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# Anatomy of Fencing | Master • Champion

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Computer Science: Game Design & Development

## INTRODUCTION

### Project Purpose:

To create a Virtual Reality (VR) Fencing video game.

To learn and develop new skills in using and understanding Unreal Engine 4.

To bring the art, sport, and love of Fencing in the form of a PC-platform video game to Fencers and non-Fencers alike, including those who suffer from physical/movement disabilities.

To immerse said players into either a traditional PC-gaming experience, or a Virtual-Reality-based experience using the Oculus [Development Kit 2].



## ABSTRACT & HYPOTHESIS

Disability in the United States directly affects 1 in 5 citizens (CDC, 2015). The Centers for Disease Control and Prevention (CDC) reports that of the 1 in 5 citizens who are disabled, the most common disability type is mobility limitation (CDC, 2015). Our research has shown that, through rehabilitation, stroke victims have been able to improve mobility limitations with the use of Virtual Reality (VR) (Merians, Alma S et al, 2002). Small clinical studies have shown that victims can be rehabilitated to improve their limited motion. In designing a Fencing video game, we intend to open up the sport of Fencing to the disabled who are unable to participate physically in the sport. The invention of VR has allowed a full immersion experience into the environment designed by the developer. We are geared towards providing those who are unable to Fence physically with the emotions and experiences that mentally come with the sport of Fencing. This game will be designed for all, but directed towards those who are physically--due to disability or age--unable to partake in Fencing.

*Regardless of physical condition, all people should be allowed and given the opportunity to partake in athletics, Fencing included.*

## MATERIALS

### Unreal Engine 4

Unreal Engine is a game engine (or development tool) used by indie and AAA developers alike to produce games. In addition to being a tool used by the pros, Unreal Engine is a gaming tool we wanted to learn and familiarize ourselves with in preparation for the post-grad industry. Using Unreal Engine as our development tool of choice also allowed us to take advantage of the engine's Artificial Intelligence component, albeit we ended up hard-coding the logic ourselves. This hard-coding was made easier via Unreal's intuitive "Blueprints" visual coding system, which allows for the physical piecing together of how an instance should be executed, instead of having to type the typical programming statements. Blueprints also utilizes "visual debugging", which allows the developer to watch how the code is being executed: this allows for a visual error-catch, instead of looking for that misnomer or missing semicolon.

### TurboSquid.com

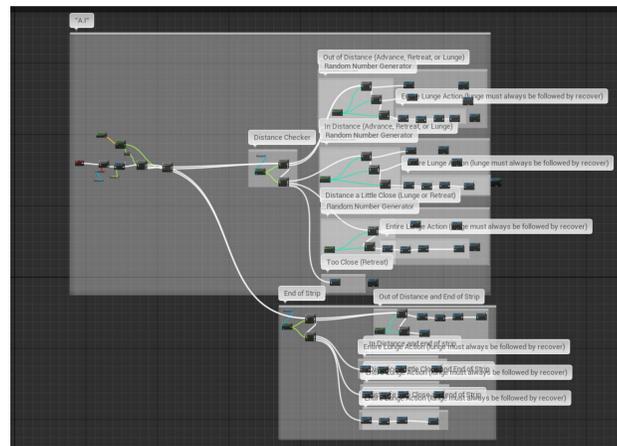
Turbosquid is an online marketplace utilized by game developers and artists to find/buy and sell all kinds of assets--from professional, realistic-looking 3D models to old-world, low-poly models. This is where we purchased the player/opponent models, and the all the background elements.

### Music & Sound Effects

We chose to add an instrumental version of a popular song (Heathens, Twenty One Pilots) to the splash screen in order to put players in a good mood before "competing". Although professional Fencing matches are usually quiet as to not distract the referee or the Fencers, we felt that adding in a cheering crowd sound effect would generate positive, yet passive feedback to the player--since everyone likes to be cheered for.

## METHODS

Pictured below is a representation of the Blueprints visual coding system, particularly the entire coded layout for our Artificially Intelligent opposing Fencer.



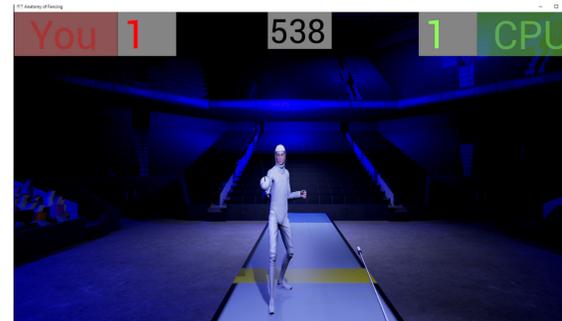
## GAMEPLAY

Pictured below is the Anatomy of Fencing Main Menu screen. From here, players can either choose to start a Bout (a match), adjust the Settings (Fullscreen and VR-input), or view the game's controls in the About screen; they can also choose to quit and exit the game.



If the player chooses to begin a Bout, they will have the option of either "competing" in a 3-minute, 5 touch bout, or a 9-minute, 15-touch bout. Pictured below is an in-game Bout screenshot.

[Also pictured: as per the rules of the Épée weapon, double-touches (each player gets a point for a successful touch) are allowed.]



If the player wins a 3-minute Bout, they can either advance to a harder 3-minute Bout (the opponent becomes more difficult to compete against), or quit to the Main Menu. Regardless of the outcome (Win/Lose), including outcomes for competing in a 9-minute Bout, appropriate text will be displayed, and the player will be returned to the Main Menu.

## USER TESTING

User testing is very important in the development of any product that is intended for a specific audience/consumer-base. Since this was a game intended for the players, we had volunteers test the game continuously throughout the development period. Early testing allowed us to tailor the game to be more user-friendly, and exposed bugs in our game that we had either not seen or not taken into account. Later testing allowed us to finalize smaller details and get overall feedback on the game itself.

## CONCLUSIONS

### Future Improvements:

In regards to software, we would like to add a few gameplay improvements, such as the "Right of Way" rule in Fencing; the inclusion of the other two Fencing weapons (Sabre and Foil); a Multiplayer option; modeling/using our own assets (instead of purchasing pre-made ones). In regards to hardware, we would like to include the ability for players to use other VR inputs (such as the HTC Vive, and other sensors such as hand controllers and the tactile VR vest); developing the game for other platforms (Consoles such as PS4/Xbox, Phones such as Android or iPhones, and compatibility for Mac OSX.)

### Overall Outcome:

Volunteer testers/players rated the logo and name a 3.82/5 average. Volunteer testers/players rated the game overall as a 3.82/5. Since this game was created with both Fencers and non-Fencers in mind, we had volunteers from both parties test the game. Overall, we seemed to have created a game that achieved its intended goals.

### Other Testing Related Conclusions:

User testing allowed us to make some key changes in the game, such as improving the player's understanding of their character's movements; adding a Timeout/Pause Screen; creating a life-like scoring simulation in regards to the scores and lighting; displaying a "Half" text after a touch score has been awarded; fixing the "infinite loop" glitch upon being awarded a double-touch score on the Bout score limit.

The volunteer testers/players voted for the price they would pay for a game like this: out of 17 total responses, 2 people said they would pay \$10-\$30, while the other 15 said they would pay less than \$10. This puts this game at a more or less average price for an indie, PC-platform game--which is essentially what this game is. [However, due to licensing restrictions, we could and would never actually sell this game.]

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