

Project Document

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Project Name: Robotic Arm with Temperature-Based

Project Description

The project “Robotic Arm with Temperature-Based Object Classification” focuses on building an intelligent robotic arm capable of classifying and handling objects based on their thermal properties. By using temperature sensors and machine learning models, the system can distinguish between hot, cold, and neutral objects, enabling safe and context-aware interactions.

The robotic arm integrates real-time sensor data, AI-based classification, and automated motion control to adapt its grip strength, speed, and safety measures. For example, if an object is detected as excessively hot, the arm can avoid direct contact or use protective handling strategies. This approach ensures both safety and efficiency in environments such as manufacturing, laboratories, and healthcare.

By combining robotics, IoT-based sensing, and AI-driven classification, the system demonstrates a practical step toward intelligent automation. The project also incorporates monitoring dashboards for supervisors to visualize object classification results, safety alerts, and arm performance metrics.

Project Objectives

- To detect and classify objects based on their temperature using thermal sensors and AI models.
- To integrate classification results with robotic arm motion control for safe and adaptive handling.
- To ensure safety by avoiding or cautiously handling high-temperature objects.
- To optimize robotic operations in real-world environments such as industry, healthcare, and research labs.
- To provide real-time monitoring and alerts through a user-friendly dashboard.

Project Specific Outcomes (PrSO)

PSO1 – AI Model Development for Temperature-Aware Object Classification

Design, train, and validate AI/ML models that use temperature and sensor data to classify objects (e.g., hot, cold, neutral), ensuring at least X% improvement in accuracy and safety compared to baseline robotic handling systems.

PSO2 – Data Optimization for Robust Object Handling

Collect, preprocess, and balance sensor datasets (thermal readings, handling feedback) to minimize classification errors and enhance model generalization by Y%, ensuring safe and reliable performance across diverse conditions.

PSO3 – Real-World Integration & Safety Dashboard

Deploy the robotic arm with an integrated dashboard that provides object classification results, safety alerts, and arm performance analytics, demonstrating Z% improvement in handling efficiency and operator safety through real-world evaluation.

CO PO PSO PrSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PrSO 1	PrSO 2	PrSO 3
CO1	3	2	3	2	3	1	1	1	1	1	2	1	3	3	2	2	1	3
CO2	2	3	2	3	2	1	1	1	1	1	2	1	2	2	3	2	1	2
CO3	2	2	2	3	3	1	1	1	1	1	2	1	2	3	2	2	1	2
CO4	2	2	3	2	3	1	1	1	2	1	3	1	2	2	2	3	1	2
CO5	1	1	2	1	1	3	2	3	1	1	2	2	1	2	1	2	2	1

Project Gap Course

Advanced Artificial Intelligence and Emotion Detection for Adaptive Learning

Purpose of the Gap Course

To equip students with the essential theoretical foundations, technical skills, and ethical considerations required to design, implement, and deploy robotic arm systems integrated with temperature-based object classification for applications in automation, manufacturing, and smart safety systems.

Duration

15 Hours

Coursera Link

[AI for Emotional Wellbeing] (<https://www.coursera.org/learn/ai-for-emotional-wellbeing/>) (can be updated to a more relevant robotics/AI course if you want)

Skill Required

Python Programming

Machine Learning & Deep Learning for Sensor Data & Object Classification

Arduino / Raspberry Pi Programming for robotic arm control

Computer Vision & Thermal Imaging Integration

Streamlit or React.js for interactive dashboards

API Integration for real-time monitoring and control