Sensors – Detailed Explanation and Applications in Robotics

What Are Sensors?

Sensors are devices that collect information from the environment. They sense physical things like light, heat, distance, sound, pressure, motion, and convert these into electrical signals. Robots use sensors to understand the environment, make decisions, and perform tasks automatically.

Types of Sensors and Their Applications

1. Ultrasonic Sensor

What it does:

- Measures distance using sound waves.

Applications:

- Obstacle-avoiding robots to prevent collisions.

- Parking assistance in cars.

- Measuring water tank level without touching the liquid.

2. Infrared (IR) Sensor

What it does:

- Detects lines, objects, or heat.

Applications:

- Line-following robots in factories.

- Object counters on conveyor belts.

- Security alarm systems using IR beams.

3. Temperature Sensor (LM35, DHT11)

What it does:

- Measures temperature and humidity.

Applications:

- Fire-fighting robots detect heat.

- Smart homes adjust AC or fan automatically.

- Factory machines monitored to prevent overheating.

4. Light Sensor (LDR)

What it does:

- Detects brightness and light intensity.

Applications:

- Solar tracking robots that follow sunlight.

- Automatic streetlights switching ON/OFF.

- Light-following robots for rescue missions.

5. Touch / Pressure Sensor

What it does:

- Detects touch or force like robot “skin.”

Applications:

- Robotic grippers handle fragile items safely.

- Bumper robots detect collisions.

- Interactive robots respond to touch.

6. Gas Sensor (MQ-Series)

What it does:

- Detects smoke, LPG, CO, alcohol gases.

Applications:

- Gas leakage detection robots.

- Smoke detectors for safety.

- Air quality monitoring in industries.

7. Camera / Vision Sensor

What it does:

- Captures photos and videos.

Applications:

- Face recognition robots.

- Self-driving cars detect lanes and people.

- Quality inspection in factories.

8. Gyroscope / Accelerometer

What it does:

- Detects tilt, balance, and motion.

Applications:

- Drone stability control.

- Self-balancing robots like Segway.

- Mobile phones and gaming controllers.

9. Proximity Sensor

What it does:

- Detects objects without touching.

Applications:

- Automatic doors opening when someone is near.

- Robot navigation and mapping.

- Phones turning off screen during calls.

10. GPS Sensor

What it does:

- Detects robot’s location using satellites.

Applications:

- Delivery robots navigating roads.

- Agricultural robots mapping fields.

- Tracking vehicles, buses, and trucks.

Short Summary:

Sensors help robots sense the environment. Common types include ultrasonic, IR, temperature, light, touch, gas, camera, motion, proximity, and GPS sensors. Their applications include navigation, automation, fire detection, safety, industrial work, and self-driving systems.