DETAILED GAME SPECIFICATION: PAUL'S ASTRO GOLF ADVENTURE [PAGA]

COURSE: COMPUTING MACHINERY II [COMP 2659], WINTER 2022

INSTRUCTOR: PAUL POSPISIL

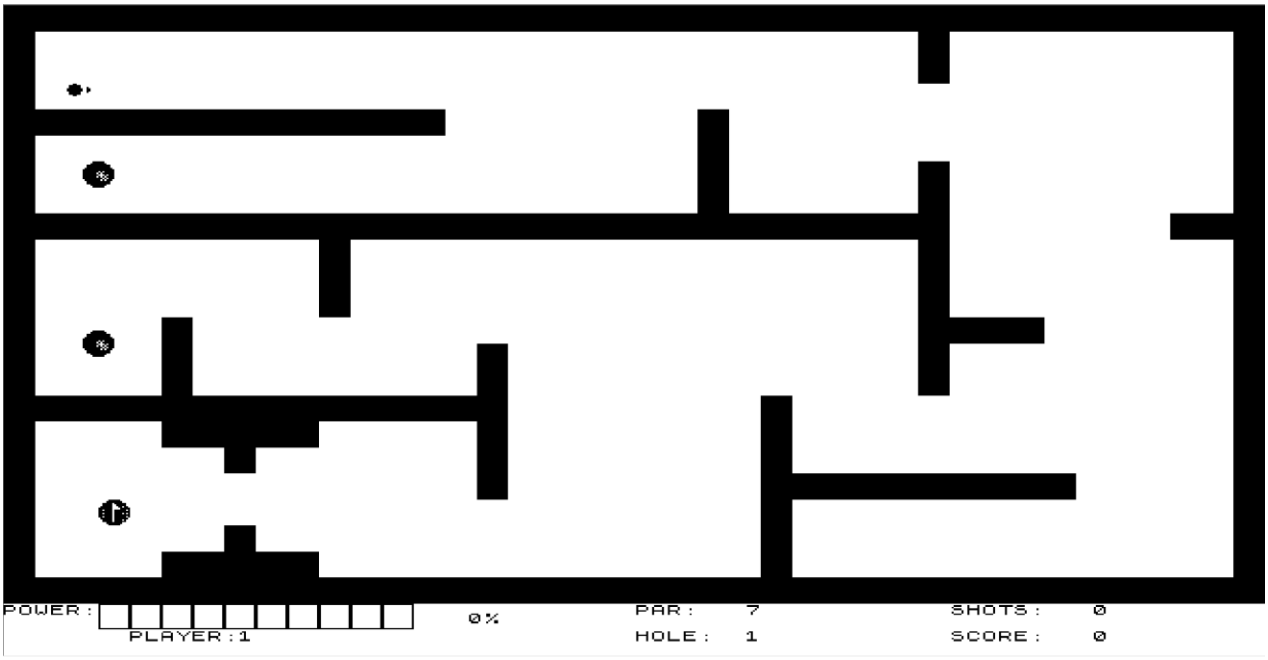
AUTHORS: JOE SPURWAY

SOREN BRADLEY

LAST MODIFIED: FRIDAY, APRIL 8TH, 2022

I. General Game Overview

This 2D mini-golf game [PAGA] will enable a user to play from a top-down perspective a variety of virtual miniature golf courses. One course at time, PAGA provides the user the ability to control the angle of a putting ball (char ‘A’ or ‘D’), the power of their shot (char ‘W’ or ‘S’) and actuating their shot by pressing the enter key. To signify the angle's position changing relative to the ball, a directional line will be used that implies the direction the ball will travel. Following this, we will use a graphical power bar to visualize the output power of the shot. Obstacles are placed on the map in the form of surface terrain changes and portals/redirects. Surface terrain changes, changing the speed of the ball lowering the power of the moving ball. Portals teleport the ball to another area on the map. The ball leaves the portal with the same power and angle that it entered the portal with. The perspective of the game takes a bird’s eye view, where the user can see the whole map and all its features to accurately calculate their next shot. The goal of the game is to get the user’s ball into the putting-hole at a defined position on the map in the least number of turns possible.



II. 1-Player: Game Play Details

START SCREEN

The game will open with a menu screen displaying the mini-golf game logo followed by an entry start button and a quit game button. There will should be accompanying music to accompany a dynamic star like background that moves behind the menu scene. From this point the user will jump straight in to continue procedurally through a 9-hole course, one level at a time - time permitting.

GAME START STATE

A 1-player game session begins with the first hole- opening to two major screen sections, the map box area, and the stat box area. As seen below the stat box will display the current hole (map number 1), the par for the current hole, and the number of shorts taken so far (0) along with the power and angle of the shot both set to the default value of (0). The map box section will contain four main functional components; the ball with its accompanying directional pointer, the ground definition box over the whole map with its accompanying terrain definition boxes that define the behavior of the ball as it passes through, and the wall boundry boxes that will deflect the ball when impacted, and finally the hole box that will be where the user aims to shoot the ball. The ball will be positioned at (32,32) oriented to the right at 90 degrees vertical within this first level and will move at a defined [power bar] component of velocity, 100 pixels per second. This will decrease depending on terrain passed but over regular terrain the velocity decreases by 20 pixels per second.

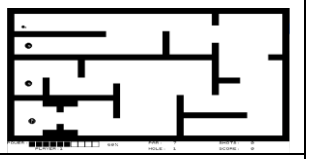
GAME RULES

Players must complete each hole in number order without skipping any hole. Players use the options provided (angle/power/shot) to hit the golf ball from the tee area straight into the hole. The objective is to make it into each hole in as few moves as possible. Every stroke taken counts as a point, and each level as a defined par for an optimal completion time. The player with the fewest strokes at the end of the round wins.

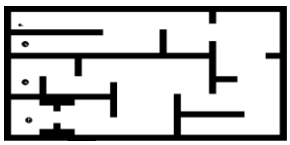
END SCREEN

Ending the game via completing all available holes takes you to an end screen with high scores and an option to return to the menu, quit or play again.

OBJECTS

Object or Object Type Name	**Properties**	**Behaviors**	**Graphical Image [when available]**
Model	Map Box Stat Box Dimensions: 640x400 px	Arranges objects to form UI.	
Stat Box	Position integers - x coordinate: 0 px - y coordinate: 338 px Power Bar Box Total Score Box Map Number Box Par Box Shot Box Player Box Size: 640 x 64 px	Contains stat objects	
Power Bar Box	Position Integers - x coordinate: 0 px - y coordinate: 373 px Power Box - x coordinate: 65 px - y coordinate: 338 px	Contains power box Updates Power percentage	

	Power text - x coordinate: 0 px - y coordinate: 373 px - Size: 64 x 32 px Power percentage - x coordinate: 220 px - y coordinate: 373 px - Size: 64 x 25 px Type: string Size: 320 x 32	Displays power text and power percentage	
Power Box	Position Integers - x coordinate: 65 px - y coordinate: 368 px Power segment Size 224 x 32 px	Updates to current power setting Displays current power setting	
Player Box	Position Integers - x coordinate: 64 px - y coordinate: 384 px Type: Integer Max Players: 2 Size 64 x 32px	Displays Player count	
Total Score Box	Position Integers - x coordinate: 481 px - y coordinate: 384 px Integer Max Score integer 450 (9 holes max 50 shots each) Size: 160 x 32 px	Displays score Updates score	Score: 0
Hole/Map Number Box	Position Integers - x coordinate: 321 px - y coordinate: 384 px Type: Integer Max Map Integer: 9 Size 160 x 32 pixels	Displays current hole Updates to new hole	Hole: 0
Par Box	Position Integers - x coordinate: 321 px - y coordinate: 368 px Type: Integer Max Par Integer: 7	Displays par of hole Updates par	Par: 0

	Size: 160 x 32 pixels		
Shot Box	Position Integers - x coordinate: 481 px - y coordinate: 368 px Type: Integer Max score: 50 Size 160 x 32 pixels	Displays shots taken Updates shots taken	Shots: 0
Map Box	Position Integers - x coordinate: 0 px - y coordinate: 640 px Start Position - x coordinate: - y coordinate: Size 380 x 512 pixels Array of Terrain Definition Box Ball Hole Array of portals Array of Walls Ground	Displays current map Displays ball position and ball angle indicator Displays terrain Definition Box's in places Displays Hole Displays Ground Displays Walls Displays portals	
Ball	Position Integers - x coordinate: dynamic - y coordinate: dynamic Integer angle (in steps of 15 degrees) [I.E., int 1 = 30° & int 24 = 360°] - Max angle value: 16 - Min angle value: 0 Integer power unit (in steps of 10) - Max power value: 100 Current Velocity (pixel person second): Integer - Max value 10 - Min value –10 Movement: - Amount of x pixels to move based on angle calculations	Displays ball at current x/y position Velocity is set based on a power and angle function Can collide with walls, terrain, and Hole Creates the velocity (power per pixel) via the power input value.	

	- Amount of y pixels to move based on angle calculations Ball Directional Pointer Size: 16 x 16 pixels		
Ball Directional box	Position Integers - x coordinate: center x - y coordinate: center y Ball angle Integer - Max angle value: 16 - Min angle value: 0 Size: 64 x 64 pixels	Displays the direction that the ball will go based on the angle set by user.	
Ball Direction pointer	Position Integers - x coordinate: center x - y coordinate: center y Ball angle Integer - Max angle value: 16 - Min angle value: 0 Size: 31 x 31 pixels	Displays the direction that the ball will go based on the angle set by user. Is the arrow for the direction	
Terrain Definition Box	Position Integers - x coordinate: dynamic - y coordinate: dynamic Integer Friction Coefficient - Standard Value: 4 Size: 128 x 128 pixels	When ball enters Terrain box the balls velocity with by effected by the friction coefficient Friction Coefficient is subtracted from the balls currently velocity every 8 pixels	
Portal	Position Integers - x coordinate: dynamic - y coordinate: dynamic Position of connected portal - x coordinate: dynamic - y coordinate: dynamic Size: 32 x 32 pixels	When the ball crosses the portal boundary the balls x/y coordinates will be replaced with the partner portals as their velocity and angle remain unaffected.	
Wall Box	Position Integers - x coordinate: dynamic - y coordinate: dynamic Size Horizontal: 16 x 64 Pixels	Acts as a boundary and obstacle for the ball on the map.	

	Size Vertical: 64 x 16 Pixels		
Hole	Position Integers - x coordinate: - y coordinate: - Center Hit Boolean Size: 32 x 32 pixels	Game continues until Hit Boolean is True.	

PHYSICS

Event Name	Triggering Input Event	Description
Wall impact	Ball hits wall	Angle of incidence == Angle of reflection Velocity is reduced by 25% after impact.
Terrain Collision	Ball passes into new terrain class and its velocity decrement is increased by a defined value. (e.g., 50%)	Terrain is classified by a friction modifier to alter velocity dependent of the surface type.
Hole Hitbox	Ball moves to a position that overlaps with the hole box Collision occurs when the x and y value of the ball enter the hitbox. Position of the entirety of the ball 16 x 16 pixels) enters the hitbox of the hole and is at a power less than or equal to 100 power per pixel, the ball goes in the whole	Under the condition that power does not exceed a defined amount, ball will enter the hole to end the level or continue out of the hole at a reduced power and a directional angle change.
Ball Power	Ball hit button entered	Ball moves at a speed and direction defined by the users entered power unit setting the velocity of the ball.
Ground Friction	The ball's velocity is reduced by 2 every 10 pixels the ball moves on the ground object	The ground the ball moves on will reduce the velocity of the moving ball by a set amount.

ASYNCHRONOUS (INPUT) EVENTS

Event Name	Triggering Input Event	Description
Power Level Change	‘w’ will increase the power level ‘s’ will decrease the power level	Each increase/decrease modified the 10=segmented power bar by 10% [1 bar].
Angle degree change	‘a’ will increment the shot angle	Discrete actuation in either direction will alter the ball's directional pointer to align to its

	‘d’ will decrement the shot angle	proposed position in increments of 30 degrees.
Strike Ball	‘enter’ will actuate the impact with the ball	Takes the power level and angle degrees change to start the balls movement.

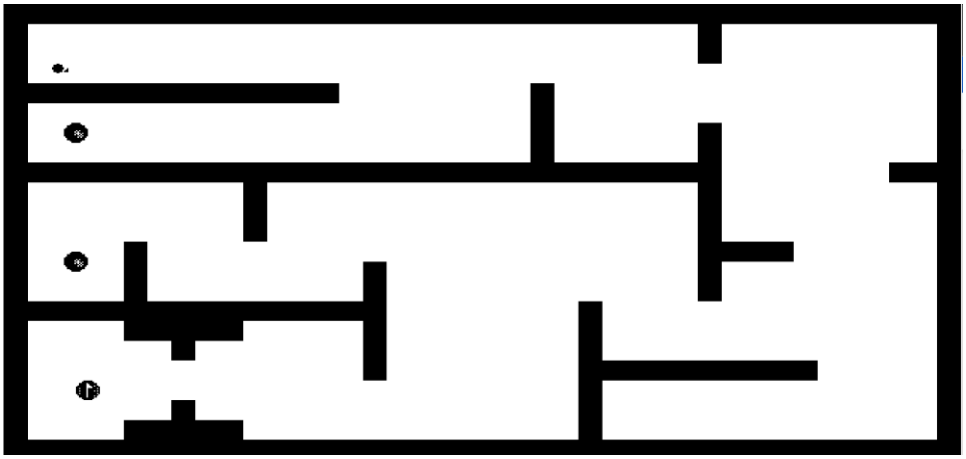
SYNCHRONOUS (TIMED) EVENTS

Event Name	**Triggering Input Event**	**Description**
Enters hole	**When the ball object hits the hitbox of the hole object**	**Sound effect “Yasssss” plays before ending round**

CONDITION-BASED (CASCADED) EVENTS

Event Name	**Triggering Input Event**	**Description**
Get ball in hole	Ball box x/y position equal or within bounds of hole hitbox.	Map score is added to the total score. Hole session is ends and the user moves to the next map or finishes.
User Takes Shot	'LF’ [enter] will initiate the shot sequence with parameters defined by sleeted angle and power.	Ball travels at a velocity defined by the powers inputted power unit * 10 pixels to get power per pixel metric.
User changes power	‘w’ will increase the power setting ‘s’ will decrease the power setting	Power bar will change to reduce or increase the shown bar segment via a viable.
User changes Ball angle	‘a’ rotates the direction anti-clockwise ‘d’ rotates the direction clockwise	The Ball direction pointer moves to the angel specified by the user defined ball angle. (30 degrees)
Ball Wall Collision	x and y position of the top, left, bottom, or right of the ball are next to adjacent (next to each other) to a position of the wall.	Ball collides with wall object and “bounces” off the wall object with the balls angle of incidences being converted to angle of reflection off the wall object
Ball Hole Collision	x and y position of the top, left, bottom, or right of the ball are within the hitbox of the hole at a speed lower than or equal to 30.	Ball enters the hole
Ball Portal Collision	x and y position of the top, left, bottom, or right of the ball are inside the hitbox of the Portal.	Ball enters portal and it's teleported to the hitbox of the connected port exit and leaves with the same power and angle it entered the portal with

HYPOTHETICAL GAMING SESSION



Upon opening the game, the user is greeted with an opening menu screen with an accompanying musical jingle. This splash screen presents the user with options of a one or two player mode along with an exit button. After the user selects the 1 or 2 player mode the music continues to the first hole of the course. The first hole will be presented, and the screen will be updated with the first mini golf map loaded. This level will contain a basic design that implements all the basic map objects including a one-way portal, walls, and a hole. This levels velocity will decrease at a fixed rate as there will be no variable terrain the ball travels over.

The user can manipulate the mechanics of the game through the 'w', 'a', 's', 'd' and 'space' characters on the keyboard. By altering the angle by 30 degrees (char 'a' or 'd') and power by 10 % increments/decrements (char 'w' or 's') then taking shot (char 'space) the user picks their route through the map to achieve optimal completion by comparing shots against the current par for the hole. Finally, the user can exit the current level back to the main menu via the 'q' key. As the ball moves around the course the interactions it makes with its surroundings will comprise the challenge of the game. The users can interact with features to aid or hinder them like terrain changes that will slow the ball and magical teleporting portals that will move the ball into favorable map positions.

Upon the user's completion of a hole the next map will be loaded in for the user. Upon completion of all 9 holes, the user will either be sent back to the home splash screen or within the two-player mode, a score comparison will be presented.

III. 2-PLAYER: GAMEPLAY DETAILS

Objectives and Rules Modifications

The two-player version of mini golf resembles similar mechanics to that of a single player game with the addition of a second ball on the course. The screen will be identical for both players with the addition of both users' stat box data being visible to both users, (or if possible, independent to each user) and will limit the user to input only when it is their turn. The hitbox of each ball will now also need to account for interaction between ball and ball, time permitting this would stop or react to this event.

Modifications

Rules

The player who gains the least points across the total available holes wins.

The player who gains the most points across the total available holes loses.

Gameplay

Assuming the same, shared interface we will display both players' stat box on the display.

Assuming different screen outputs we will display each player specific stat box to the relevant screens.

Both players' golf balls will be shown on either screen.

Ball to ball interactions will need to be handled appropriately.

IV. SOUND EFFECTS

Sound Effect Name	Event Triggering Playback	Description [Linked]
Song (opening splash screen)	User opens the program	The Police's 'Walking on the Moon' Peter Schilling's 'Major Tom'
Song (gameplay)	User starts the game	As the players' scores increase the music will increase in complexity. Each added musical layer will add to the upbeat tune along with an engaging faster tempo until a par.
User shot	User shoots the ball	Splonk
Enter Hole	Ball enters hole	Yasssss
Enter portal	Ball crosses portal	Poooooof

Background Music

Walking on the Moon sets the scene for this space fairing mini-golf game with its funky tones and chill galactic themes, any keen Astro-golfer would love to dance to. Following this, the song Major Tom shoots us into a fun action-packed multi-level mini-golf game.

V. ADDITIONAL FEATURES (TIME PERMITTING)

Inclination and Declination

For each terrain box that makes up a play space we hope to create a velocity modifier to create the effect of increase or decrease in the pitch of the surface the ball travels across. From this we hope to visually represent these different modifiers via shading and lines to signify their representative class - shallow incline, regular incline, or a steep incline.

Level selection menu to access each of the 9-holes independently.

For each level we hope to create an accessible menu icon on a splash screen to join a new game in any hole independently without playing through all 9.

Jumping

For both the balls maneuverability, and opportunity for added in map features - the implementation of a 'jump' feature allowing the ball to move into a raised state to jump over things like walls, gaps, and environmental dangers would be beneficial.

Program Building Game Specs

Create a program that could create the matrix array for each level design for a multi hole course.

Walls

Diagonal walls using different wall objects and a new reaction matrix.

Change wall array angle definition to one you do not need to sequentially search through.