

Tasks on Sensors

Sensor Selection for a Drone Navigation System (30 pts)

Objective: Understand the selection of sensors essential for drones, focusing on navigation, stability, and obstacle detection.

- Which sensors are necessary for stable navigation in a drone and why?
- How does a gyroscope contribute to flight stability?
- Which sensor would best detect obstacles in real-time?
- What factors affect the performance of these sensors in a fast-moving drone?

Analysis of Hall Effect Sensors in Automotive Applications (30 pts)

Objective: Investigate the functionality and application of Hall effect sensors in automotive systems, focusing on their role in safety and control.

- How does a Hall effect sensor detect rotational speed in anti-lock braking systems (ABS)?
- What are the advantages of Hall effect sensors over other types of sensors in automotive applications?
- In what ways do Hall effect sensors contribute to vehicle safety?
- What environmental factors could affect the performance of Hall effect sensors in vehicles?
- What advancements are emerging in Hall effect sensor technology for modern vehicles?

Sensor Fusion in Autonomous Vehicles: A Case Study (40 pts)

Objective: Conduct an in-depth study on the role of sensor fusion in autonomous vehicles, focusing on how various sensors work together to ensure accurate navigation, obstacle detection, and safety.

- What types of sensors are typically used in autonomous vehicles, and what are their primary roles?
- How does sensor fusion improve the reliability and accuracy of autonomous vehicle navigation?
- What are the key challenges in implementing sensor fusion in real-time autonomous driving systems?
- In what ways can sensor fusion algorithms address sensor-specific weaknesses, such as LIDAR's difficulty with reflective surfaces?
- What recent advancements in machine learning and AI are enhancing sensor fusion for autonomous vehicles?