

## Solutions to the Midterm Exam

### *Problem 1*

- a) Hierarchical Architecture
- b) Hybrid Architecture

### *Problem 2*

- False
- False

### *Problem 3*

- False
- True
- False
- True

### *Problem 4*

- a) For the median blur filter, you use an  $n \times n$  kernel. Sort all of the pixel values in that kernel, then the median value replaces the center pixel of the kernel.
  
- b) `disable_servos()` should be used when you are no longer using the servo motors in order to prevent the robot's batteries from draining.

### *Problem 5*

- a) An active sensor emits energy into the world.
- b) IR reflectance, Sharp IR distance sensor ("ET")
- c) A passive sensor does not emit any energy to get its values.
- d) Touch sensor, light sensor, camera

### *Problem 6*

One possibility: Use an IR sensor (e.g., the top hat sensor) mounted at the front of the robot, under the robot, pointing at the floor. If the sensor's value changes from close to far, the robot should stop, back up, and turn.

### *Extra Credit*

Shakey