Lab report 4

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- `init()` : Sets initial random velocities and LED color to green. Green indicates the robot is moving (state = 0) while red indicates the robot has stopped (state = 1)
- `random_stop(number_robot_sensed)` : Calculates the probability `P_s` based on the number of still robots sensed, through on the formula:

  $$P_s = \min\{P_s^{max}, S + \alpha N\}$$

  where N corresponds to `number_robot_sensed`
  If a random number `t` is less than or equal to `P_s` , the robot stops (`state` set to `1`) and LED color turns red.
- `random_walk(number_robot_sensed)` : Calculates the probability `P_w` based on the number of still robots sensed, through the formula:

  $$P_w = \max\{P_w^{min}, W - \beta N\}$$

  where N corresponds to `number_robot_sensed`
  If a random number `t` is less than or equal to `P_w` , the robot moves randomly (`state` set to `0`) and LED color turns green.
- `signal_presence(value)` : Sends a signal indicating the robot's state, either 1 for when the robot is moving or 0 for when it is still.
- `CountRAB()` : Counts the number of still robots sensed within a certain range.
- `obstacle_avoidance()` : The function iterates through all the proximity sensor readings and searches for the highest proximity reading. If an obstacle is detected, the wheels velocities are modified in order for the robot to either steer left or right. Unlike other exercises that contained the obstacle avoidance behavior, here the threshold is set to `0.5` , relatively high. With a threshold too low, the robots would never get close enough to each other and clusters would not form.
- `step()` : The core function. It increments the step count, calls `CountRAB()` to retrieve the number of sensed robots, and passes down the value both to `random_stop(number_robot_sensed)` and `random_walk(number_robot_sensed)` . After defining the robot behavior, `signal_presence(value)` is called to update the other nearby robots on the current robot's state. In case the robot is currently moving, the `obstacle_avoidance()` function is called.