



Congratulations! You passed!

Next Item



1. What are the differences between **exteroceptive sensors** and **proprioceptive sensors**?
(Select all that apply)

1 / 1
point



Proprioceptive sensors are used to determine vehicle position, whereas exteroceptive sensors are used for sensing the environment.



Un-selected is correct



Exteroceptive sensors can determine obstacle size and distance away, whereas proprioceptive sensors cannot.



Correct

Proprioceptive sensors do not observe nor measure environment surroundings.



Exteroceptive sensors can determine distance traveled by the vehicle, whereas proprioceptive sensors cannot.



Un-selected is correct



Proprioceptive sensors can determine distance traveled by the vehicle, whereas exteroceptive sensors cannot.



Un-selected is correct



Proprioceptive sensors do not interact with the environment, whereas exteroceptive sensors do.



Correct

Exteroceptive sensors contain active sensors such as Lidar or Sonar, which interact with the environment by emitting light or sound and waiting for response.



1 / 1
point

2. Which of the following exteroceptive sensors would you use in **harsh sunlight**?



Radar



Correct

Radar is unaffected by harsh sunlight.



Lidar



Un-selected is correct



Cameras



Un-selected is correct



Sonar



Correct

Sonar is unaffected by harsh sunlight.



1 / 1
point

3. Why is synchronization and timing accuracy important in the self driving system? **Choose the primary reason.**



Synchronization is important to ensure correct sensor fusion.



Correct

Correct!



Synchronization is important to check sensor failure.

- ☐ Synchronization is important to ensure that sensors measure the environment at the same time.
- ☐ Synchronization is important to ensure organized computation.



1 / 1
point

4. Your autonomous vehicle is driving on the German autobahn at 150 km/h and you wish to maintain safe following distances with other vehicles. Assuming a safe following distance of 2s, **what is the distance (in m) required between vehicles?** Round your answer to **2 decimal places**.

83.33

Correct Response
 $150 \times 2 / 3.6$



1 / 1
point

5. Using the same speed of 150 km/h, **what is the braking distance (in m) required for emergency stops?** Assume an aggressive deceleration of 5 m/s². Round your answer to **2 decimal places**.

173.61

Correct Response
 $(150 / 3.6)^2 / (2 \times 5)$



1 / 1
point

6. Suppose your vehicle was using long range cameras for sensing forward distance, but it is now nighttime and the images captured are too dark. **Which of the following sensors can be used to compensate?**

☒ Lidar

Correct
Lidar can be configured for long range detection and can also operate in darkness.



IMU



Un-selected is correct



Radar



Correct

Radar can be configured for long range detection and can also operate in darkness.



Sonar



Un-selected is correct



7. What are the differences between an **occupancy grid** and a **localization map**? (Select all that apply)

1 / 1
point



The localization map is primarily used to estimate the vehicle position, whereas the occupancy grid is primarily used to plan collision free paths.



Correct

Correct. The vehicle position is a critical measurement to estimate how the ego vehicle is moving through the environment, and relies on matching sensor measurements at the current time to the localization map. The occupancy grid map stores live collision avoidance data in the form of occupied and unoccupied cells around the vehicle.



The localization map uses only lidar data, whereas the occupancy grid can use both lidar and camera data.



Un-selected is correct



The occupancy grid only contains static objects, while the localization map contains only dynamic objects.



Un-selected is correct



An occupancy grid uses a dense representation of the environment, whereas a localization map does not need to be dense.



Correct

Since localization mapping is only concerned with identifying the vehicle pose in the environment, it can use point features or object locations and does not need to densely cover the entire environment, whereas occupancy grid mapping must capture the locations of all obstacles to be avoided and must therefore be dense.



8. The vehicle steps through the software architecture and arrives at the controller stage. What information is required for the **controller** to output its commands to the vehicle?

1 / 1
point



Vehicle state



Correct

The controller requires the vehicle position and velocity to determine the appropriate amount of steering, throttle, and brake.



Environment maps



Un-selected is correct



Planned paths



Correct

The controller commands the vehicle to follow the planned paths.



Locations of obstacles and other vehicles



Un-selected is correct



9. What is (are) the role(s) of the **system supervisor**? (Select all that apply)

1 / 1



To ensure that the planned paths are collision free



point

Un-selected is correct



To ensure that the controller outputs are within operating range



Un-selected is correct



To ensure that the maps update at the correct frequencies



Correct

The system software is responsible for monitoring software and ensuring operation at correct frequencies.



To ensure that the sensors are working correctly



Correct

The system supervisor is responsible for monitoring hardware and ensuring that the sensors are not broken.



1 / 1
point

10. Which of the following tasks should be assigned to the **local planner**?



Planning a merge onto the highway



Planning to avoid a parked car in the ego vehicle's lane



Correct

This is a reactive planning task, so it should be designated to the local planner.



Planning a lane change to turn left



Planning a route to a destination



1 / 1

11. What common objects in the environment appear in the **occupancy grid**?



Lane boundaries

point



Parked vehicles



Correct

The occupancy grid contains static obstacles which block vehicle movement.



Other moving vehicles



Traffic lights



1 / 1
point

12. Which of the following maps contain **roadway speed limits**?



Occupancy grid



Localization map



Detailed roadmap



Correct

The detailed roadmap contains traffic regulations.

