# Science Smackdown

University Of Mauritius

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Software Design Fundamentals and Programming - SIS 1040Y


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## Abstract

Science Smackdown is an Action/Fighting video game based on famous scientists, the scientists have special abilities based on their field of study and the discoveries they made. Science Smackdown is targeted to people of age 12+, encouraging people to develop interest in science and learning basic things about scientists, whose discoveries improved our lifestyle and reshaped our world.

To start with, the player must input his name and as he moves forward in the game, he will encounter with different powers inherited from the discoveries of related scientists. And hence enforcing his ability to move to different levels.

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# Introduction

Science Smackdown is a 2.5D Action/Fighting game inspired from "BombSquad" a multiplayer action game and "Street Fighter" a single and multiplayer fighting game. The game is based around old and famous scientists who use powerups based on their respective area of study and the discoveries they have made during their lifetime.

## Problem Statement

Science Smackdown has been targeted for players of age 12+ in an attempt to encourage youngsters to have an interest in science. The game has been designed to help players of any age to have a better understanding of scientific theories through the powerups of the individual characters.

## Aims and Objectives

-**Aims**

The aim of the game is to battle the opponent in a deathmatch using the in-game mechanics like kicks and punches and mostly using the powerups to drain the enemy's HP more rapidly.

-**Objectives**

The objectives of this game are:

- To generate interest of users in science
- To help players have a better understanding of science while having fun

# Scope

The game's scope is as follows:

- Science Smackdown is an action fighting video game.
- It is a single player game in a 2D environment.
- Each level, the protagonist will encounter different bosses increasing in difficulty.
- The game has an age rating of 12+
- Codes are written in C#

## Table 1: Distribution of Task

| | Bhayraw | Moos | Rajcoomar | Ramdass | Shakun |
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# Background Study

## Basic Concepts

Science Smackdown is a 2.5D action/fighting game. It composes of two characters fighting each other. Each character is based on old and famous scientists who use powerups based on their respective area of study and the discoveries they have made during their lifetime. The user can choose his/her character while the opposing character is computer-controlled. Once the user's character defeats the opposing character, it moves on to the next level until it reaches the final level.

## Existing Games

### BombSquad

BombSquad is a fun multiplayer game where your mission is to beat your opponents using bombs, fists, and wits in thrilling races, vicious fights, or classic games where what matters is getting out alive. There are three game modes for a total of eight different players: cooperative, team, or free-for-all.


Figure 1: BombSquad


Figure 2: BombSquad

## Street Fighter

Street fighter is an offline or online 2D/3D arcade fighting game originated in Japan in 1987 developed by Capcom. While the first game in the series started on arcade machines, it is now released on many platforms such as PlayStation, Nintendo Switch and Microsoft Windows. The newest in the series, Street Fighter 5 is powered by Unreal Engine 4 which has astonishing graphics. The game offers more than 20 dynamic characters with unique abilities to choose from to be the protagonist to complete a different variety of quests in story or arcade mode.


Figure 3: Street Fighter


Figure 4: Street Fighter

## Tekken

Tekken is a world- famous classic fighting game which was founded and developed by Bandai Namco Studios in Japan. It consists of series that are based on arcade games and fighting videos. The first game was released in 1994 as an arcade game and run-on PlayStations which later released on multi - platforms like PlayStation Portable, Xbox 360and Xbox One and cross – platforms like Microsoft Windows. Powered by Unreal Engine 4, the latest version consists of amazing graphics with intense cinematics 3D battles and duels with an ability of over 30 playable characters including the fan favourites for e.g., Street Fighter's Akuma series. It is one of the first fighting games which had used 3D animation at its time. Mobile version named Tekken Gameplay has also been released where users can play using the touch controls to play on screen together with new battle movements added.


Figure 5: Tekken


Figure 6: Tekken

## Injustice: Gods Among Us

Injustice: Gods Among Us is an offline fighting video game in the Injustice franchise based upon the fictional universe of DC Comics. The game was developed by NetherRealm Studios and published by Warner Bros. It was released in 2013 on multiple platforms such as PlayStation 3, PlayStation 4, PlayStation Vita, Xbox 360, Wii U, Microsoft Windows, IOS and Android. It is set in a 2.5D environment: while character models and backgrounds are rendered in three-dimensional graphics, the characters are restricted to fight within a two-dimensional space. It is powered by Unreal Engine 3 which has amazing graphics and it also won several awards for "Best Fighting Game" in 2013. A sequel, Injustice 2, was released in May 2017. The game offers more than 25 playable characters from the DC universe and Scorpion from the Mortal Kombat series.

Figure 7: Injustice: Gods Among Us

Figure 8: Injustice: Gods Among Us

# Potential Tools

## Unreal Engine

Unreal Engine is a game engine developed by Epic Games. Initially developed for PC first-person shooters, it has since been used in a variety of genres of three-dimensional (3D) games and has seen adoption by other industries, most notably the film and television industry. Written in C++, the Unreal Engine features a high degree of portability, supporting a wide range of desktop, mobile, console and virtual reality platforms.

## Unity

Unity is a cross-platform game engine developed by Unity Technologies, first announced and released in June 2005 at Apple Inc.'s Worldwide Developers Conference as a Mac OS X-exclusive game engine. The engine has since been gradually extended to support a variety of desktop, mobile, console and virtual reality platforms. It is particularly popular for iOS and Android mobile game development and used for games such as Pokémon Go, Monument Valley, Call of Duty: Mobile, Beat Saber and Cuphead.

## Adobe Photoshop

Adobe Photoshop is a raster graphics editor developed and published by Adobe Inc. for Windows and macOS. Photoshop can edit and compose raster images in multiple layers and supports masks, alpha compositing and several color models including RGB, CMYK, CIELAB, spot color, and duotone. Photoshop uses its own PSD and PSB file formats to support these features. In addition to raster graphics, Photoshop has limited abilities to edit or render text and vector graphics (especially through clipping path for the latter), as well as 3D graphics and video. Its feature set can be expanded by plug-ins; programs developed and distributed independently of Photoshop that run inside it and offer new or enhanced features.

## Microsoft Visual Studio

Microsoft Visual Studio is a code editor that can be integrated with a variety of third-party productivity tools to improve development quality and speed. Files and applications can be easily created, edited, and navigated.

## CryEngine

CryEngine is a game engine created by the German game developer Crytek. The CryEngine software development kit (SDK), formerly known as Sandbox Editor, is the most recent version of the level editor used to create levels for CryEngine. The software includes tools to aid in scripting, animation, and object creation.

# Comparative Analysis of Tools

- **Unreal Engine:**

  Pros:

  - ✓ better characteristics for the different types of graphics.
  - ✓ Allows users to customize shaders without coding
  - ✓ Lightning-fast post-processing
  - ✓ All user groups have access to source code
  - ✓ For a wide variety of situations, Unreal Engine has more tools and functionality

  Cons:

  - Licensing model disadvantageous for large commercial projects
  - Too cumbersome for small-scale games

- **Unity**

  Pros:

- ✓ Insanely fast unity game development speeds.
- ✓ Easy and quick import process of resource subsystem
- ✓ Multi-platform unity game development and deployment platforms for Consoles, Desktops, Browsers and Mobiles.
- ✓ Excellent and easy 3D surround/panning implementation and Audio engine.

  Cons:

- Expensive if you need to use its entire features (render textures, stencil buffer support etc.).
- Polishing graphics takes more time and work

- **Adobe Photoshop**

  Pros:

- ✓ Available on all platforms
- ✓ Supports almost all image formats

  Cons:

- Performance issues
- Beginners can get confused
- Expensive

- **Microsoft Visual Studio**

  Pros:

- ✓ Help to write code without errors.
- ✓ Very configurable and can use many predefined actions.

Cons:

- Slow debugging
- Slow loading

- **CryEngine**

Pros:

✓ Convenient real-time lighting engine
✓ Neat terrain tools.

Cons:

- Poor documentation
- Lack of learning materials

# Conclusion

In short, the action game Science Smackdown inspired on the existing games such as BombSquad, Steet Fighter and Tekken which have many amazing and intense features and actions. It is quite like Injustice: Gods Among Us which consists of comics as well.

To start with, Unity will be used as an engine as it can build both 2D/3D games and supports 20+ platforms. Asset Store with free samples and models are available which will help in program development. It is also a supportive community which provides intuitive interface. For coding and programming on Unity, both JavaScript and C# are used but most of the time C# will be used.

To design the game and its characters, Adobe Photoshop will be used due to its features of enhancing pictures in different levels and transforming them into visuals by applying various effects. 3D graphics might also be used. It is one of the simplest and time saving editors which will eventually ease the designing section.

# Analysis

## Proposed System

The game mainly consists of 2 modes: Arcade and Survival. In arcade mode the players basically choose their character of choice and fight in a multiplayer deathmatch, which means last person standing wins. In survival mode a person plays solo in a timed-battle against bots and if the player dies it's game over. The battle starts with low-level bots at first and then as the player progresses the bot difficulty also increases.

The characters available are:

- Albert Einstein
- Marie Curie
- Isaac Newton
- Stephen Hawking
- Nikola Tesla

The characters mainly use their powers which are based off each scientists' theories and discoveries that they have made during their lifetime. All characters have a different base attack and defence function as well as other special attacks which are more powerful causing more damage. Those special attacks will not be available at the start of the match. In order to activate them, the players need to cause damage to their opponents which will provide them with orbs to charge up those attacks.

Albert Einstein is mainly known for his theory of relativity and his mass–energy equivalence formula $E = mc^2$ which gave rise to the idea of nuclear power and nuclear bombs, in which case his powers are based on nuclear attack.

Marie Curie is known for her research on radioactivity and for the discovery of polonium and radium. Her powers are based on radioactivity.

Isaac Newton is known for his discoveries in optics and for the 3 Newtonian Laws based on motion. His powers are based on gravity.

Stephen Hawking is known for his theories on the structure of the universe and on the big Bang to black holes. His powers will be associated to black holes.

Nikola Tesla is known for his contributions to the design of the modern alternating current electricity supply system. His powers will be based on electricity.

There will also be powerups available during a battle and they mainly are like boosters to increase speed, damage, health, etc…

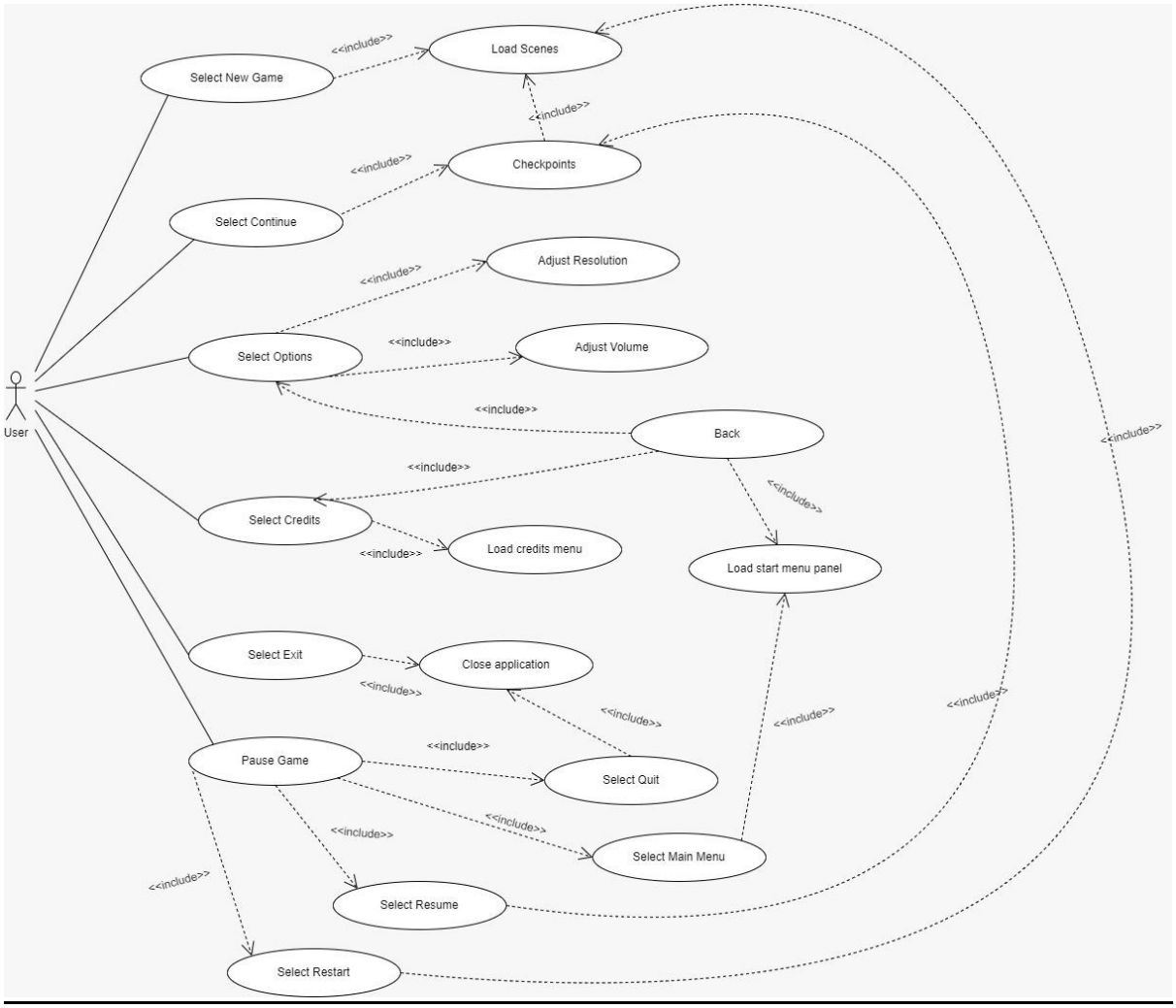
## Functional Requirements:

- FR1: The system shall display Science Smackdown on the welcome page.
- FR2: The system shall display the Main Menu.
- FR3: The system shall allow the user to select “New Game”, “Continue”, “Option”, “Credits”, “Exit”.
- FR4: The system shall allow the user to return to previous screen when “Esc” is pressed.
- FR5: The system shall allow the user to enter his/her name.
- FR6: The system shall allow the user to select “Arcade” or “Survival” after selecting “New Game” or “Continue”.
- FR7: The system shall allow the user to select his/her character.

## Non-Functional Requirements:

- NFR1: The system shall respond within 2 seconds the user clicks a button.
- NFR2: The system shall require less than 10 GB of storage space.
- NFR3: The system shall occupy less than 4 GB of RAM while running.
- NFR4: The system shall save any change made by the user every 20 seconds.

# Use Case Diagram



## Chosen Tools

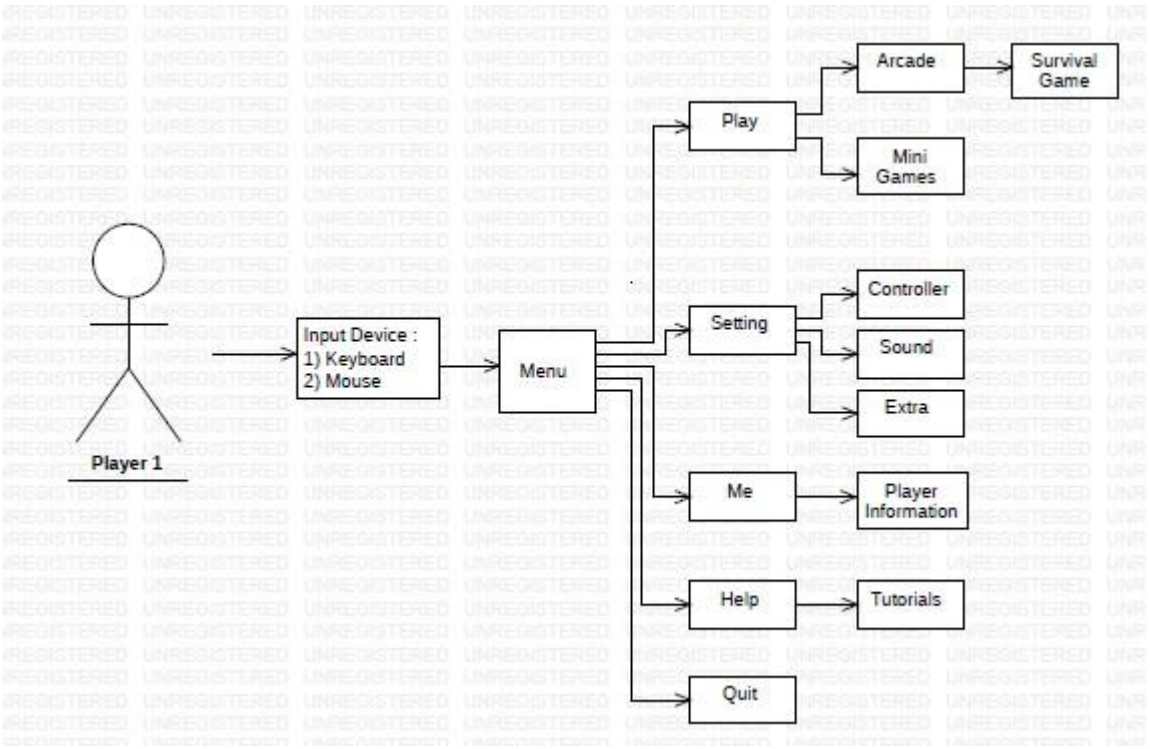
1. **Unity**
   We chose unity because it is free, it allows development of games in both 3D and 2D and provides a lot of readymade templates and textures. It also provides easy to learn tutorial.

2. **Adobe Photoshop**
   Adobe Photoshop will be used due to its features of enhancing pictures in different levels and transforming them into visuals by applying various effects. 3D graphics might also be used. It is one of the simplest and time saving editors which will eventually ease the designing section.

3. **Microsoft Visual Studio**
   A code editor with support for development operations like debugging, task running and version control.

# Design

## Architectural Design




## UI Design

Menu

The menu screen will be displayed first with the following features: New Game, Continue, Options, Credits, Exit.

“New Game” and “Continue” will lead to other menu where the player will choose whether to play the Arcade(main game) or Survival. (New Game will request the user to enter his/her name and start a new profile). After that, the player will be allowed to choose its main character to play in the game.

“Option”: This will allow the player to adjust for volume, controls, and other advance features like enable/disable camera shake. Me: Choosing this option will lead to the player to its information and previous game records.

“Exit”: The button allows the player to exit the game.

Sample screenshot of UI Design

**Main Menu**


*Figure 1: Main Menu*

The Main menu will display the following buttons:

- New Game
- Continue
- Options
- Credits
- Exit

**Pause Menu**


*Figure 2: Pause Menu Screen*

New screen pops up which will consist of the following buttons:

- Resume
- Restart
- Main Menu
- Quit