Brick Breaker Project

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Preparation

What will be stored in memory:

- Colours
- Variables pertaining the paddle, ball, bricks, Wall
- Bitmap Address Display
- Keyboard Address
- Delay

How it will be stored in memory:

- All these values will be stored in the .data section
- Colours will be saved under the label MY_COLOURS it holds all the colours related to creating the display not including the paddle and ball colour
- The variables pertaining to Paddle include the following:
- The paddle's size
- The paddle's colour
- The address of the paddle's Leftmost pixel
- The variables pertaining to Ball include the following:
- The Ball's colour
- The Ball's position
- The Ball's direction
- A variable for wall width
- A variable for delay

- The bitmap display address (top left pixel of the bit map display) and the keyboard address will be stored.
- The keyboard address

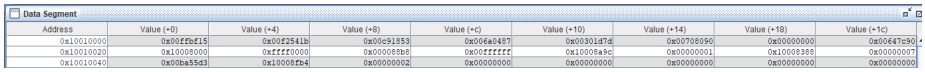

Figure 1: A screenshot of memory showing bitmap display holding values

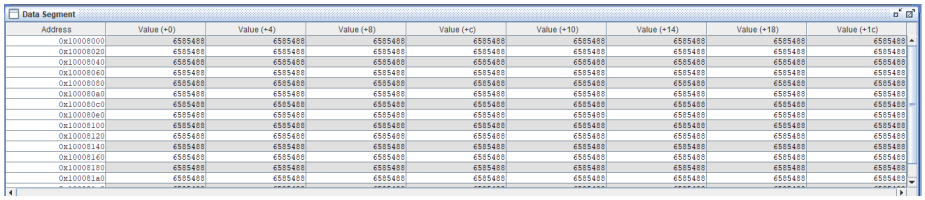

Figure 2: A screenshot of memory showing bitmap display holding values

1 Milestone 1

Figure 3: A static screen shot of Milestone 1.

2 Milestone 2

Implemented

3 Milestone 3

How will the ball change directions when it collides?

Depending on the direction the ball is moving and the object it impacts with the ball will change accordingly.

In our game the ball can move in four directions. Those being top right, top left, down right, and down left.

Ceiling Collision: For a ceiling collision, if the ball hits the ceiling while moving top right, then the ball will go from moving top right to down right. In other words, it carries its rightward momentum, but swaps its vertical direction. The four directions that will change will be; if a ball goes top-right it will change to bottom-right, a ball going top-left will change to bottom-left, a ball going bottom-right will go top-right, a ball going bottom left will go top-left.

Wall Collision: For a wall collision, the ball will preserve its vertical momentum, but will swap its horizontal movement. The four directions that will change will be; if a ball goes top-right it will change to top-left, a ball going top-left will change to top-right, a ball going bottom-right will go bottom-left, a ball going bottom left will go bottom-right.

Corner of the screens: If the brick collided with the top corners of the display which is where the wall and ceiling meet the ball should reverse both its horizontal and vertical direction. Similarly if the paddle and wall create a corner the ball should swap directions in the same way.

Brick Collisions: There are a lot of possibilities when it comes to brick collisions. If a brick is hit by a ball near the middle of the brick it should be treated as a ceiling bounce. However, there are many edge cases to consider for intuitive motion of the ball. These include: the ball colliding with the corner of the brick, the ball colliding with two bricks at once, the ball hitting the side of a brick should be treated as a wall bounce. When the ball hits the corner of the brick or the corner of two bricks, the ball will head in the opposite direction, e.g. a ball going top-right hitting the corner will go bottom-left. Finally, to prevent the ball clipping through a brick without hitting the brick there should be a check such that clipping through a brick is checked and the brick is destroyed and direction change is treated as a ceiling bounce.

4 Milestone 4

4 Easy Features implemented.

Easy Feature 1: Three lives for the player

We gave the player three lives or attempts to destroy all the bricks. If the ball exits the screen three times they lose. This was done by adding a LIVES label to .data and having a register hold the player's lives and removing a life each loss.

Easy Feature 2: Game over screen and restart option

When the player has depleted their three lives the game will display a GAME OVER screen and they can press the 'r' key to restart the game with three new lives. This was done by adding a function that would allow for keyboard input after loss and either start the program over or exit depending if they presses 'r' or 'q' respectively.

Easy Feature 5: Pause game on 'p'

We gave the player the ability to pause the game by simply pressing the 'p' key. We created an endless loop that would occur when the user pressed 'p' and listened for another 'p' key press exit the loop.

Easy Feature 9: Launch the ball of attempt

We gave the player the ability to move before the game starts and launch the ball on their command when they press the space bar. This was implemented by adding a "pregame" function that would fix the ball to the paddle and would look for a space bar keyboard input to start the main game loop.

5 Milestone 5

Total of 7 Easy Features implemented.

3 Easy Features that were implemented for Milestone 5:

Easy Feature 4: Sound effects for different collisions

This feature implemented different sound effects when it hit the wall, ceiling, bricks and the paddle. Also implemented a sound for winning the game (destroying all the bricks) displaying a W and as well as losing the game (running out of lives) on the GAME OVER screen. This was done by adding a sounds for different collisions within each type of collision detector function.

Easy Feature 6: Time limit

We implemented a time limit for the player giving them 60 seconds to complete the game for all three lives as the timer starts when they start playing the game. This was implemented using syscall 30 which gives the time from January 1, 1970. We keep track of the starting time from that date in a register

and check if the difference between current time and start time exceeds time limit.

Easy Feature 8: Second paddle above first paddle

We added a second paddle for a second player to play with them, they can press the 'j' or 'l' keys to move their paddle left and right. We also moved the ball to be connected to the second player for them to launch instead.

Created a secondary PADDLE space in memory called PADDLE2 that had its left most pixel shifted one y pixel above the first paddle. This mimicked the first paddle with the same size and colour. Respond to 'j' and 'l' functions were made to mimic respond to 'a' and 'd' but instead moved PADDLE2.

How To Play

Objective:

- Hit the white ball with the purple paddle on the bottom to destroy all the bricks on the board that are yellow to dark purple to win the game as they disappear when hit. The dark grey ceiling and walls will not disappear when hit. Refer to Figure 4.
- The ball will bounce around intuitively, use your spatial awareness to determine the ball's intuitive movement and follow with your paddle to rebound it.
- Two players will play the game together where the first controls the bottom paddle and the second the top paddle. Once the game is started a timer of 60 seconds starts to beat the game or else the players lose.

Controls:

Player 1: Bottom Paddle

- Press 'a' to move the bottom paddle left
- Press 'd' to move the bottom paddle right

Player 2: Top Paddle

- Press 'j' to move the top paddle left
- Press 'l' to move the top paddle right
- Press space bar to launch the ball at the start of attempt.

General Controls:

- Press 'p' to pause the game after during the state where the ball has been launched.
- Press 'q' to quit the game anytime during the execution of the game

- Press 'r' to restart the game during win or lose state.

Gameplay:

- The player may move their paddles for each attempt before they launch the ball to gain a better position.
- After the ball is launched the game has started and the ball will randomly launch either top left or top right.
- During the game either player may press the key 'p' to freeze/pause the game and press 'p' again to resume.
- If both players miss the ball and exits off screen the lives the player has will decrease by 1 and the game will restart to a neutral position but with the current brick states retained.
- Different sound effects will play when the player hits a wall, ceiling, brick or paddle with the ball.
- If the players manage to destroy all the bricks the game will freeze and transition to a WIN screen where it displays a big W.
- If the players miss the ball three times, the game has been lost and will transition to a GAME OVER screen.
- Players may press the key 'r' to restart the game when they see the win screen or the game over screen. This will effectively reset the position of the players, reset the brick states and give the players three new lives.

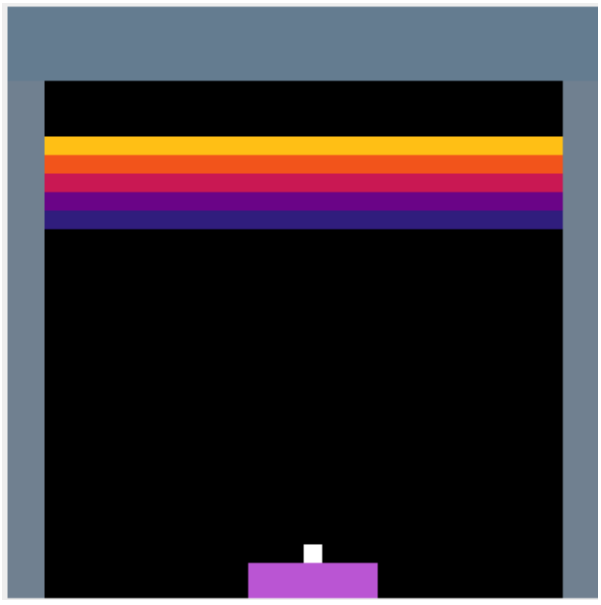

Figure 4: A static screen shot of the completed Milestone 5 game.