

# Home Work #1

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## Dead Reckoning Devices

1. **Inertial Measurement Unit (IMU):** A sensor package that typically includes accelerometers and gyroscopes. IMUs measure changes in velocity and orientation to estimate position.
2. **Odometer:** A device that measures the distance traveled by a vehicle by counting wheel revolutions.
3. **Tachometer:** Measures the rotation speed of a vehicle's wheels or other rotating components, aiding in speed and distance calculations.
4. **Wheel Encoders:** Optical or magnetic sensors attached to a wheel to measure wheel rotation, used in robotics and navigation systems.
5. **Stride Sensors:** Devices that measure a person's stride length and cadence, often used in pedestrian dead reckoning systems.
6. **Fiber Optic Gyroscopes (FOGs):** High-precision gyroscopes based on the interference of light traveling through optical fibers.
7. **Ring Laser Gyroscopes (RLGs):** High-precision gyroscopes that use laser beams in a closed-loop configuration to detect rotation.

## Fixed Positioning Devices

1. **Global Positioning System (GPS):** A satellite-based navigation system that provides accurate position, velocity, and time information worldwide.
2. **Galileo Positioning System:** The European global navigation satellite system, similar to GPS, offering global coverage.
3. **Glonass Navigation System:** The Russian global navigation satellite system, providing global positioning and timing services.
4. **BeiDou Navigation Satellite System:** China's global satellite navigation system, which offers global and regional services.
5. **Loran-C:** A terrestrial radio navigation system used for long-range navigation, mainly in coastal areas.
6. **Quasi-Zenith Satellite System (QZSS):** A Japanese regional satellite navigation system designed to improve GPS accuracy over Japan.
7. **Indian Regional Navigation Satellite System (IRNSS/NavIC):** India's regional satellite navigation system, primarily covering the Indian subcontinent.

8. **Differential GPS (DGPS):** Augments GPS by providing correction signals to improve accuracy, often used in maritime and land-based applications.
9. **Real-Time Kinematic (RTK) GPS:** High-precision GPS technique that uses a reference station to provide centimeter-level accuracy.
10. **Satellite-Based Augmentation System (SBAS):** Systems like WAAS (USA), EGNOS (Europe), and MSAS (Japan) enhance GPS accuracy through ground-based reference stations.
11. **Terrestrial Beacon Systems:** Ground-based beacons that transmit signals used for navigation, such as DME (Distance Measuring Equipment) in aviation.
12. **Doppler Velocity Log (DVL):** Measures water velocity by analyzing the Doppler shift of acoustic signals reflected off the seabed. Often used in underwater navigation.
13. **Barometer:** Measures atmospheric pressure changes, which can be used to estimate altitude changes when integrated over time.

## Explanation

Dead reckoning devices rely on internal sensors, vehicle measurements, and motion analysis to estimate position, velocity, and orientation. Fixed positioning methods utilize signals from satellite or ground-based systems to determine precise location, making them less prone to drift and errors compared to dead reckoning.