Space Wars

Project Starfighter – Milestone I

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## 

## Project Description

This project will be a reflection of everything that I learn in CSCE 4220 this semester alongside further research into related topics. Specifically, My game project will be a real-time space shooter made within the unreal 4 engine. It will be based on the classic Star Wars Battlefront II space battle game mode with a few adjustments and additions to the environmental gameplay. This project will only focus on the space combat and not the ground combat. The game will be objective based and will start with a single player mode for development time constraints. If time allows, I will implement bonus features such as multiplayer to make the project more in line with its purpose.

## Requirements

This section will focus on the finer details of each requirement for the complete game and group them appropriately.

Notation:

* Requirement # - These are all of the requirements of the game that need to be in the game for completeness.
* Function # - These are all of the functions associated with each requirement to further breakdown the aspects of the game.
* Bonus # - These are all of the bonus additions to the game that could be worked on after the above requirements and functions are implemented.

### Pitch Requirements

This section will list all of the requirements noted in the initial pitch draft of the project.

General:

* 3D Starfighter shooter [Req 1]
* Real Time [Req 2]
* Play divided into two teams [Req 3]
* Battlefield will consist of at least 2 main star cruisers, a few corvette class ships for each side, and several Starfighters playable by the player. [Req 4]
* AI will spawn at random intervals throughout the game. [Req 5]
* Star cruisers and corvettes will be operated by the AI. [Req 6]
* Play will be reserved to Single player to start. [Req 7]
* The player can choose from 2 ships to play as throughout the game.
  + Standard Starfighter [Req 8]
  + Bomber [Req 9]
* The game is over when either team scores enough attrition points to ultimately defeat the enemy, and there will be no time limit. [Req 10]
* The player dying rewards points to the enemy team, but doesn’t end the game. [Func 1]
* There will be destroyable objectives on each side to score additional points. [Func 2]
  + Shield generator
  + Turrets
  + Etc.

The World:

* The sky box will be set in space. [Req 11]
* There will be boundaries for the playing field so that the game is focused on the battle. [Func 3]

Player Character:

* Star Pilot [Req 12]
* Able to fly 2 different ships [Req 13]
  + Standard Starfighter – fast with high powered lasers, and medium powered shields, can also fire torpedoes[Func 4]
  + Bomber – Slow with low powered lasers, but powerful bombs and shields [Func 5]
* Takes damage from collisions (usually lethal). [Func 6]
  + Can be shot down by any enemy lasers and torpedoes.[Func 7]
* Shields will have a regeneration rate while flying around no matter if in combat or out. [Func 8]
  + The regeneration will be stunned for about 2 seconds if fired upon during regen.
  + Regeneration rate will be consistent throughout the match.
* The player is dead when both the shield and hp bars are at 0%. The player will then have an explosion animation for death. [Req 14]
* The player will have a short cooldown timer for them to change ships before re-entering the battle. [Func 9]
* The player will also have a virtually unlimited number of lives until either side wins the battle. [Req 15]

Camera:

* One mode:
  + 3rd Person [Req 16]
  + Third person mode will be placed behind and above the ship. [Req 17]
  + You will be able to see most of the exterior of the ship. [Func 10]
  + The camera will avoid obstructions by other starships and star cruisers whenever the player flies near them. [Func 11]

Non-Player Characters:

* The NPCs will control all of the other Starfighters fighting within the battle along with controlling the corvettes and star cruisers weapons. [Req 18]
  + NPC Starfighters consist of the standard fighter and the bomber, which have the same stats as the player ships.
  + NPC turrets will have medium powered lasers with low accuracy when the player is far away from them, but higher when the player is closer.
* They will actively be searching for any enemy team Starfighters and starship objectives. [Func 12]
  + Turrets will stay stationary on the starships. [Func 13]
* Each NPC controlled ship/turret will have a death animation. [Req 19]

Furniture:

* Space debris from previous space battles. [Req 20]
  + These can be collided with and cause the player to self-destruct. [Func 14]
  + These pieces of furniture can move across the battlefield based on player or NPC interaction(crashing). [Func 15]
* Minor asteroids. [Req 21]
* Distant planets and moons. [Req 22]
* Everything will spawn in a fixed location for each game, and will move based on dynamic interaction. [Func 16]

User Interface:

* Controller will control the Player. [Req 23]
* Unrealistic space flight will be simulated. [Func 17]
  + Damage to the player will appear on the player character directly with a red flashing outline of the ship along with a decrease to either the shield or the hp bars. [Req 24]
* The screen will display:
  + The health bar, shield bar [Func 18]
  + Attrition points for each team [Func 19]
  + Space map [Func 20]
  + Targeted enemy health and shield bars [Func 21]
  + Torpedo/bomb cooldown timer. [Func 22]

Lasers:

* High-Powered [Req 25]
  + Standard Starfighter
* Low-Powered [Req 26]
  + Bomber
* Medium-Powered [Req 27]
  + Turrets
  + Can be beams and short burst lasers [Func 23]
* Enemy lasers are Red. [Req 29]
* Allied player lasers are Blue. [Req 30]

Torpedoes:

* Carried by Both Starfighters. [Req 31]
* Slower than lasers in terms of speed. [Func 24]
* Can lock on to the target and track them until they collide with the target or any other crash-able obstacle in the way. [Func 25]
* Penetrates shields. [Func 26]
* Explosion animation on collision. [Req 32]

Bombs:

* Launched from the bottom the bomber. [Func 27]
* Falls as if it is affected by gravity until it collides with something. [Req 33]
* Deals high damage. [Func 28]
* Explosion animation on collision. [Req 34]

Star Cruisers:

* Destroyable Objectives:
  + Shield Generator [Req 35]
  + Engines [Req 36]
  + Multiple turrets [Req 37]
  + The Command Bridge [Req 38]
  + Life Support [Req 39]
  + Weapon Systems [Req 40]
  + Hanger Bay – where ships will spawn from [Func 29]

Star Corvettes:

* Destroyable objectives:
  + Turrets [Req 41]
  + Engines [Req 42]
  + Shield Generator [Req 43]
  + Main Hull [Req 44]

Possible Additions:

* Multiplayer [Bonus 1]
* Additional Starfighters [Bonus 2]
* Additional turret types [Bonus 3]
* Maybe a ground game like Battlefront 2 [Bonus 4]
* Make the star cruiser turrets controllable [Bonus 5]

### Adjustments

Adjustments will be made throughout the project development and will be listed in this section along with reasons for each adjustment and any additions to the requirements. Most of the adjustments made here are to help with the development time constraints by lowering the amount of work needed to complete the project. Most of the removed requirements will be moved into the “Bonus” category. Also, the other side to these adjustments is to reorganize the list of requirements so that they can be clearer to the developer and others while building the game.

Note: All of these adjustments are being made to the Pitch Requirements. At the end of these adjustments, the pitch requirements organization will be scrapped and a new final list of requirements will be created with better organization.

General:

* Requirement 4 will be adjusted to not require corvette class ships and multiple other ships for the player to choose from, only one.
  + Reason: The main reason for this change is to lower the amount of work required to complete the project within the given time constraints.
* Requirements 5 and 6 will be changed into functions of the AI.
  + Reason: To better organize the requirements and give some intro background for the AI functions.
* Requirement 8 and 9 will be removed from the requirement list.
  + Reason: The main reason for this change is that they are already defined under the player character page.

The World:

* The XYZ plane will be added as a Function of the world space.
  + Reason: This will just keep the game defined as a 3D space shooter.
* The Starfighters and Starships will not be affected by gravity. This will be added as another function of the world space.
  + Reason: This will further define the physics within the world space.

Player Character:

* Requirement 12 will be removed as a requirement.
  + Reason: The reason for this removal is because “Star Pilot” is just a general description of the player character.
* Requirement 13 will be adjusted to match previous adjustments by removing the second flyable ship.
  + Reason: To cut down on the development time.
* Function 5 will be removed from the functions list.
  + Reason: To cut down on the development time.
* Function 6 will be changed to be a requirement of the Player Character.
  + Reason: This will serve to better group the functions of how the player character will take damage.
* Function 8 will be added to the requirements grouping. “The regeneration will be stunned for about 2 seconds if fired upon during regen” will be added as a function of the shield requirement along with “Regeneration rate will be consistent throughout the match.”
  + Reason: The shield aspect of the game should be a requirement than a function, while its description of how it works should be the functions of the shield requirement.
* Requirement 14 will be changed to be a function of the Player Character.
  + Reason: This is to better organize the requirements and their functions.

Camera:

* Requirement 16 will be changed to add 1st person view.
  + Reason: During development, this functionality was easily discovered and added.

Furniture:

* Requirement 21 will be added to Requirement 20.
  + Reason: Minor asteroids fall into the same definition of space debris.
* Requirement 22 will be moved to the bonus features list.
  + Reason: To cut down on development time and keep performance stable for the game.

User Interface:

* Function 20 will be renamed to Radar.
  + Reason: This change gives the function a better definition to use.
  + Requirement 24 will be changed to be a Function.
    - Reason: The visual display reacting on the screen is more of a function for how the UI displays information to the screen than a requirement.

Torpedoes:

* Requirement 32 will be changed to be a function of the torpedo.
  + Reason: This change was made to better organize the list of requirements and associate the animation only with the torpedo attributes.

Bombs:

* Functions 27 and 28 along with Requirements 33 and 34 are moved to the bonus features list.
  + Reason: To cut down on development time and fall in line with previous changes to the bomber ship requirements.

Star Cruisers:

* Function 29 will stay, but the Hangar Bay definition that it is attached to will become a requirement for the Star Cruisers page.
  + Reason: To better organize the Star Cruiser requirements.

Star Corvettes:

* Requirements 41-44 are moved to the bonus features list.
  + Reason: To cut down on development time and fall in line with previous changes to the Star Corvette ship requirements.

The final significant change being made to the list of requirements will be an additional overall grouping that will group the main aspects of the game together with their respective requirements and functions. This new requirement grouping will be called “Overarch #” and it will be shown in the grouping sections and the final list.

### Requirements Regrouped

This section will explain the grouping of each requirement.

* **Overarch [OA]** - These are the Overall main aspects of the game that each requirement and function can fall under.
* **Requirement [Req]** - These are all of the requirements of the overarch requirements that need to be in the game for completeness.
* **Function [Func]** - These are all of the functions associated with each requirement to further breakdown the aspects of the game.
* **Bonus [B]** - These are all of the bonus additions to the game that could be worked on after the above requirements and functions are implemented.

Note: the numbering system will be removed due to the more organized overarch grouping.

Example:

* The Player Character is an Overarch requirement, because the game needs a PC.
  + Under the PC is a list of requirements that the PC must have to be a PC within the game such as being able to sly a standard Starfighter.
    - Then to further detail each requirement a list of function requirements are listed to spell out each function needed for the requirement such as the PC ship being able to take damage.

### Final List

The final section of the project requirements will list the final draft of requirements noted up to this milestone. Each requirement will be fully detailed and defined in this section. The grouping of each requirement also helps to define each requirement so that there isn’t much of a need to explain how everything will work in the end.

General: *These are the general requirements of the game that help to define what type of game is being made and how it will be played overall.*

* 3D Starfighter shooter [Req]

*Definition: Basically the game will be a third person shooter set in space.*

* Real Time [Req]

*Definition: The game will have no stops until the match is over and a team wins.*

* Play is divided into two teams [Req]

*Definition: There will be two sides to the battlefield for the player to either join or attempt to defeat throughout the game. Each side will have their own visual definitions but will be balanced in terms of functionality and gameplay.*

* Battlefield will consist of at least 2 main star cruisers, enemy and allied AI Starfighters, and a Starfighter that is playable by the player. [Req]
  + AI will spawn at random intervals throughout the game. [Func]

*Definition: Throughout the game, as AI are destroyed throughout the battle, they will be respawned at random to repopulate the battlefield.*

* + Star cruisers and corvettes will be operated by the AI. [Func]

*Definition: this type of AI will roam the battlefield in fixed areas and paths to bring a more dynamic feel of a changing environment in space.*

* Play will be reserved to Single player to start. [Req]

*Definition: There will only be one player exploring the game at the beginning of development to test everything out before implementing multiplayer.*

* The game is over when either team scores enough attrition points to ultimately defeat the enemy, and there will be no time limit. [Req]

*Definition: The gameplay will be based on a points system where accomplishing, or in this case destroying, objectives will reward the appropriate team points towards winning the game.*

* + The player dying rewards points to the enemy team, but doesn’t end the game. [Func]
  + There will be destroyable objectives on each side to score additional points. [Func]

**The World:**

* The sky box will be set in space. [OA]
  + XYZ Plane [Req]

*Definition: Using the XYZ plane will help to define the game as being 3D.*

* + - There will be boundaries for the playing field so that the game is focused on the battle. [Func]
  + The Starfighters and Starships will not be affected by gravity. [Req]

*Definition: There will be no need to use gravity in space because it doesn’t exactly exist.*

**Player Character [OA]:**

* Able to fly one ship [Req]
  + Standard Starfighter [Func]

*Definition: The standard Starfighter is fast with high powered lasers and can also fire torpedoes. The Starfighter will also be able to boost and have full pitch, yaw, and roll movement systems.*

* Takes damage from collisions [Req]
  + Can be shot down by any enemy lasers and torpedoes.[Func]
  + The player is dead when both the shield and hp bars are at 0%. The player will then have an explosion animation for death. [Func]

*Definition: HP bars and shield bars will be represented in UI.*

* + The player will have a short cooldown timer for them to change ships before re-entering the battle. [Func]

*Definition: This function will allow the player to have some sort of breathing time if needed to take a look at the battlefield and make some decisions based on the gameplay.*

* Shields will have a regeneration rate while flying around no matter if in combat or out. [Req]

*Definition: This will remove the need for multiple different functions that clutter the system when calculating the shield functions.*

* + The regeneration will be stunned for about 2 seconds if fired upon during regen. [Func]

*Definition: This will give some balance to players trying to finish off a skilled pilot, but short enough for the unskilled to learn and attempt to get away.*

* + Regeneration rate will be consistent throughout the match. [Func]
* The player will also have a virtually unlimited number of lives until either side wins the battle. [Req]

*Definition: There is a background tracker for the number of lives involved with the game due to the score counting down the end of the game and the function of the player death rewarding the enemy team points.*

**Camera[OA]:**

* 3rd Person and 1st Person modes [Req]
  + Third person mode will be placed behind and above the ship. [Req]
    - You will be able to see most of the exterior of the ship. [Func]
    - The 3rd person camera will avoid obstructions by other starships and star cruisers whenever the player flies near them. [Func]

**Non-Player Characters[OA]:**

* The NPCs will control all of the other Starfighters fighting within the battle along with controlling the corvettes and star cruisers weapons. [Req]
  + They will actively be searching for any enemy team Starfighters and starship objectives. [Func]
  + Turrets will stay stationary on the starships. [Func]

*Definition: The AI will be split into different roaming groups to spread out the space combat. Some ships will fight in the center area of the map, while others will fly over to attack the enemy cruiser or defend their own.*

* Each NPC controlled ship/turret will have a death animation. [Req]

**Furniture[OA]:**

* Space debris from previous space battles. [Req]

*Definition: Space debris consists of ship wreckage, asteroids of all sizes, and possibly some meteor showers or planets. The space debris will also be dynamic in movement if they collide or interact with the PC/NPCs.*

* + These can be collided with and cause the player to self-destruct. [Func]
  + These pieces of furniture can move across the battlefield based on player or NPC interaction (crashing). [Func]
  + Everything will spawn in a fixed location for each game, and will move based on dynamic interaction. [Func]

**User Interface[OA]:**

* Controller will control the Player. [Req]

*Definition: The goal is to hook up a game controller such as the XBOX 360 controller to play the game instead of using the mouse and keyboard.*

* + Unrealistic space flight will be simulated. [Func]

Definition:Flying the Starfighter will feel like flying jet fighters in Earth’s atmosphere.

* The screen will display[Req]:

*Definition: This section defines what will be displayed on the player’s UI in real-time.*

* + Damage to the player will appear on the player character directly with a red flashing outline of the ship along with a decrease to either the shield or the hp bars. [Func]
  + The health bar, shield bar [Func]
  + Attrition points for each team [Func]
  + Space map [Func]
  + Targeted enemy health and shield bars [Func]
  + Torpedo/bomb cooldown timer. [Func]

**Lasers[OA]:**

*Definition: Starfighters will each be given a primary fire function to actually deal damage in the field.*

* High-Powered [Req]

*Definition: These lasers will be used by the standard Starfighters.*

* Low-Powered [Req]

*Definition: These lasers will be used by the bomber class Starfighter and some turrets on the star cruisers.*

* Medium-Powered [Req]

*Definition: These lasers will be used by the turrets on the star cruisers.*

* + Can be beams and short burst lasers [Func]
* Enemy lasers are Red. [Req]
* Allied player lasers are Blue. [Req]

*Definition: The color definitions are to help the player distinguish their own laser fire among the enemy’s.*

**Torpedoes[OA]:**

* Carried by Both Starfighters. [Req]

*Definition: Starfighters will also be given a secondary fire to bring more dynamic gameplay into the mix. These torpedoes will have significantly different attributes compared to the laser to also be visually appealing, alongside having lethal effects in the battlefield. To balance this addition to the gameplay, a cooldown timer will be implemented.*

* + Slower than lasers in terms of speed. [Func]
  + Can lock on to the target and track them until they collide with the target or any other crash-able obstacle in the way. [Func]
  + Penetrates shields. [Func]
  + Explosion animation on collision. [Func]

**Star Cruisers[OA]:**

*Definition: Star cruisers serve as the main bases for each faction within the game. Each cruiser comes with several objectives that the other team can attack and destroy to earn points for their team. Each of the following requirements are destructible in the game.*

* Shield Generator [Req]
* Engines [Req]
* Multiple turrets [Req]
* The Command Bridge [Req]
* Life Support [Req]
* Weapon Systems [Req]
* Hanger Bay [Req]
  + Ships will spawn from outside this area [Func]

*Definition: The hangar bay will serve to give each team an area to spawn that feels immersive to the gameplay. Of course this aspect will need to be adjusted as the dynamics of the battlefield change to avoid negative results like spawn camping.*

Bonus: *The list of bonus requirements serve as optional additional content that could be added later once the above Overarching requirements are completed. They only bring depth to the completed game alongside other options to explore.*

* Multiplayer [B]
* Additional Starfighters [B]
  + Bomber – Slow with low powered lasers, but powerful bombs and shields
  + Bombs:
    - Launched from the bottom the bomber.
    - Falls as if it is affected by gravity until it collides with something.
    - Deals high damage.
    - Explosion animation on collision.
* Additional turret types [B]
* Maybe a ground game like Battlefront 2 [B]
* Star Corvettes [B]
  + Turrets
  + Engines
  + Shield Generator
  + Main Hull
* Make the star cruiser turrets controllable [B]
* Add distant planets and moons. [B]

## Project Schedule

This is the schedule of development for the project towards three specified dates throughout the semester. The schedule will serve to help keep track of the developer’s progress.

### Milestone I: 2/24/2016

* Skybox [OA]
  + There is room for easy scale expansion.
  + The resolution could be adjusted for a better looking star field.
* Camera [OA]
  + The 1st and 3rd person cameras are built and are functioning appropriately.
  + A spring camera is working for the 3rd person view that will not let environmental objects interfere with vision.
* Player Character [OA]
  + Most of the Player Character functions are built and setup.
  + Needs the ability to take damage, including shield damage.
  + Also needs to reward points on death.
* Laser [OA]
  + The basic High-Powered laser blueprint has been built with their respective colors.
  + Only need to duplicate it and adjust the material textures and damage output for the other types of lasers.
* Bonus: Implemented some basic NPC functions, but it is very buggy right now.

### Milestone II: 3/24/2016

* Finish any missing requirements from Milestone I.
* Torpedoes [OA]
* Non-Player Characters [OA]
* Star Cruisers [OA]

### Final: 5/9-13/2016

* Finish any missing requirements from Milestone II.
* UI [OA]
* Furniture [OA]
* Any extra time for Bonus features

## Project Resources

These are the online resources that I have used up to this point to develop the first milestone.

* Unreal 4’s Content Examples
* Unreal 4’s AI blueprints
* CSCE 4220 class turoials
* SpaceScape software and tutorials – for creating the space skybox - <https://www.youtube.com/watch?v=JSRsQpRfDlk>
* Unreal Tek tutorials - <https://www.youtube.com/watch?v=WK4WGVK1vTQ>
* Strigifo tutorials - <https://www.youtube.com/watch?v=omU-P1I8RZc&list=PLwmGmCVti_dBUu-57WkLips2kq2bT_4wO&index=1>