Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
(Autonomous)

Accredited by NAAC – UGC with 'A+ Grade (Cycle IV)

(Recognised by UGC, Approved by AICTE & Affiliated to Bharathiar University)

Coimbatore- 49

DEPARTMENT OF COMPUTER SCIENCE

(ARTIFICIAL INTELLIGENCE & ROBOTICS)

Hardware

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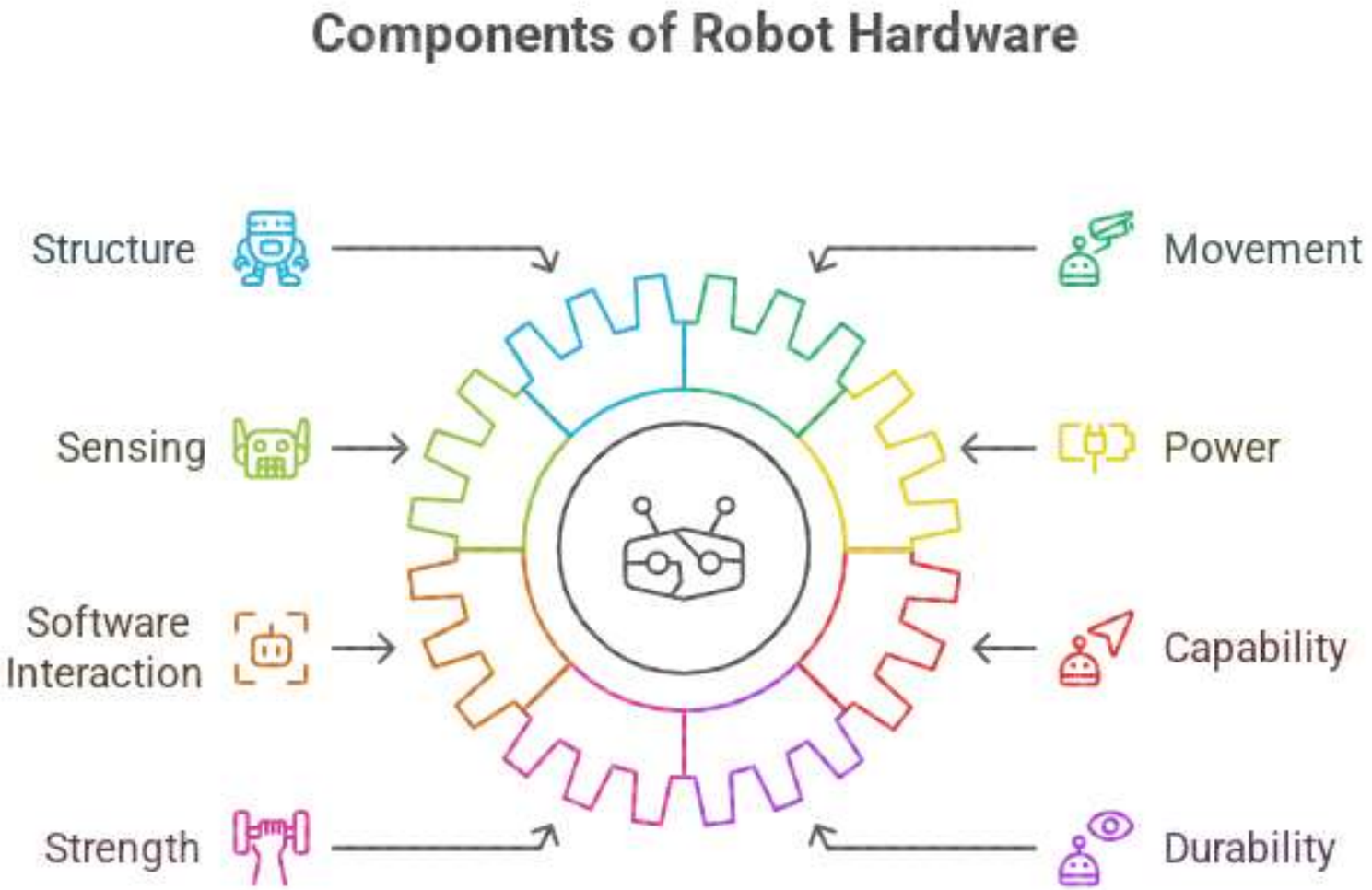
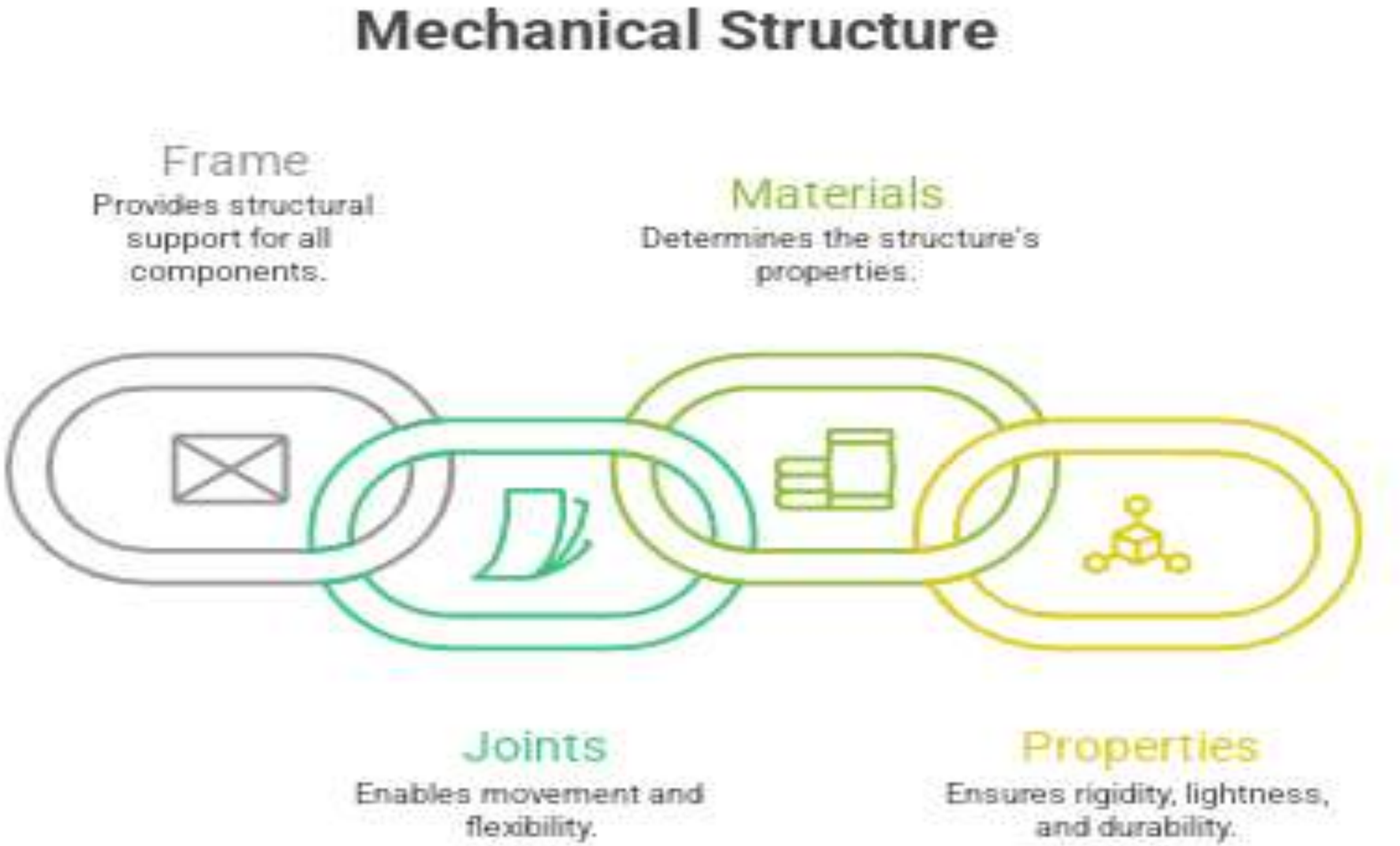
DT- Stages in Hardware

Stage	Short Description	Output
Empathize	Understand need for fast, reactive robot behavior.	Identify key behavior needs.
Define	Frame problem: robots must act quickly without complex models.	Clear problem statement.
Ideate	Generate simple behavior layers (avoid, wander, explore).	List of behavior layers.
Prototype	Build basic layered control with suppression/inhibition.	Layered behavior prototype.
Test	Test in environment and refine interactions.	Improved, stable behavior.

Introduction to Robot Hardware



Mechanical Structure

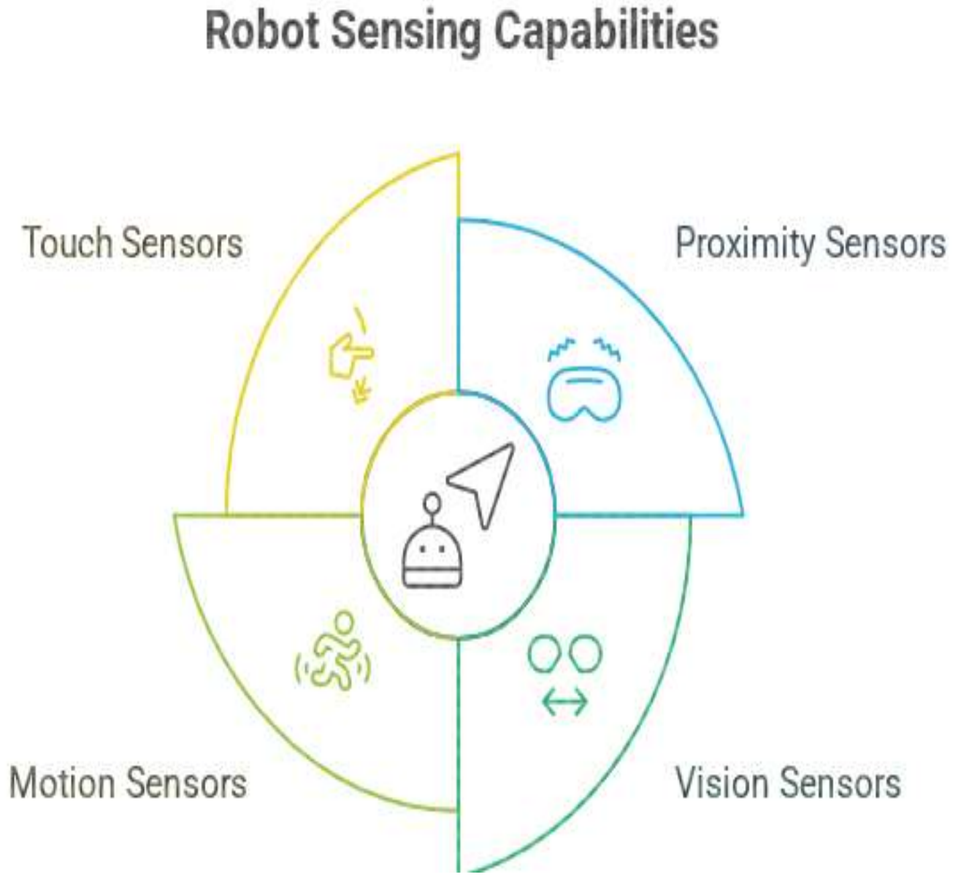


Actuators

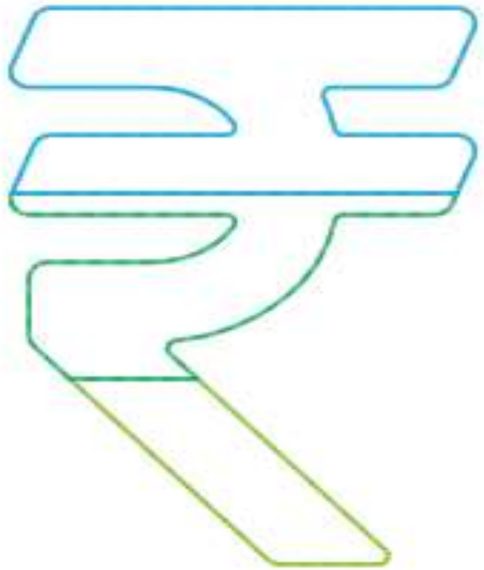
- Devices that create motion.
- Types: DC motors, servo motors, stepper motors, hydraulic/pneumatic actuators.
- Provide rotational or linear movement.
- Selection depends on speed, torque, and load requirements.

Sensors

- Allow the robot to sense its environment.
- Types:
  - **Proximity sensors:** IR, ultrasonic
  - **Vision sensors:** cameras, LiDAR
  - **Motion sensors:** IMU, gyroscopes
  - **Touch sensors:** bump switches
- Provide data for navigation, control, and decision-making.



Robot Power System Overview



Energy Supply

Provides power through batteries, adapters, or external sources

Voltage Regulation

Ensures stable operation by maintaining consistent voltage

Power Consumption Matching

Aligns power supply with the robot's energy needs

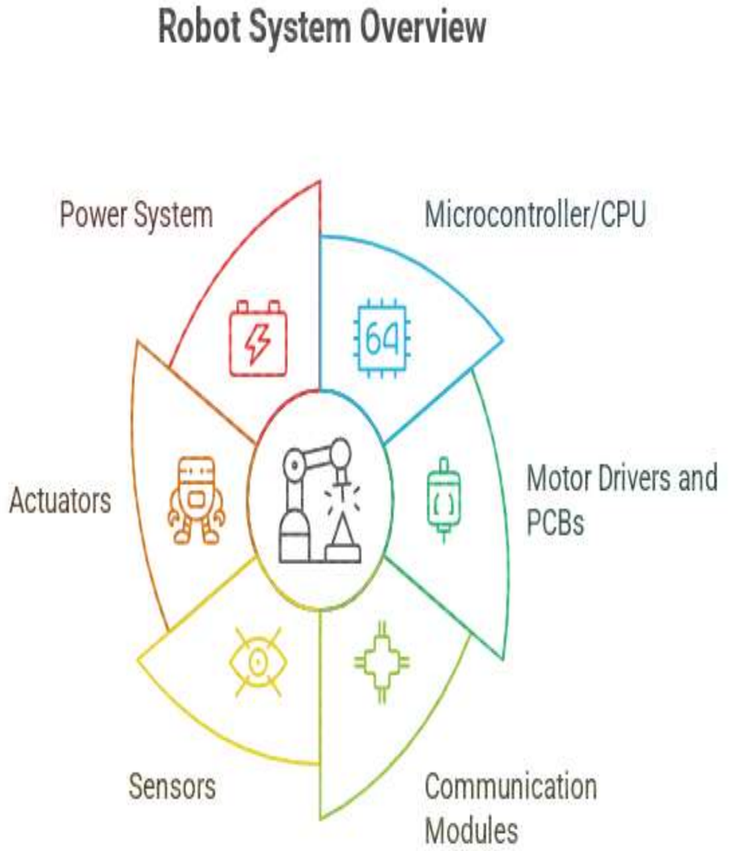
Controller & Electronics

•Microcontroller or CPU controls robot behaviours.

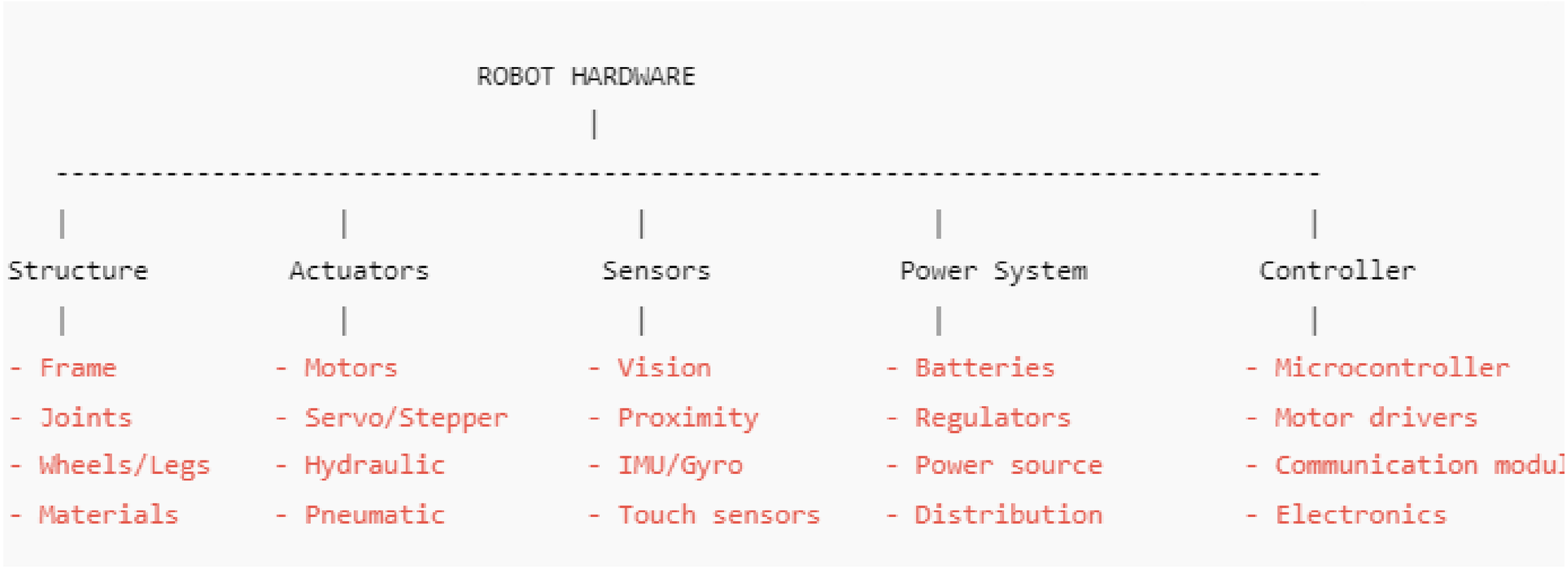
• Motor drivers and PCBs manage power and signals.

• Communication modules: Bluetooth, Wi-Fi, CAN, UART.

• Connects sensors, actuators, and power system into on working unit.



Mind Map


ROBOT HARDWARE
Structure
Actuators
Sensors
Power System
Controller
- Frame
- Joints
- Wheels/Legs
- Materials
- Motors
- Servo/Stepper
- Hydraulic
- Pneumatic
- Vision
- Proximity
- IMU/Gyro
- Touch sensors
- Batteries
- Regulators
- Power source
- Distribution
- Microcontroller
- Motor drivers
- Communication modul
- Electronics

QUIZ

1. **What does robot hardware refer to?**
a) Only software programs b) All physical components of a robot c) The robot's color d) Only motors
Answer: b)
2. **Which component provides structure and supports the robot?**
a) Actuator b) Sensor c) Mechanical frame d) Battery
Answer: c)
3. **Which of the following is an actuator?**
a) Camera b) LiDAR c) DC motor d) Gyroscope
Answer: c)
4. **Which component supplies energy to the robot?**
a) Controller b) Power system c) Chassis d) Wheels
Answer: b)
5. **What is the main function of the controller?**
a) Paint the robot b) Create movement directly
c) Control and coordinate all robotic operations d) Provide external power
Answer: c)

THANK YOU