SNS COLLEGE OF TECHNOLOGY

DEPARTMENT OF AEROSPACE ENGINEERING

19ASZ301– ROBOTICS & AUTOMATION IN SPACE

III YEAR VI SEM

UNIT 4 –PLC, SCADA AND SENSORS IN AUTOMATION

TOPIC - FORCE SENSOR, LIGHT SENSORS, PRESSURE SENSORS

FORCE SENSORS IN ROBOTICS

Force Sensor:

- Measures magnitude of force or torque applied to an object.
- Converts mechanical input (force) into an electrical signal.
- Used in robotic gripping, assembly tasks, collision detection.

Common Types:

- Strain Gauge-based
- Piezoelectric
- Capacitive

Application in Space Robotics:

- Rover arms for rock sampling
- Docking systems to monitor contact force
- Robotic surgery tools for delicate operations

| Type	Sensing Mechanism	Typical Use Case
Strain Gauge	Deformation of metal	Gripper force feedback
Piezoelectric	Charge from pressure	Dynamic force sensing
Capacitive	Distance change	Lightweight end-effectors

LIGHT SENSORS

Light Sensor:
- Detects ambient light or changes in light intensity. Converts light energy into an electrical signal.

Types:
- Photodiodes
- Phototransistors
- Light Dependent Resistors (LDR)
- Solar cells (as sensors)

Functions in Robotics:
- Environment detection (day/night, solar alignment)
- Line following and edge detection
- Adaptive brightness for vision systems

Arduino Light Tracking Robot
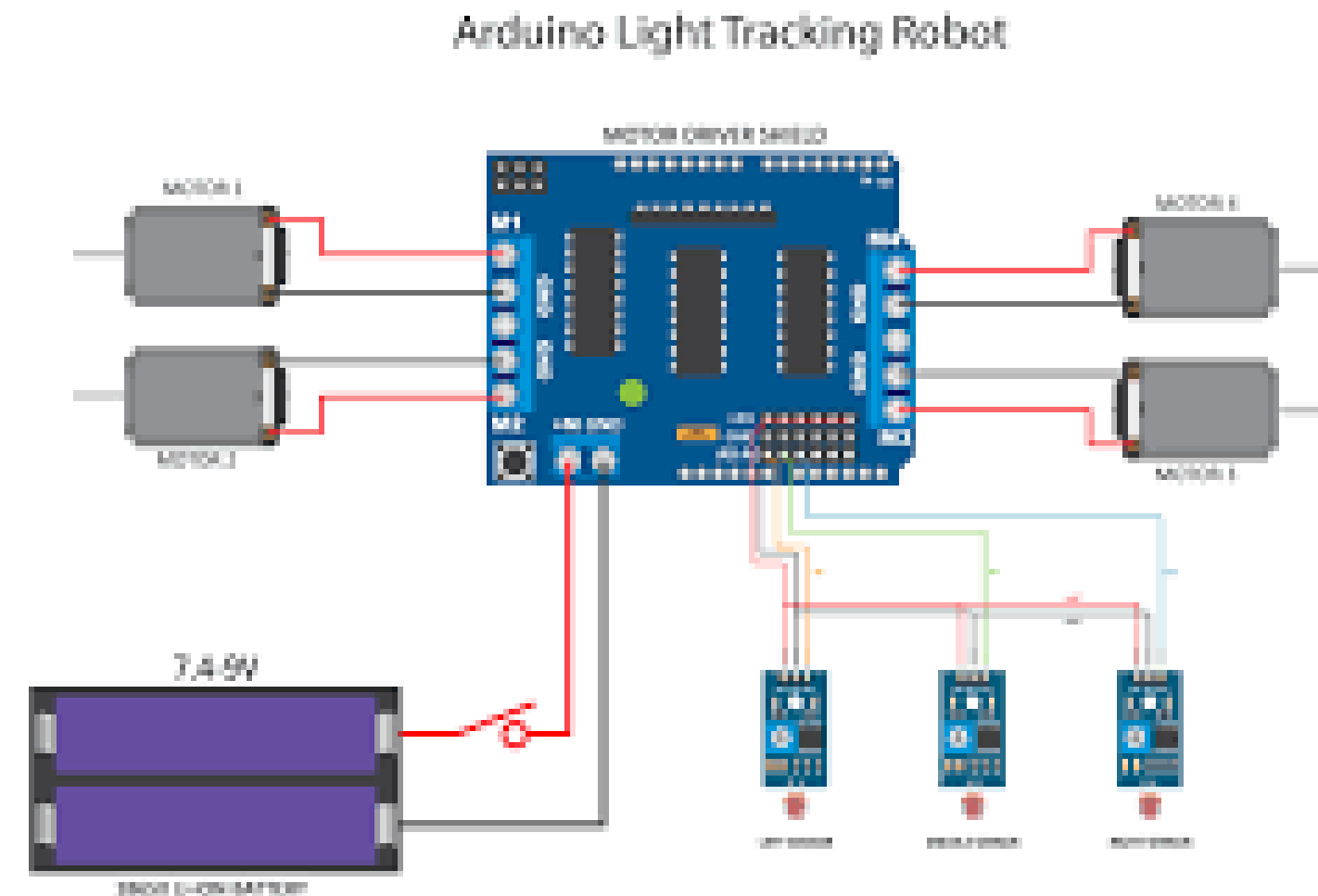
PRESSURE SENSORS

Pressure Sensor:

- Measures force exerted by a fluid (gas or liquid).
- Converts pressure into an electrical signal.
- Used for monitoring sealed environments, propulsion systems, etc.

Types:

- Piezoelectric
- Capacitive
- Piezoresistive

Sensor Type	Operation	Typical Use in Space
Piezoresistive	Resistance change under stress	Cabin pressure monitoring
Capacitive	Plate distance change	Fuel tank monitoring
Piezoelectric	Voltage from stress	Dynamic pressure in engines