SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+'
Grade Approved by AICTE, New Delhi & Affiliated to Anna University,
Chennai

DEPARTMENT OF AEROSPACE ENGINEERING

19ASZ301– ROBOTICS & AUTOMATION IN SPACE

III YEAR VI SEM

UNIT 4 –PLC, SCADA AND SENSORS IN AUTOMATION

TOPIC - INTRODUCTION TO MACHINE VISION AND ARTIFICIAL INTELLIGENCE

INTRODUCTION TO MACHINE VISION

Definition:

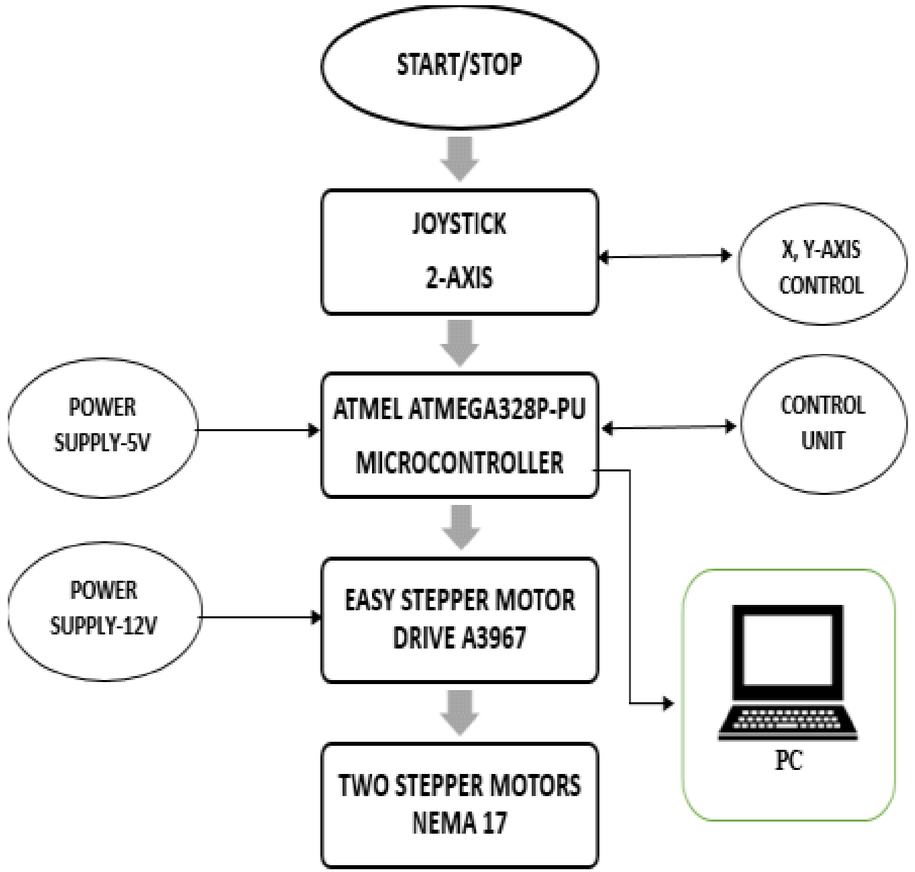
- Machine Vision is the use of digital sensors, cameras, and software to acquire, process, and interpret visual data for automated decision-making.

Core Components:

- Camera/Sensor: Captures image data
- Lighting System: Enhances visibility
- Image Processing Software: Interprets images
- Output System: Triggers actions or flags defects

Use in Space Robotics:

- Navigation of planetary rovers
- Object recognition & manipulation
- Surface mapping & obstacle detection



INTRODUCTION TO ARTIFICIAL INTELLIGENCE (AI)

Definition:

- Artificial Intelligence refers to machines programmed to simulate human-like intelligence, including learning, reasoning, and problem-solving.

Types of AI:

- Narrow AI: Performs specific tasks (e.g., anomaly detection)
- General AI: Still theoretical – performs any cognitive task
- Machine Learning (ML): Subset of AI that learns from data

Application in Automation:

- Predictive maintenance
- Autonomous navigation
- Fault detection & diagnostics

AI Technique	Function	Example Use in Space
Computer Vision (CV)	Visual interpretation	Rover terrain analysis
Neural Networks	Pattern recognition	Space debris detection
Reinforcement Learning	Learning through feedback	Docking & landing maneuvers

MACHINE VISION + AI IN SPACE ROBOTICS

Power of Integration:

- AI enhances machine vision systems with intelligent decision-making
- Enables real-time autonomy and environmental adaptability

Examples in Space:

- Lunar & Mars rovers using AI-vision for path planning
- Spacecraft inspection systems using vision + ML
- Autonomous satellites identifying and tracking objects

System	Machine Vision Role	AI Contribution
Mars Rovers	Obstacle detection	Route optimization
Satellite Servicing Robots	Object recognition	Autonomous manipulation decisions
Lander Navigation Systems	Terrain analysis	Soft landing site prediction

Thank You