Nathan Gill – Curling unity project

Marking Criteria

Scene/Environment

Includes an arena environment built in the unity editor, a crowd that is randomly generated on each play, sound effects for winning/losing an end as well as sliding a stone. I chose against using textures as I tried many but couldn’t find any that looked good, I also think the use of strictly colours fits well with the low poly crowd members.

Interaction

In aiming mode, arrow oscillates back and forth and when clicked slides the stone in that particular direction. In directing mode player can sweep the stone using a and d for the relevant direction, free cam available at any point should they wish to use it by pressing Y. Player views the AI stone when it is the AI’s turn.

Physics

For the player, I implemented my own physics for sliding and sweeping the stone, including how it reacts when it collides with a wall or another stone including transferring momentum (stone) and bouncing (wall), this was all build from scratch and includes no assistance from a rigidbody, the AI stones do however use a rb, but that is due to the nature of how it operates during directing.

Structure

Game includes a fully working menu system, including an options screen where the user can adjust number of ends, number of stones per end, volume and AI difficulty (this setting tightens the angle the ai will slide between) this is all handled by two state machines ‘menu states’ and ‘play states’, the first managing which screen the player currently sees (menu/paused/play/game ended) and when in the play state, the second state machine comes into effect, splits the play state into aiming/directing/enemy turn/round ended, each one determines what happens during a particular state of play and handles enabling/disabling relevant controls, displaying/hiding UI elements and many other gameplay features. The correct scoring rules are followed throughout the play state.

Technical Proficiency

The 3 key functions that I believe display technical proficiency are listed below, to save me writing them twice I’ve just stated physics and structure as I mentioned everything above.

Physics (as seen above)

Structure (as seen above)

AI Implementation

AI Aiming

For the aiming, the AI works out the angle between the pivot (the game object that rotates the arrow to initially slide) and the target, as this value increases and decreases, an exponential function *(e^((- angle + 0.001) / maxAngle \* 1 - angle \* 0.02f) where maxAngle <= 45/25/18)* increases the chance of the AI deciding to slide when it is closer to facing the direction of the target, and decreases as it moves further away, allows for a reasonable amount of variation whilst maintaining fairness. maxAngle is determined by AI difficulty set in the options menu (45 = difficulty 1 / easy, 18 = hard)

AI Directing

Starts by taking the X coords of both the target and the stone and works out the distance between them. Next works out which side of the target the stone is on, by comparing their x coordinates, this determines which direction the AI will sweep in, as if it is on the left of the stone, the AI will sweep right and towards it and vice versa, if the stone is already on target, then it will not sweep.

AI Decision Making

If there are several stones blocking the target, the chance of the AI sliding straight is reduced, and instead the chance of sliding between the angles of 6o & 20o (or in the case of hard 6o & 18o) is increased, to simulate some assessment of the game state and avoidance of blocking stones.

Instructions

Game starts on menu screen, options are defaulted to {insert default options} once play is pressed, you are able to view the oscillating arrow and upon clicking the left mouse button, will direct your stone in that particular direction, A and D are used to curl the stone in your chosen direction, after your turn, the AI will take their turn, this gameplay loop repeats until all stones have been used for a specific end, where a winner screen for that specific end will be displayed, the game will end when the number of ends the user has specified have been completed, following this a game over screen will appear with the option to play again or return to the menu, a free cam is available by pressing Y at any point where you will also be able to see the scoreboard (game asset not UI element) and view the environment in more detail should you wish to do so.

Performance

Not sure about performance issues as I used my desktop but I’d recommend testing on at least a desktop PC

**Assets**

**Win round sound effect** – <https://pixabay.com/sound-effects/aww-8277/>

**Lose round sound effect** – <https://www.youtube.com/watch?v=2Cj9pXhIXus> – start of this video

**Stone sliding sound –** <https://www.youtube.com/watch?v=7cAnlZ1U1Mg>

**Probuilder –** <https://unity.com/features/probuilder> - Allows you to make more complex shapes in unity by extruding faces/edges/vertices

All other assets/scripts/UI elements were created by me for the purpose of this project.