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## Requirements

1. Confirm that missiles behave as expected per user input
    a. The solution must initiate a missile launch when the user clicks the right mouse button.
    b. The solution must initiate a missile launch when the user clicks the space bar
    c. The solution must limit the number of active missiles on the screen to no more than five (5) at any given time. (an “active missile” is any missile currently being displayed on the screen)
    d. The solution must remove the missile from being active if it goes off the screen.
    e. The solution must maintain the same constant speed for all missiles
    f. The solution must launch missiles from the center of the bottom of the screen when a launch is initiated
    g. The solution must maintain the same constant direction for all missiles to be vertically straight up from the launched position.
    h. The solution must detect when a missile “hits” a ship
    i. The solution must display an explosion at the point where a missile “hits” a ship
    j. The solution must remove the missile and ship after the missile “hits” the ship
    k. The solution must keep a count of all “hits”
2. The solution must support ships launched by the solution
    a. The solution must initiate a ship launch when the system detects there are no active ships.
    b. The solution must support multiple types of ships based on a configurable value.
    c. The solution must display the appropriate image based on the type of ship when the ship is active
    d. The solution must randomly initiate a ship launch based on a configurable rate where the default is 30% of the time
        i. The solution must randomly choose from available ship types when a launch is initiated, giving all types equal chance of being launched.
        ii. The solution must limit the number of active ships on the screen to no more than ten (10) at any given time. (an “active ship ” is any ship currently being displayed on the screen)
        iii. The solution must randomly choose a location to launch a ship from when initiated
            1. The system must randomly choose to launch the ship from the left side of the screen or the right side of the screen
            2. The system must randomly choose a row in the top two-thirds of the screen to launch the ship from
            3. The system must assign the speed of the ship based on the type of the ship being initiated
            4. The system must assign the direction of the ship based on which side of the screen it is being launched from (if from the left, direction goes left to right; if from the right, direction goes right to left)
    e. The solution must remove the ship from being active if it goes off the screen.

**Commented [RS1]:** Combine these

**Commented [RS2R1]:** They are all related to "hits"

**Commented [RS3]:** Actual rendering of ship objects

**Commented [RS4]:** Randomness tests with ship rendering

**Commented [RS5]:** Location-based rendering

3. The solution must end the game when the “hit” count has reached ten (10)
4. The solution must end the game when the user clicks the left mouse button
5. The solution must end the game when the user clicks the esc button
6. The solution must end the game if the user has not initiated a missile launch in the last 5 minutes.

## Test Cases

**Req. 1**

I. 1A, 1B, 1C:
   a. Precondition: Confirm game is running and there are no missiles on the screen.
   b. Action: The users spam clicks the right mouse button and space bar.
   c. Postcondition: Confirm at most 5 missiles are displayed on screen.

II. 1A:
   a. Precondition: Confirm game is running and there are no missiles on the screen.
   b. Action: The user clicks the right mouse button three times.
   c. Postcondition: Confirm 3 missiles have been launched.

III. IB:
   a. Precondition: Confirm game is running and there are no missiles on the screen.
   b. Action: The user clicks the space bar three times.
   c. Postcondition: Confirm 3 missiles have been launched.

IV. 1A, 1B:
   a. Precondition: Confirm game is running and there are no missiles on the screen.
   b. Action: Press all inputs except left click, right click, space bar, and escape.
   c. Postcondition: Confirm there are no missiles launched.

V. 1C, 1D:
   a. Precondition: The game is running. The missile has been launched.
   b. Action: Wait for the missile to move off screen. Launch 5 other missiles.
   c. Postcondition: There are 5 missiles visible on screen.

VI. 1D:
   a. Precondition: The game is running. The missile has been launched.
   b. Action: Wait for the missile to move off screen.
   c. Postcondition: There are no missiles visible on screen.

VII. 1A, 1B, 1E:
   a. Precondition: Confirm the game is running and no missiles are launched.
   b. Action: Launch two missiles by pressing space bar twice or right click twice
   c. Postcondition: Confirm the distance between the two missiles doesn't change during missile flight

VIII. 1F, 1B, 1G:
   a. Precondition: Game is running. There is a ship on screen.
   b. Action: Launch a missile with space bar.
   c. Postcondition: Missile launches from center of screen vertically.

IX. 1F, 1A, 1G:
   a. Precondition: Game is running. There is a ship on screen.
   b. Action: Launch a missile with right click.
   c. Postcondition: Missile launches from center of screen vertically.

X. 1H, 1I, 1J, 1K:
   a. Precondition: Game is running. Ship(s) and missile(s) are visible and active
   b. Action: Missile detects ship contact (and vice versa)

c. Postcondition: “Hit counter” increments, explosion rendered at contact area, missile and ship are then removed from the screen undercover of explosion.

XI. 1D
   a. Precondition: Ship(s) moving across the screen
   b. Action: Ship goes beyond the border of the GUI
   c. Postcondition: Ship object is removed from game

**Req. 2**

XII. 2A, 2D:
   a. Precondition: Ship spawn rate is zero.
   b. Action: Kill the ship on the screen. Wait for five minutes. There should only be one ship on the screen the whole time.
   c. Postcondition: The game ends without more than one ship being on the screen.

XIII. 2Diii3, 2B:
   a. Precondition: Configure ship spawn type to 2.
   b. Action: Open game. Wait for two different types of ship to spawn. Observe for five minutes.
   c. Postcondition: Ships move at different rates.

XIV. 2Diii3, 2B:
   a. Precondition: Configure ship spawn type to 2. Configure spawn rate to 100%
   b. Action: Open game. Wait for two different types of ship to spawn. Observe for five minutes.
   c. Postcondition: Ships move at different rates.

XV. 2Dii
   a. Precondition: Configure ship spawn rate to 100%.
   b. Action: Open game. Wait for 5 minutes.
   c. Postcondition: There are 10 ships on screen the entire time.

XVI. 2Dii
   a. Precondition: Configure ship spawn rate to 30%.
   b. Action: Open game. Wait for 5 minutes.
   c. Postcondition: There are no more than ships on the screen at any given time.

XVII. 2D, 2Di, 2Dii:
   a. Precondition:
   b. Action:
   c. Postcondition

XVIII. 3:
   a. Precondition: Missile and ship collide, and the user has nine hits already.
   b. Action: User observes the hit counter increment up to 10.
   c. Postcondition: The game is no longer running.

XIX. 3.
   a. Precondition: Confirm the game is running, the user has less than nine hits.
   b. Action: Missile collides with a ship
   c. Postcondition: The game is still running

XX. 4:
   a. Precondition: The game is running.
   b. Action: The user left clicks with the mouse.
   c. Postcondition: The game is no longer running.

XXI. 5:

a. Precondition: The game is running.
b. Action: The user presses the esc key.
c. Postcondition: The game is no longer running.

XXII. 5:

a. Precondition: The game is running.
b. Action: Press all other

XXIII. 6:

a. Precondition: The game is running, there are active missiles on the screen.
b. Action: The screen is observed for five minutes, no input at all is given.
c. Postcondition: The game is no longer running.