Project Report: Milestone 1

Janssen Myer Rambaud (1008107004), Felix Zhang (1007650212)

November 29, 2022

1   Part I: Planning and Configuration

1. **Breakout Bitmap Display and Memory Map Plan**: Our plan is to have a 512 pixel (wdith) x 256 pixel (height) display while keeping the same base address 0x10008000 ($gp). We also plan on having unit widths be 4 pixels x 4 pixels because it remains even while being a better size than say 2 x 2, which is too small. Table is on the next page.

Data Segment	Address	Variable Names
IMMUTABLE DATA		
	0x10008000 (Address of Bitmap Display)	ADDR_DSPL
	0xffff0000 (Address of Keyboard)	ADDR_KBRD
	Takes in 1 address (Display width divided by unit width [in pixels])	SCREEN_WIDTH
	Takes in 2 addresses for (length, height) of the paddle	PADDLE_DIM
	Takes in 1 address for width of wall	WALL_WIDTH
	Takes in 2 addresses (left wall x-coordinate, right wall x-coordinate)	WALLS_X
	Takes in 1 address for (height) of buffer	BUFFER_HEIGHT
	Takes in 1 address buffer colour (used for drawing walls, bricks)	BUFFER_COLOUR
	Takes in 1 address for the y coordinate of a brick	BRICKS_Y
	Takes in 2 addresses (2-D array that stores colour)	BRICKS
	Takes in 2 addresses (width, height) for a brick	BRICKS_DIM
	Takes in 7 addresses (1 for array length, 6 for elements/colours)	COLOURS
MUTABLE DATA		
	Takes in 1 address for colour of paddle (gray)	PADDLE_COLOUR
	Takes in 1 address for colour of ball (white)	BALL_COLOUR
	Takes in 2 addresses (x, y) coordinates	PADDLE_COORDS
	Takes in 2 addresses (x, y) coordinates	BALL_COORDS
	Takes in 1 address for the movement direction of the ball	DIRECTION

2. Translate your plan into the .data section of your breakout.asm program. Assemble your program in MARS and inspect memory to ensure it matches your plan. Include a screenshot (or multiple screenshots) of memory demonstrating that it has been laid out according to your plan.

Figure 1: Screenshot of .data code section (1).

Figure 2: Screenshot of .data code section (2).

Figure 3: Screenshot of .data memory.

2 Part II: Milestone 1
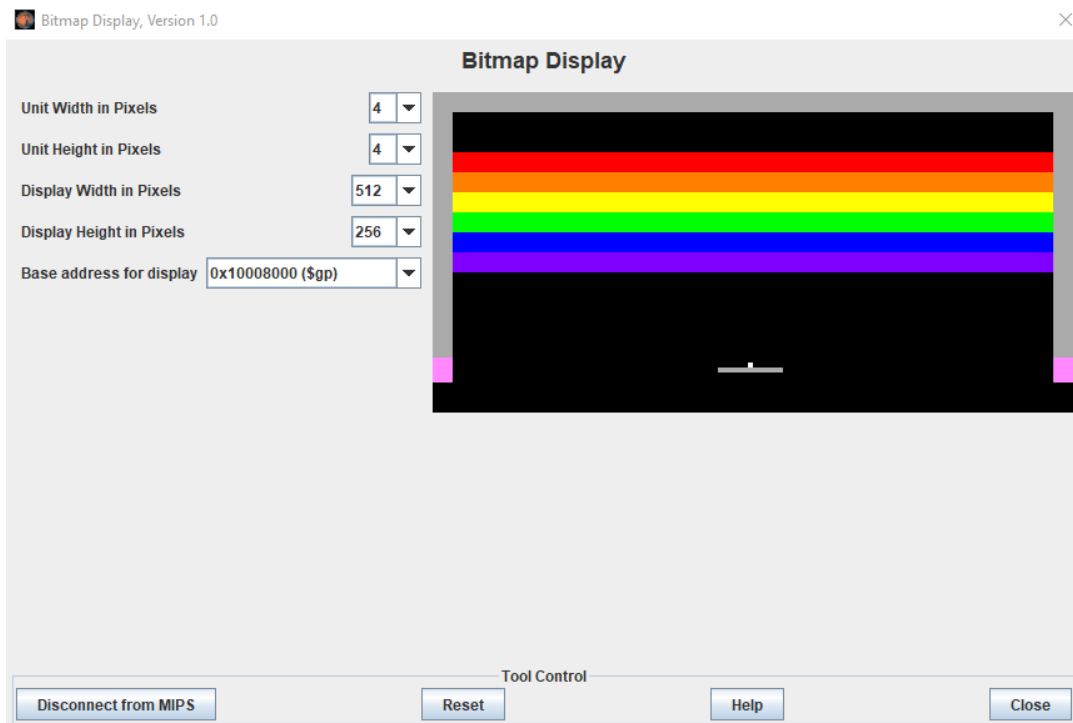
3. Draw the scene (Milestone 1)

Figure 4: The static scene of Milestone 1 Drawing.

3   Part III: Milestone 2

QUESTION: How will the ball change directions when it collides?

The rules governing how the ball changes directions when it collides are as follows.

If it collided with the paddle, then the resulting direction depends on which section of the paddle it hit. Hitting the leftmost third results it travelling north-east (at a 45° angle), the middle third results it travelling north, and the rightmost third results in it travelling north-west (at a 45° angle).

Otherwise, if it collided with a non-paddle object then the resulting direction depends on the original direction. If the original direction of ball forms the angle θ with the surface it collided with, then the resulting direction is the reflection of the original direction across the line perpendicular to the collision surface away from the collision point. For example, if the ball is travelling north-west (at a 45° angle) and collides with the left wall, then it begins travelling in the north-east direction (at a 45° angle). Note this also means if the ball was travelling perpendicular to surface with which it collided, then after the collision, it is moving in the reverse direction. So, if the ball was travelling north before colliding with the bottom of a brick, then it is travelling south after the collision.

Upload breakout.asm to MarkUs so that you have a snapshot of your progress so far.

4   Part IV: Milestone 3

Upload breakout.asm to MarkUs so that you have a snapshot of your progress so far.