

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.