Cover page

Project title: Image Processing Controlled Robot Academic Year: Summer 2024/2025

Group Members: Arqam Mousa Department Name: Computer Engineering

Jad Kawa'

Project Type: Hardware

Supervisor Name: Dr. Raed Al-Qadi

Format:

- Single space, Times New Roman.
- 12 pt,
- Maximum 1 page.

Abstract Body:

Items must be provided in the Abstract:

- Why do you think this project is important? Please explain the significance of this
- Project in brief.
- In your point of view what are the important aspects that should be covered in the project?
- Objective(s): In your view, please explain the main objectives of the project.
- Methodology: Give a brief outline of the application development process.
- Has this project been done before? Are there any similar applications available today?
- **Note:** Please deliver this abstract early to ensure that your Project has been approved by the department's projects committee. **Registration will not be done without this approval.**

Project's Abstract:

This project introduces a mobile robot capable of identifying and sorting objects using image processing. The robot features four mecanum wheels for omnidirectional movement and a 5-degree-of-freedom (DOF) robotic arm mounted on top. A fixed overhead camera, connected to a PC or any smart device, provides a bird's-eye view of the workspace. Using OpenCV, the smart device classifies objects as either "ball" or "not ball" and sends commands via Bluetooth to an Arduino Mega on the robot. The robot then moves to the target and uses its arm to place balls in a container and discard other items.

This project is important as it simulates a real-world object collection scenario, such as search-and-retrieve or warehouse sorting, using affordable hardware and vision-based control. It highlights the practical integration of computer vision, wireless communication, and robotic actuation.

Key aspects include accurate object classification, reliable Bluetooth communication, mecanum-based mobility, and coordinated arm control.

Objectives:

- Classify and sort objects using a vision-based system.
- Wirelessly control a mobile robot and robotic arm.
- Simulate real-life autonomous collection tasks.
- Demonstrate coordinated movement and manipulation.

Methodology:

The robot is built on a mecanum chassis with a 5-DOF arm, controlled by an Arduino Mega. A smart device processes camera input using OpenCV and sends commands over Bluetooth. The robot navigates to objects and performs sorting based on classification.

While similar systems exist in industry, this project offers a compact, low-cost version suitable for educational and research purposes, demonstrating real-time intelligent control in a physical environment.