PCP 2 | Swimming Relay

Razeen Brey BRYRAZ002

Simulation Rules

1. The Start Button Starts the Simulation.

MedleySimulation

- The view, results and teams[] thread initialisations were moved from the main() method to actionPerformed() of startB (the start button).

2. The Quit Button terminates the simulation.

Given.

3. Only one Swimmer is allowed on a GridBlock at a time.

GridBlock

- isOccupied was changed from int to AtomicInteger.
  - Ensures that only one thread can access a GridBlock at a time.
  - This is achieved due to the thread-safe java AtomicInteger.

4.Swimmers move block by block, simultaneously to ensure liveliness.

GridBlock

- get(), release() and occupied() were synchronized to safeguard against data races.

StadiumGrid

- currentBlock and newBlock in moveTowards() and jumpTo() were synchronised, in that order, to allow for simultaneous forward movement of swimmers without data races involving accessing GridBlocks.

5. After Start button is pressed, Swimmers enter through entrance one at a time in race order.

SwimTeam

- AtomicInteger swimOrder created to manage order of Swimmer objects.
  - This is set to 1 for BackStroke.

Swimmer

- Added a SwimTeam object - swimTeam - to the Swimmer object to access swimTeam.swimOrder.
- Synchronised swimTeam to make swimmers wait until it is their turn to enter:
  - While the thread's stroke (swimStroke.order) is not the next in line (is not = to swimTeam.swimOrder)...
    - wait
  - If it is the next required stroke of the team...
    - enter the stadium
    - increment swimTeam.swimOrder
    - notify all other threads.

StadiumGrid

- Synchronised entrance in enterStadium() to prevent data races.

6. Swimmers line up in race order.

Swimmer

- A CountDownLatch, blackLatch was created to hold all BackStroke swimmers from starting the race.
- Swimmers are in order based on point 5 above.
- Points 3 and 4 ensure that each GridBlock only has 1 Swimmer in it and that they move block by block.
  - Therefore, all other swimmers will line up and wait behind their BackStroke Swimmer in their team.

7. The race only begins when all Backstroke swimmers arrive.

Swimmer

- blackLatch was made static so that all Swimmer objects can read it.
- If a Swimmer is a backstroke Swimmer and has reached the entrance the CountDownLatch is counted down.
- Once all 10 backstroke Swimmers arrive, the latch is released and the race begins.

8. Other members of the team can only start once their previous team member has finished.

SwimTeam

- CountDownLatch-es were created for orange, magenta and red swimmers.

Swimmer

- Once the black swimmer finishes, it triggers the countdown of the orange swimmer through the shared swimTeam.
- The orange Swimmer swims the race and triggers the magenta swimmers countdown, etc.

9. The team with the first freestyle swimmer to complete wins.

Given.