Θέματα Διπλωματικών GFF

Κατασκευαστικές

1. Design and Control of a Pick-and-Place Robot Using Arduino and Servo Motors
Type: Practical / Hardware
Tools: Arduino, SolidWorks, basic servos
Description: Build a basic 4-DOF pick-and-place robot. Focus on control strategies (e.g., PID), and use simple vision or proximity sensors for object detection.

2. Vision-Based Object Recognition for Robotic Manipulation
Type: Software / Vision
Tools: OpenCV, Python, Raspberry Pi or PC
Description: Develop a basic vision system that identifies and classifies parts on a conveyor using a webcam and triggers robotic actions.

Θεωρητικές / Surveys

3. State of the Art in Artificial Intelligence for Industrial Robotic Arms
Focus: Survey of AI techniques (e.g., reinforcement learning, neural networks) used in robot motion planning, perception, and decision-making.
Scope: Trends in AI-based control vs traditional methods
Applications in adaptive manufacturing

4. A Comparative Review of Industrial Robot Programming Languages and Interfaces
Focus: Analysis of popular robot programming environments like RAPID (ABB), KRL (KUKA), URScript (Universal Robots), and open-source

options like ROS.
Scope: Syntax, features, and ease of use Application domains and flexibility
Programming trends (e.g., visual programming)

5. Trends and Challenges in Human-Robot Collaboration (HRC) in Manufacturing
Focus: Review of literature on collaborative robotics in production lines, including safety, ergonomics, and real-world deployment.
Scope: Overview of ISO/TS 15066 and related standards Risk assessment frameworks

6. The Role of Industrial Robotics in Industry 5.0: Toward Human-Centric and Sustainable Manufacturing
Focus: Analyze how the principles of Industry 5.0 (personalization, sustainability, and human-machine collaboration) are shaping the future of industrial robotics.
Scope: Definition and pillars of Industry 5.0
Contrast with Industry 4.0 (automation, cyber-physical systems)
Role of cobots, AI, and ethics
Case studies of early Industry 5.0 implementations (Europe, Japan, etc.)

7. A Survey of Digital Twin Architectures for Mechatronic Systems in Smart Manufacturing
Focus: Analyze and classify different architectural frameworks used to develop digital twins for mechatronic systems, such as robotic arms, AGVs, CNC machines, and integrated cells.
Scope:
Definitions and taxonomy of digital twin layers: physical, digital, and communication
Reference models
Communication protocols
Challenges in real-time synchronization, data security, and scalability

8. The Role of Digital Twins in Predictive Maintenance of Industrial Mechatronic Systems

Focus: Theoretical analysis of how digital twins enable condition monitoring, fault prediction, and maintenance scheduling in complex mechatronic assets.

Scope:

Key components: sensor integration, data analytics, simulation models

Use cases: robotic joints, motors, gearboxes, and actuators

Techniques: anomaly detection, machine learning models, FMEA with digital twins

Comparison with traditional CMMS (Computerized Maintenance Management Systems)