

1 Pi-Swarm Simulator

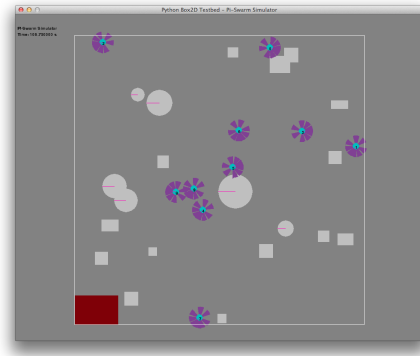


Fig. 1. Pi-Swarm simulator with robots as blue circles with an ID number and IR sensor cones shown in purple. Obstacles are shown in white.

The Pi-Swarm simulator is a 2D top-down environment being developed in Python. It uses pygame [1] for graphics and pyBox2D [2] as a physics engine. The simulated Pi-Swarms use a simplified model of the physical hardware, they are shown as light blue circles in figure 1 with a unique ID number and a centre line indicating their heading. The robots move using two wheels on the perimeter of the robot body. A small force is applied at each timestep to represent the motor drive in the direction of movement (either forwards or backwards).

The environment is a square arena with obstacles placed at random locations (figure 1). The Pi-swarms use 8 IR sensors, at the same positions as the physical robots, to perform obstacle avoidance and navigate the arena. The sensors' fields of view are represented as cones surrounding the robots. When running the robots draw 0.33C from their battery, based on an average use case for the real Pi-Swarm robots. They recharge at a rate of 0.5C in power areas on the ground (bottom left of figure 1).

References

1. Pete Shinnars et al: Pygame <http://pygame.org> (2000)
2. Ken Lauer and Erin Catto: Pybox2d <http://code.google.com/p/pybox2d/> (2008)