

Budget Esports Video Game

CST 499

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## Executive Summary

The goal of this project is to produce an innovative, demonstrative video game that caters to the underserved population aiming to become a professional in the Esports industry. Contents of the final product will include a gameplay tutorial, a playable stage, and potentially networking functionality for local multiplayer. Features of this video game are to be created with various hardware limitations of an average consumer in mind. The video game should be able to run smoothly at a high frame rate, averaging 60 frames per second, on an average consumer laptop less than \$500 in value without any aftermarket modifications. Controls for the video game should not require any external hardware. While the final product is geared towards an amateur market, the video game's aesthetics should be polished enough to appear as if it is past the developmental phase. There should be effects, sounds, textured geometries, a user interface layer, and the ability to customize controls. The purpose of this project is to make competitive gaming more accessible to those who cannot afford the hardware to run video games at a decent resolution and speed. This same population would be aspiring to become a Esports professional but, due to those hardware limitations, cannot play at a competitive level. Itch.io will be where the video game will be distributed for free and the primary support platforms will be Windows. Linux, Mac, and mobile deployment will be considered given time constraints.

As for the video game to be made, the player will play the role of a machine operator sent to an unknown planet to gather much needed resources. Upon landing on the planet, the player finds that there are plenty of hostile creatures who are composed of the resources being sought. The player must destroy these creatures, collect resources, and safely deposit the resources back at the rendezvous point. Using a combination of projectiles and the weight and speed of the player's machine is required to deliver enough force to destroy the creatures. More resources collected means more weight to throw around, but it also means more time to build up speed and more strain on the machine. As the player progresses, the player must also manage the strain on their machine. Every action puts strain on the machine which will recover slowly over time, but taking too much damage from monsters or straining the machine while overheating can cause permanent damage. How much resources can the player accumulate before the machine breaks down?

**Table of Contents**

Introduction ..... 4

Project Goals and Objectives ..... 5

Environmental Scan/Literature Review ..... 7

Stakeholders and Community ..... 8

Approach/Methodology ..... 9

Ethical Considerations ..... 11

Legal Considerations ..... 13

Project Scope ..... 13

    Timeline/Budget ..... 13

    Resources Needed ..... 16

    Milestones ..... 16

    Risks and Dependencies ..... 16

Final Deliverables ..... 16

Usability Testing/Evaluation ..... 16

Team Members ..... 18

## **Introduction**

Video games are big. In 2018, the game industry generated 134.9 billion in revenue globally; a 10.9% increase from the previous year (Batchelor, 2018). The Esports market alone is expected to surpass 1 billion in revenue and garner 453.8 million viewers (Pannekeet 2019). As the game industry grows larger each year, the amount of hopeful professional Esports athletes also increases. In order to stand out amongst the growing competition, an Esports athlete must spend big for that competitive edge that will allow them to win big. Much like the athletes of traditional sports such as football or baseball, Esports athletes will need to invest in equipment to be able to participate in the sport. This equipment is where most of an Esports athlete's investments will go towards.

Computer hardware defines much of an Esports athlete's competitive ability and generally more monetary investment correlates to better performance. Key factors such as frame rate, resolution, and response times all depend on the hardware. Peripherals such as the monitor, mouse, keyboard, headphones, and controllers can have a great impact on a player's response times, so cheaper peripherals could potentially bottleneck how much information a player can send and perceive per millisecond. Other bottlenecks include internal hardware components such as CPU, GPU, and RAM which work in unison to reduce latencies and determine the amount of frames processed and rendered. Newer GPUs can also enable minute details to be rendered such as more accurate shadows or reflections. Unfortunately, high-performance internal hardware components also require an equally high-performance motherboard and cooling solution. As an added cost, gaming oriented hardware are often marketed with superfluous aesthetic features that

do not contribute to performance. At the time of writing this proposal, the cost of an Esports oriented gaming computer could easily surpass \$2,000 US dollars.

The purpose of this project is to create a video game that any aspiring Esports athlete could play without requiring a great investment into hardware. This is achieved by making a video game that will run smoothly on non-enthusiast, off-the-shelf hardware. The primary audience are those who aspire to become an Esports athlete but lacks the funding or resources to compete at professional standards. A secondary audience would be students. There is an emphasis to get more students into science, technology, engineering, and math fields, so video games, despite the seemingly contradictory entertainment value, are a great academic example of the culmination of those fields. With both audiences, there is a need for accessibility, and this project would allow aspiring Esports athletes and students alike to try competitive gaming without having to initially invest thousands into premium hardware. This project does not aim to become a triple-A Esports title, but rather a stepping stone into the world of video games with the minimum of hardware requirements.

### **Project Goals and Objectives**

Beyond this project, the long term goal is to create an example for demonstrating that video games are viable to create, download, and play on a low budget. This goal's purpose is to promote accessibility to lower income populations and tightly budgeted institutions. Hopefully, this project will also encourage more to enter the video game industry. To achieve this goal, the resulting video game from this project should be created using open-source software or freeware, have a small footprint for portability, and not require any enthusiast-market hardware to run. Based on these goals, the vital objectives are as follows:

- Game development involves the creation of a workflow from conception to deployment using open-source or free software.
- The development of assets should be done with the final file size in mind, keeping file size to optimally around 20 megabytes but definitely under 100 megabytes.
- Target platform for the final game will primarily be a device with Windows operating system, a dual-core CPU, integrated graphics, 4 gigabytes of RAM, a non-mechanical keyboard with about 88 keys, a touchpad or a 3-button mouse, and a 60 Hertz screen. The game should achieve a steady 60 frames per second on this device.
- Players will be able to customize the controls of the video game's character using an in-game key mapping user interface, and the default keymap should be keyboard exclusive.
- Players will be able to control the video game's character to navigate the map and fire projectiles to achieve an end game result.
- Players will be able to gauge the game's progression through a health bar.
- The video game should have an element of replayability.
- Players should be able to compete against other players through their local area network.
- The game should be deployed as an executable on the Windows platform through the itch.io website.

Secondary objectives, which are mostly aesthetics, will be implemented following successful implementation of the vital objectives. These secondary objectives include creating a textured models for the character, enemies and terrain, adding visual effects and sounds, and

deployment to Linux and Mac platforms. Should all the above objectives be fulfilled, remaining time will be allocated towards inserting new gameplay elements.

### **Environmental Scan/Literature Review**

When comparing this project to other video games, the two major aspects to compare are the project's intention and the mechanics of the video game. It would be difficult to determine if there exists a video game similar to the one being created in this project due to the sheer amount of games in the market. There are many independent video games being released everyday. In 2017, the popular video game distribution platform, Steam, hosted over 7,600 new video games (Wright, 2018). On average, that is more than 20 video games released each day and that is only accounting for the Steam platform. While this project offer some unique sounding features, the components of this project is likely to exist in other possibly obscure video games.

An interpretation of the main intention of this project was to show that video game development could be done on little to no budget. When people think of video games, the big triple-A titles with equally big budgets immediately comes to most minds. Certainly, large professional studios have a lot of expenses and overhead that gets considered into a game's budget, but even smaller independent studios have budgets starting in the hundreds of thousands per game (Pichlmair, 2011). Unfortunately, there is not much information that can be found to support the development of a budget-free video game. An online search will only yield a variety of free software to make a video game and large-budget video games. This lack of information implies that there may not be any precedence of a video game being developed with this low-budgeted intention, but this is unlikely due to the saturation of the video game market.

Gameplay mechanics are often limited to hardware controllers so innovations in mechanics are usually derivatives of existing mechanics and not completely new. For example, the player's movement in this project's video game differ from the conventional first-person computer game where location is dictated by the w, a, s, and d keys are used to relocate the player while the mouse controls the point of view. This video game will have a locked point of view and player orientation will be controlled by a set of six keys controlling the forward, backwards, and sideways motion of the left and right sides of the character. These controls are more akin to flight simulators that maneuver an aircraft by controlling wing flaps. Another differentiating mechanic of this game is the single energy and health indicator. It is common for players to have single health indicator where the indicator would decrement when damage is taken, increase when a recovery event is triggered, and potentially grow as the game progresses. For this game, the player's health is equivalent to the energy consumed. Every action a player takes decrements the indicator, time increments the indicator, and the indicator can shrink when damage is incurred. There exists games with stamina meters, such as games from the Monster Hunter franchise, but stamina and health are generally separate indicators.

### **Stakeholders and Community**

As briefly mentioned in the introduction, the main audience for this project are first the underserved population interested in a career in Esports and second are students who are seeking justification in joining a science, technology, engineering, or math (STEM) related fields. Those considering pursuing Esports professionally can use the resulting video game as a free trial to determine if this career route is a fit for their lifestyle. Students could use the resulting video game as a free, demonstrative resource to learn more about the development process and gauge



their interest in pursuing higher education in STEM fields. The video game also demonstrates the application of arts and design fields promoted within technological industries, so this project should appeal to a broad scope of students. While there are other options available to stakeholders, little or none of those options consider the expenses of the stakeholder like this project.

The larger audience impacted by this project would be the game development community. Within the community, there are common industry standards being promoted such as the use of the Unity game engine, the Unreal game engine, or using C# for scripting. While these resources are free or have free versions available, the promotion of these resources have created a perception that open-source alternatives are inferior. This project deviates from those industry standards by using mostly open-source resources. Hopefully, this project would be a good demonstration of those open-source resources and attract more attention and funding towards their future development.

There is no potential loss from this project for any stakeholder or community as this will be a single game in the vast independent game development community, and the gains to be had may be small. This project is not being developed for the mainstream and is not expected to generate any revenue directly. The main benefit of this project is as representative product demonstrating the potential viability of game development without the need of premium hardware or software.

### **Approach/Methodology**

The primary software to create this game will be a combination of Blender and the Armory3D engine. Blender is an open-source 3D modeling and animation software which has

other media production features built in. The Armory3D engine is a game engine built to work inside of Blender while utilizing Blender's node-based graphic pipeline for constructing game logic and the Haxe-powered multimedia framework of Kha. Armory3D engine, Kha, and Haxe are all also open-source. Prominent software for game assets specifically include, Audacity, MediBang, Microsoft's Visual Studio Code, and ArmorPaint, and these will be used to create the video game's audio, graphics, scripts, and textures respectively. These software are also free or have a free version suitable for this project. Other software are being considered since some of the software mentioned are in development and may be lacking specific functionalities to completing the video game.

In the initial developmental phases, default primitives built into Blender will be used as placeholders for models. Concurrently, concept art for the models will be developed for scaling purposes. The goal of this phase is to implement character movement using the default keymap, get enemies moving randomly, and model basic terrain obstacle. Most of the time during this phase will be adjusting the character's movement speed to suit gameplay and test maneuverability. Blender's rigid body physics will be used for collisions. This phase should also implement the spawning of projectiles but not projectile collisions. No coding will be necessary at this phase.

The following phase will be the development of the key mapping user interface. A main menu interface will be created at this point to act as a directory. Upon a player's selection of the controller option in the main menu, the player should be taken to a new screen where they can customize the key mapping. On the screen, the character model should be visible and responsive to the current key mapping. Also on screen, the players should be able to see a table of keys to

actions. Players should be able to select an action and subsequently press the key to be reassigned to that action. Controls are done using event-driven nodes in Armory3D engine. The input for those nodes will be transitioned over to script variables to allow for the custom key mappings.

In the next phase, variables will be created for all player and enemy characters. All coding will likely be done in Microsoft's Visual Studio Code using the Haxe language and the proper corresponding extension packs for syntax highlighting. Important variables will be kept in a base character class containing attributes for weight, speed, and direction. The player and enemies will both inherit the base class and implement their own attributes and methods for movement, and the player should have an attribute to gauge strain and damage. The main game loop should start taking form at this point and a specification for end game conditions should be formulated.

For the final vital phase, all spawning and collision events should be scripted. A user interface for the players strain gauge will be created and a set of tests for gameplay behavior will be created. Major stretch goal would be local area networking gameplay and replacing primitives with textured models. This should be the longest development phase which should result in a playable single player game. Deployment to the Windows platform, and other platforms such as Mac and Linux, will be done through the Armory3D engine and uploaded to the itch.io website.

### **Ethical Considerations**

Video games have been the subject of many studies regarding health and have also been associated with unhealthy lifestyles. In 2018, the World Health Organization declared an addiction to video games as a mental disorder under the International Classification of Diseases

(World Health Organization, 2018). More recently, mass shootings in the United States have been attributed to violent video games by some politicians. The events prompted the removal of certain video game titles and its promotional materials from one of the largest retail stores while still selling more imminently life-threatening firearms (Chapman et al., 2019). Does this make video games more dangerous than guns? What about countries that have a larger consumption rate of video games but drastically lower gun violence like South Korea or Japan? Despite conflicting concerns and statistics, consumers are wary of dangers that can prompt such violence as mass shootings. A major concern for this project would be its availability. The main audience of this project is the underserved community who would not otherwise have access to video games. By enabling video games to reach a greater audience, this project could be seen as a vehicle for spreading violence and enabling unhealthy lifestyles.

This project would be considered a violent video game since the goal and mechanics are geared towards the use of force. To mitigate ethical concerns, the setting and characters are fictional, there is no gore, and low polygonal models will abstract forms to reduce connotations to real-world relationships. The controls are also simple and different from common vehicles. Players are often submerged into a video game's world, and there are concerns that players would project the virtual world onto the real world and enact violence as if they were in-game. By implementing mechanics that are hard to reproduce in the real world, players should find it difficult to enact the game's mechanics in reality. To further combat possible implications of causing unhealthy lifestyles, this project will also consider addiction. The game for this project will have no saveable data beyond control configurations. No competitive scoring will be kept. A player's customization, which was an early concept feature, will also be disabled so there are no

other in-game goals beyond an instanced end-game score. While limiting such features would usually negatively impact a video game's playability, these limitations are aligned with this project's goal of being an entry-level video game for the purpose of attracting attention to the industry. Players of this game are not meant to play this game in the long-term.

### **Legal Considerations**

There no legal considerations for this project. All software used for this project was obtained legally and attribution is not required as the resulting video game will be distributed for free and not for business purposes. Attributions to software used during this project will be displayed publicly in-game as a potential countermeasure. Assets for the video game will be designed and created personally and will not utilize or infringe on any copyrighted material. Despite not being a retail game, warnings will be created. Warnings for this game will be aligned with the ESRB rating system and displayed on itch.io and within the game. Should necessary, further legal considerations will be accounted for during any change in intended development.

### **Project Scope**

#### **Timeline/Budget**

<b>Task</b>	<b>Estimated Time Allotment</b>
<b>Week 0</b>	
Setup development environment	6 Hours
Preliminary information and tutorials	4 Days
Concept designs	1 Day
<b>Week 1</b>	
Rough modeling of assets with rigging	2 Days
Develop character controls with animations	2 Days

Design main menu UI	1 Day
<b>Week 2</b>	
Create controller setup interface	3 Days
Structure character, enemy, and game objects	1 Day
Design main game UI	1 Day
<b>Week 3</b>	
Create map loader	1 Day
Code gameplay logic	4 Days
Develop enemy AIs	2 Day
<b>Week 4</b>	
Overflow	3 Days
Setup Itch.io	1 Day
Incorporate sounds	2 Days
<b>Week 5</b>	
Deploy game (continuous)	1 Day
Polish game	6 Days
<b>Week 6</b>	
Project testing	3 Days
Bug fixing and/or game polishing	2 Days
<b>Week 7</b>	
Presentation preparation	5 Days
Polish game	1 Day
<b>Week 8</b>	
Capstone presentation	1 Day

**Resources Needed**

Necessary hardware will be a laptop that matches specifications of that thought to be in possession of the intended audience. This laptop should be worth less than \$300 in the current market. For development, a mouse and a Wacom tablet will help expedite the work process but is not deemed necessary. An external microphone will be used for some sound effects as well. Software detailed in the above “Approach/Methodology” section is all the software that should be required. Should development have enough time to implement other platforms, a game controller or a smartphone will be needed.

**Milestones**

There are only 2 milestones within this project’s scope. The first milestone will be the completion of the player’s controller setup interface. In this first milestone, players should be able to customize their keyboard controls and test controls with visual feedback. The second milestone will be completion of the main game stage where players can get a feel of the final product of the game if fully completed beyond this demonstration.

**Risks and Dependencies**

The major risk in such a project where developers are using new software for the first time is the risk of encountering a software limitation. Such limitations could drastically increase development time or require a restructuring of the project. Another equally important risk is the associated course assignments and the time that needs to be allocated for those assignments. In the timeline above, the risks are mitigated by not allowing 7-day time allotments for most week and doubling the time estimation for each task to account for roadblocks. There is also an allotment of time designated for late tasks labeled as “overflow”. As stated before, this project is

dependent on the software used and its limitations. While information and tutorials pertaining to software usage will be sought prior to the project, it is impossible to account for precise use cases that may or may not be limited by the software. Other dependencies include being able to find individuals for testing from the itch.io community and, from among those individuals, individuals who will agree to live project testing. There are many people who may be weary of exposing their identity, so a method for approaching such audience will be to request gameplay videos. To increase the possibility of attracting players to try the resulting video game, efforts to advertise on other online forums will also be done.

### **Final Deliverables**

By the end of this project, there should be a playable game as a final product. The final product would be in the form of a single executable for Windows platform. Given enough time, there should be an equivalent executable for the Mac and Linux platform. These executables should be hosted on an itch.io webpage detailing the video game. Along with the game, there should be a development blog. This blog is separate from the course blog and will detail the completion of tasks and problems encountered during the development of the video game. To complement the blog, there will be a public Github repository where all assets for the video game can be downloaded and inspected. As there is no specific client for this project, a client's approval will not be part of the final deliverables.

### **Usability Testing/Evaluation**

The following table is to be rendered into a Google Form document and linked to the final product's webpage on itch.io where volunteers for the focus group can fill out. Content of



this survey is subject to change as development progresses. Questions pertaining to networking or platform compatibility will be added if feature is implemented.

Subject	Criteria	Rating Scale
<b>Player Survey</b>	Gaming habits description	Text
	Device used to play this game	Multiple choice
	Operating System	Multiple choice
	Dedicated graphics card	True/False
	Graphics Card	Text
	Retail price of device	Text
<b>Game Performance</b>	Game loads quickly	1 - 5, Agreement level
	Able to achieve 60+ FPS consistently	True/False
	Where was there lag, if any?	Text
	Controls are responsive	1 - 5, Agreement level
<b>Game Assets</b>	Quality of assets' design	1 - 5, Satisfactory level
	Any defective/unsatisfactory elements?	Text
	Effectiveness of UI	1 - 5, Satisfactory level
<b>Game Logic</b>	Quality of gameplay	1 - 5, Satisfactory level
	Difficulty of gameplay	1 - 5, Difficulty level
	Quality of customizable controls	1 - 5, Satisfactory level
	Was it difficult to learn gameplay?	Text
<b>Player's Opinion</b>	Can this game be an Esports title?	Text
	Is there a need for more accessible gaming?	Text
	Is it easy to get started in game development?	Text
	Gameplay video	URL, optional
	Other comments	Text, optional

### **Team Members**

The team for this project consists of myself only. I, Jason Tse, will be responsible for the development of all assets, game logic, and any supplementary materials.

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