Requirements & Design Documentation:

mQIX, the Qix Game

Team 59

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Table of Contents

1. Introduction

1.1 Purpose

The purpose of this project is to develop a game, mQix, to provide the Player with an entertaining gaming experience that pays homage to the classic arcade game, Qix. mQix will aim to capture the same qualities and experiences as the classic arcade game by staying true to the core mechanics of the retro game.

1.2 Definitions, Acronyms, and Abbreviations

Term	Definition
mQix	The product: the game that the **Player** will be playing.
Player	The user of the game.
Marker	The controllable game character.
Qix	The main enemy. Randomly wanderers around the **field.**
Sparc (singular) / Sparx (plural)	One of the enemies in the game. Traverses across the edges of the **field**.
Push	The action of the **marker** entering the **field** and attempting to capture a portion of the field. Can be a noun or verb.
Tail	The path the **marker** leaves behind during a **push.**
Field	The playable game space.
One Story Point	A unit of time and effort equal to one perfect work hour.

1.3 Assumptions

We assume the Player has a working keyboard.

2. Description

2.1 Requirements Overview

This application intends to replicate the core elements and mechanics of Qix, in which the player controls the marker to claim as much territory as possible on a square field while evading hazards, such as the Qix and the Sparc.

The marker can move along the perimeter of the field. When desired, the marker can 'push', i.e. enter the field and attempt to claim more territory. Certain keys of a keyboard are assigned as the controls for these abilities. Only when the marker returns to one of the edges of the field is the area of the field reduced.

As for the enemies, the Qix moves randomly within the portion of the field unclaimed by the marker. If it contacts the marker or tail when the marker is pushing, the push is canceled and the marker takes damage. The Sparc moves in a clockwise or counterclockwise direction along the perimeter of the field and cancels pushes, inflicting damage, when it contacts the marker or the starting point of a push.

In terms of display, the marker's hp and progress (the rendered state of the field and a value representing the remaining unclaimed territory) are displayed and updated accordingly. The level ends when the area of the remaining field is less than a specified percentage of the field at the start of the level. There should be a start screen with options to see the instructions, change the difficulty, and start the game.
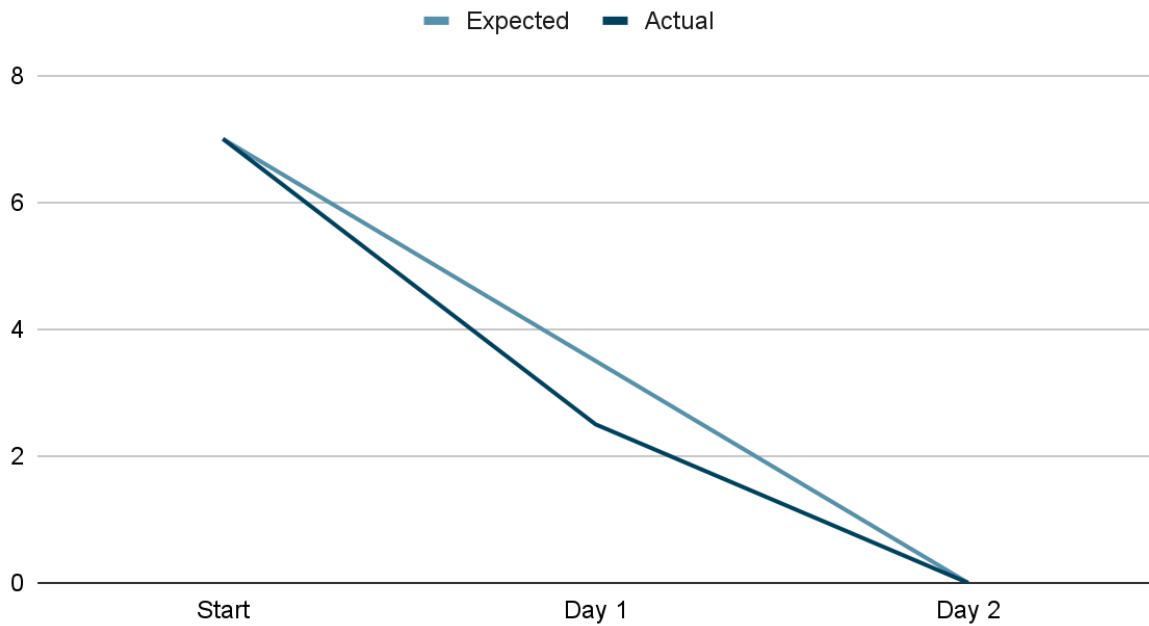
3. Backlog

3.2 Product Backlog

This backlog contains only the stories completed during this iteration.

Feature	Story	Priority	Task	Estimated (Story Points)	Actual Time (Story Points)	Implementation Notes
Enemy Movement and Collisions	Enemies move	MEDIUM	Implement: Make the Qix move around randomly	0.5	0.5 Apr. 10	Uses random.randint to constantly randomize the direction the Qix moves, making it 'jiggle'
	The Player collides with the Qix during a push or the Qix cuts the tail	MEDIUM	Implement: -Player loses hp -Push terminated and the player returns to the starting point of the push	1	1 Apr 10	If the player is pushing, check the distance between the player and the Qix compared to the sum of their radii Uses line intersection to check of the Qix crossed the tail
	Sparc reaches the start of a push	MEDIUM	Implement: -Terminate push -The Sparc changes directions -Player loses hp	1	1 Apr 10	If the player is pushing, compare the radius of each sparc with the distance between them and the start of the tail
Level Progression	The Player beats the level or loses	LOW	Make Win Text / Win Screen and advance to the next level / Return to menu Make lose screen	1	0.5 Apr 11	Uses the existing GUI functions to make the two screens. They are called based on the current value of variable gameState. When the player wins, they are taken to the winScreen. If their hp reaches 0, they are taken to the loseScreen
Menu / Start Screen & Instructions	The Player uses a GUI to navigate between a start menu, instructions, and the game	LOW	Create a GUI and manage the flow between screen states. Create the Menu and Instructions screens	2	1.5 Apr 10	Uses a function for each possible display before the game. They are called based on the current value of variable gameState. Each function renders text via a helper function and changes the value of variable gameState based on keyboard input.
Difficulty Adjustment	The Player changes the difficulty based on their preferences	LOW	Create the Difficulty Settings screen and create the functionality associated with such a feature. Game associated instances needs to be initialized with the values chosen by the player	1	1 Apr 11	Uses existing GUI functions to make a screen. Uses global variables to store the player selections, which are then used to initialize the field, marker, and enemies according to the player's selections.
Runs Without Python and Pygame Installed	The Player can run the game without the developer's dependencies	MEDIUM	Export as executable	0.5	0.5 Apr 11	Exported Using pyinstaller, no longer needs pygame and other libraries, but still needs sound and font file to be in same directory

4. Velocity Diagram

This Graph below shows our velocity over iteration 3, during which we worked on the code over 2 days. The remaining work is calculated as total estimated story points for the remaining tasks in the product backlog.

Work Left (Story Points)

Expected — Actual

5. Testing

5.1 Test Report

Test Type	Test	Initial Conditions	Test Inputs	Actual Result	Passed?
Start Menu GUI	Functionality of start selection	The executable has just begun running	The spacebar key is pressed	A game is launched with the correct difficulty settings	Yes
Start Menu GUI	Functionality of difficulty settings selection	The executable has just begun running	The minus key is pressed	The display for the start menu is hidden and replaced by the display for the difficulty settings menu	Yes
Start Menu GUI	Functionality of instructions selection	The executable has just begun running	The equals key is pressed	The display for the start menu is hidden and replaced by the display for the instructions menu	Yes
Marker Movement	Functionality of movement along the edge of the field	The executable has just begun running	A and D key are pressed one at a time	The marker moves clockwise and counterclockwise respectively along the edge of the field	Yes
Marker Pushing	Start a valid push	The marker hasn't initiated a push The marker is at a position on the perimeter where hypothetically moving up, down, left or right won't keep it on the perimeter or bring it out of bounds	The arrow keys are pressed one at a time	The marker enters the field in the direction of the pressed arrow	Yes
	Start an invalid push	The marker hasn't initiated a push. The marker is at a position on the perimeter where hypothetically moving up, down, left or right will only keep it on the perimeter or bring it out of bounds	The arrow keys are pressed one at a time	The marker stays fixed in place on the perimeter	Yes
	Crossing over the tail during a push	The marker is initiating a push	Navigate the marker to intercept the tail during a push	The push is canceled and the marker returns to starting position	Yes
	Finishing a push	The marker is initiating a push	Navigate the marker to the board edge to complete the push	The push is completed and the marker captures the section of the map	Yes
Enemy Collision	Qix collides with the marker	The marker is initiating a push	Navigate the marker to the Qix	The marker loses 1 HP and returns to the initial push position	Yes

	A Sparc collides with the marker	The marker hasn't initiated a push	Either wait for a sparc to collide with marker or move the marker along the edge to a sparc	The marker loses 1 HP and the sparc changes directions	Yes
	Qix collides with the tail	The marker is initiating a push	While pushing, wait for the Qix to collide with the tail	The marker loses 1 HP and returns to the initial push position	Yes
	A Sparc collides with the tail	The marker is initiating a push	While phishing, wait for the sparc to collide with the marker starting push position	The marker losing 1 HP and returns to the initial push position	Yes
Game End	Winning the level	There are no results to show while the game is in progress	Capture the required amount of the field	Game win, player taken to the win screen	Yes
	Losing the level	The player is in the middle of playing the game	Navigate the marker to touch the Qix or Sparc repeatedly until the marker reaches 0 HP	Game loss, player taken to the loss screen	Yes