUSTS TOWARD MOVEMENT DIRECTION FOR SMOOTHER CONTROL FEEL

PLAYER INPUT SYSTEM

UI CONTROLS:

- VIRTUAL JOYSTICK: CONTROLS SHIP'S DIRECTION AND ROTATION
- FIRE BUTTON: SHOOTS LASERS OR PROJECTILES
- MENU BUTTON: OPENS PAUSE AND SETTINGS MENU

TOUCH INPUT:

- DRAGGING INSIDE JOYSTICK AREA → ADJUSTS SHIP'S MOVEMENT AND STEERING
- PRESS AND HOLD FIRE → CONTINUOUS SHOOTING

INPUT MANAGER:

- MAPS JOYSTICK AND BUTTON INPUTS TO SHIP MOVEMENT AND WEAPON SCRIPTS
- ENSURES NEW SHIP PREFABS AUTOMATICALLY CONNECT TO INPUT SYSTEM

GAME MANAGER SETUP

CENTRAL CONTROLLER FOR:

- SPAWNING AND REMOVING PLAYER SHIPS
- MANAGING ASTEROID WAVES AND ENEMY SPAWNING
- HANDLING WIN/LOSS CONDITIONS (STATION DESTROYED OR ALL WAVES CLEARED)
- RESETTING THE SCENE AFTER SHIP DESTRUCTION
- LINKING CAMERA, SHIP, AND UI ELEMENTS
- TRACKING PLAYER SCORE, LIVES, AND LEVEL PROGRESS

PREPARING THE SCENE

- ADD SPAWN POINT OBJECT (SHIP STARTING POSITION)
- TURN PROTOTYPE SHIP INTO A PREFAB
- ADD ASTEROIDS, SPACE STATION, AND EXPLOSION EFFECTS AS PREFABS
- SET UP MAIN CAMERA TO FOLLOW THE SHIP'S MOVEMENT DYNAMICALLY
- POSITION LIGHTING AND BACKGROUND TO CREATE A DEEP-SPACE ENVIRONMENT



ASTEROID SPAWNING SYSTEM

- SPAWNS FALLING ASTEROIDS AT RANDOM POSITIONS ABOVE THE PLAY AREA
- EACH ASTEROID HAS A RIGIDBODY AND COLLIDER FOR REALISTIC PHYSICS AND COLLISION DETECTION
- CONTROLLED BY AN ASTEROIDMANAGER SCRIPT THAT HANDLES SPAWN TIMING AND WAVE FREQUENCY
- WHEN AN ASTEROID COLLIDES WITH THE SHIP OR STATION, TRIGGER AN EXPLOSION EVENT AND REDUCE PLAYER HEALTH
- ON SHIP DESTRUCTION → RESPAWN A NEW SHIP AT THE STARTING POINT

HEARTS WIN CONDITION AND EXIT SYSTEM

- SPACE STATION ACTS AS THE MAIN OBJECTIVE TO PROTECT THROUGHOUT GAMEPLAY
- ASTEROID WAVES INCREASE IN DIFFICULTY – SURVIVING ALL WAVES TRIGGERS A VICTORY CONDITION
- ON ASTEROID COLLISION WITH STATION → REDUCE STATION HEALTH; IF HEALTH REACHES ZERO → DEFEAT CONDITION
- DISPLAY VICTORY UI WHEN ALL WAVES ARE CLEARED AND THE STATION REMAINS INTACT
- DISPLAY GAME OVER UI AND RESET SCENE WHEN THE STATION IS DESTROYED

♥♥♥ BACKGROUND AND LEVEL DESIGN

- ADD A SPACE-THEMED BACKGROUND USING SKYBOX OR LARGE QUAD WITH STARFIELD TEXTURE
- USE 3D MODELS OR PARTICLE EFFECTS TO REPRESENT DISTANT PLANETS AND STARS
- RESIZE AND POSITION BACKGROUND ELEMENTS TO FIT THE ENTIRE CAMERA VIEW
- ARRANGE ASTEROID SPAWN ZONES AND STATION POSITION FOR BALANCED DIFFICULTY AND PACING
- ADJUST LIGHTING AND FOG FOR DEPTH AND VISUAL CLARITY



CAMERA FOLLOW SYSTEM

- ATTACH A CAMERAFOLLOW SCRIPT TO THE MAIN CAMERA
- CAMERA TRACKS THE SHIP'S POSITION SMOOTHLY IN ALL DIRECTIONS
- CLAMP MOVEMENT TO STAY WITHIN THE PLAYABLE AREA (NO SHOWING BEYOND SPACE BOUNDS)
- USE LERP OR SMOOTHDAMP FOR GRADUAL, CINEMATIC CAMERA MOTION
- KEEPS PLAYER AND KEY OBJECTS (SHIP, STATION, ASTEROIDS) VISIBLE DURING GAMEPLAY

GAMEPLAY MILESTONES

AT THIS STAGE:

- SHIP MOVEMENT AND SHOOTING FULLY FUNCTIONAL
- ASTEROID SPAWNING AND COLLISION DETECTION WORKING CORRECTLY
- EXPLOSION AND DAMAGE EFFECTS TRIGGER ON IMPACT
- CAMERA FOLLOW SYSTEM SMOOTHLY TRACKS THE SHIP
- GAME MANAGER HANDLES RESPAWN, WIN, AND LOSS STATES

SOUND AND EFFECTS

ADD SOUND EFFECTS FOR:

- SHIP ENGINE THRUST
- LASER FIRING
- ASTEROID COLLISIONS AND EXPLOSIONS
- STATION DAMAGE ALERTS
- VICTORY AND DEFEAT EVENTS
- INCLUDE A LOOPING BACKGROUND MUSIC TRACK TO ENHANCE IMMERSION
- USE AUDIOSOURCE COMPONENTS ON SHIP AND ENVIRONMENT OBJECTS
- ADJUST VOLUME AND SPATIAL BLEND FOR REALISTIC 3D AUDIO EXPERIENCE



FINAL TOUCHES AND WRAP UP

- ADD MAIN MENU AND UI WITH START, PAUSE, AND RESTART OPTIONS
- INCLUDE OPTIONAL INVINCIBILITY MODE FOR DEBUGGING AND TESTING
- OPTIMIZE 3D MODELS, TEXTURES, AND PREFABS FOR SMOOTHER PERFORMANCE
- VERIFY COLLISIONS, CAMERA LIMITS, AND INPUT SYSTEMS FUNCTION CORRECTLY
- GAME IS NOW READY FOR TESTING, BALANCING, AND ITERATION