

**CSED451 COMPUTER GRAPHICS**

**ASSIGNMENT 2**

2D HIERARICHAL DRAWING

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# PROGAMMING ENVIRONMENT

The Programming Languages used are as follow:

* *FreeGlut 3.0.0-2*
* *GLEW 2.1.0*
* *GLM 0.9.9.1*
* *C++*
* *OpenGL & GLSL in Windows*

The Integrated Development used is

* *Microsoft Visual Studio 2007*

We also utilized the Source Control Platform, *GitHub*, and integrated it with Microsoft Visual Studio 2007 to allow us to be able to coordinate work between us and to allow us to easily track changes in our source code during our development process. The Repository can be accessed and view at the following link:

* *https://github.com/jermsinarocket/ComputerGraphics\_Assignment2*

# FUNCTIONALITY OF THE PROGRAM

The program that we implemented is a 2D Volleyball game that is based on the concept of the original “*Pikachu Beach Volleyball*” 2D side-scrolling game.

Our game on top of the first assignment which now consists of the ball having the electricity flow that flows through the boundary of the ball. The cloud is implemented with the hierarchical structure that enables the cloud to have its shape changed while moving horizontally left and right. As for the character, the player now has the additional feature of ears and tails that will vibrate whenever the ball collides.

We have implemented a function where by the user will be able to restart the game by pressing the ***“r”*** key. This will reset the game entirely to its initial state *(Revert back to the Start Screen)*

The objective of the game is to add a hierarchical structure to the character, cloud, and ball to depict movements.

# DESIGN AND IMPLEMENTATION

# BRIEF EXPLANATION OF THE PROGRAM

## Running the Program

There are two ways to run our program, through Microsoft Visual Studio or directly running the executable file:

1. To run the program through Microsoft Visual Studio, launch the ***Assignment\_2.sln*** file located in the ***Assignment\_2* *folder***. After Microsoft Visual Studio has been launched and the solution has been loaded, **build the Solution** *(Ctrl + Shift + B)* and then run the program by pressing **F5**
2. You can launch the program directly by running the executable file ***Assigmnent\_2.exe*** located within the ***bin folder*** *(Assignment\_2\bin)*

## Playing the Game

It is the same as the Assignment 1 for playing the game, you may refer to the report of Assignment 1 on how to play the game.

## Restarting the Game w/ Examples

At the end of the game (whichever player wins), the player will need to press ‘r’ key to restart the game. This will bring back the game to its initial state.

## Additional Features

We have implemented several additional features to our program and they are as follow:

1. **Game Sounds**

* We have implemented Game Sounds at different portions of the game
  + 1st Portion: Running the Game will play **the Game Theme Song**.
  + 2nd Portion: Clicking the “Start” Button will trigger the **Start Sound**.
  + 3rd Portion: When the ball collides with points within its defined collision region, a **Bouncing Sound** will be played.
  + 4th Portion: When the Player/AI scores a point, a **Cheering Sound** will be played.
  + 5th Portion: When the Player/AI wins the game, the **Ending Theme Song** will be played

1. **Exiting the Game**

* User will be able to exit the game straight by pressing the ***“esc***” key.

1. **Switching between Fixed/Partial Screen Modes**

* In addition to showing a partial screen mode, we implemented a function whereby users can toggle between the fixed and partial screen modes by pressing the “z” key.

# PROBLEMS FACED AND SOLUTIONS

There are several problems that we have encountered throughout the processing of completing this assignment

Firstly, we had difficulty in getting the electricity for the ball. At first, we wondered if there was a need to create a segment with randomizing lines in the ball to get the electricity moves around the boundary of the ball. We did some research and found out that there was an easier way for the electricity to flow around the ball. We make sure of the middle point in between the original line to draw the lines of the flowing electricity. This would make it seems like the electricity is flowing through the ball.

Secondly, the Pikachu ear’s shape was hard to draw on 2D plane due to its nature of the shape. It was neither circle or square but rather it was an oval shape. To get the shape done, we had to calculate the theta of the rotation needed for the shape. Next, we need to calculate the radius of the X and Y plane using the glVertex2f to apply the radius and the offset needed to attach to the player. After which, we apply the transformation and rotation to the matrix to get the ear to be attached to the body.

# IMPROVEMENT TO PROGRAM

There are still numerous improvements that can be made to our program.

Firstly, the clouds are currently moving only left and right with the changing shapes. Improvements can be made if we generate new clouds that can move in and out from different angles to depict the actual clouds when the height changes.

Next, the current program is coded in 2D platform. We were thinking of making the current program into 3D characters and 3D background to depict the actual original “Pikachu Pokemon” game.

# CONCLUSION

In summary, through this assignment, we have gained a better understanding about the concepts of using hierarchical modelling and using a scene graph for this assignment. Through hierarchical modeling, we understand that using hierarchical structures can help to describe the movement of the different objects in the game. With the structure, it has helped to apply transformation and rotations to the objects easily. The most important aspect is that we were able to apply the concepts that we were taught during class to our assignment and gained an even better understanding them. All in all, this assignment has helped into further understanding of using scene graph and hierarchical modeling in 2D games.