Automated Color-based Cube Sorting Project

Using Vision-Guided Robotics for Pick and Place Operations

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Outline

Project Overview

Objective

Automate the sorting of cubes by color.

Method

Utilize a camera for color detection and a pre-programmed robot for pick and place tasks.

Problem Statement

Challenge

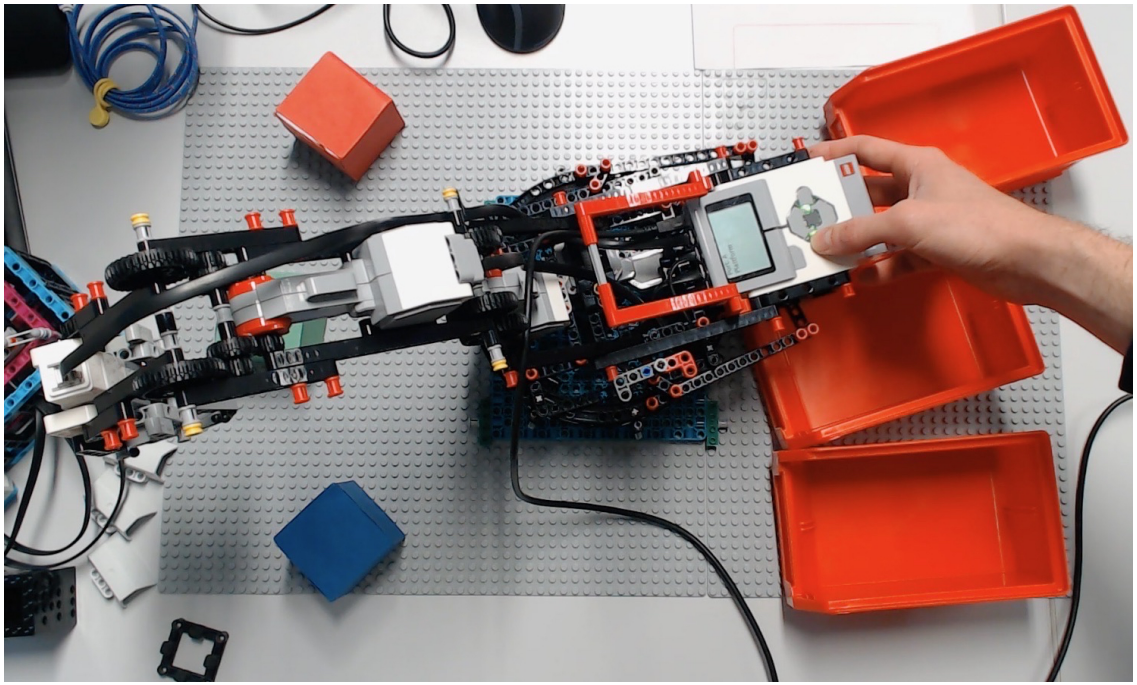
- Efficiently sort cubes based on their color
- Moving the robot with precision

Requirements

Accurate color detection and precise positioning.

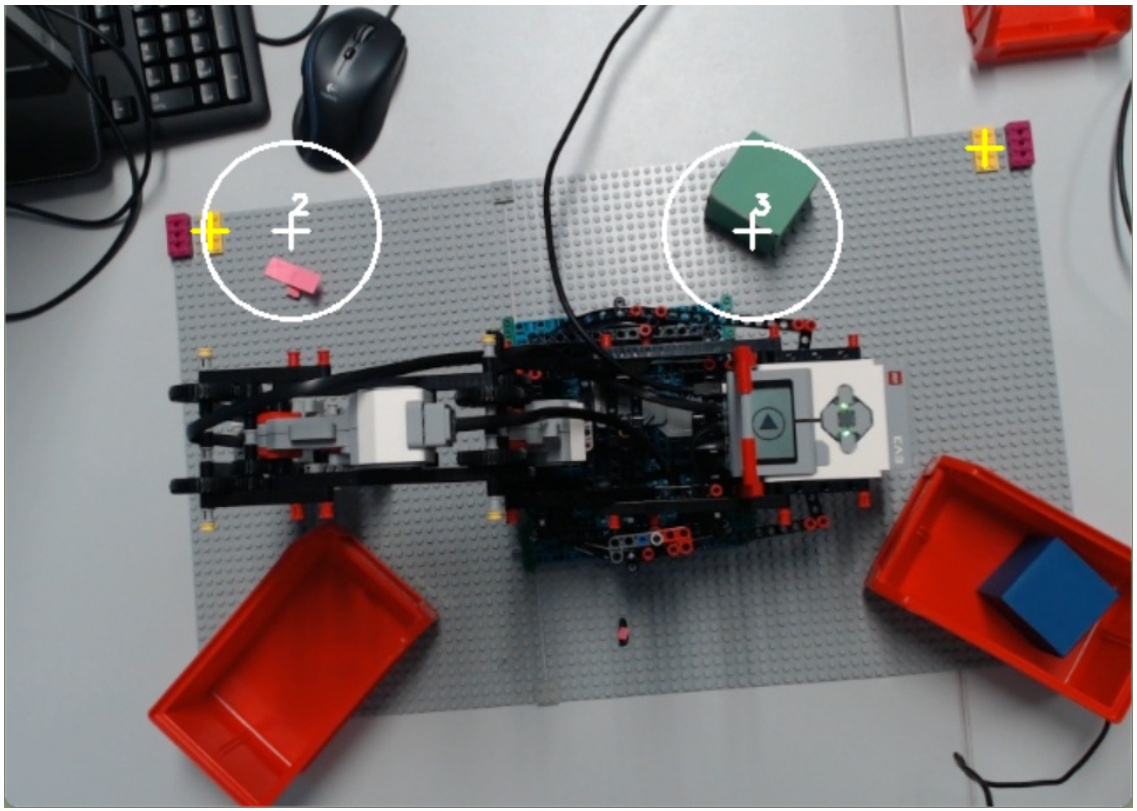
System Components

- **Camera:** Positioned above the workspace to detect cube colors.
- **Robot:** Pre-programmed for specific positions to pick and place cubes.
- **Cubes:** Different colors located at defined positions.



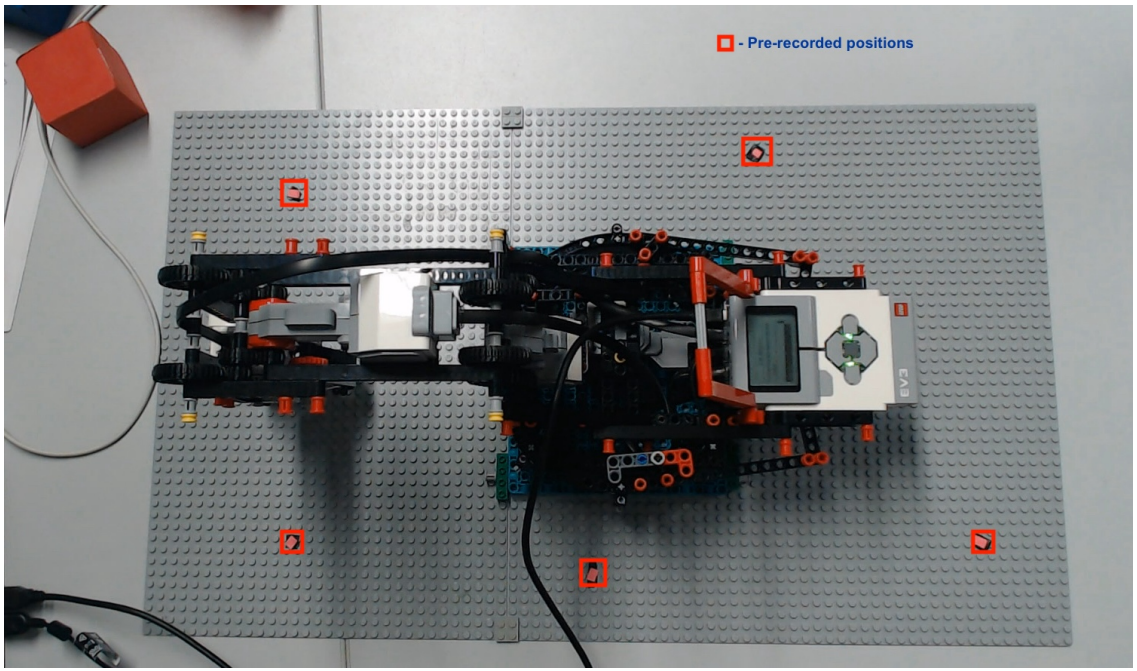
Color Detection Mechanism

- **Camera Placement:** Overhead view ensures clear detection.
- **Technology:** Color recognition algorithms identify the cube colors.
- **Accuracy:** High precision in distinguishing between different colors.



Pre-recorded Positions

- **Initial Setup:** Positions of cubes pre-recorded in the system in the format [plateform coordinate, motor 1 coordinate, motor 2 coordinate, hand coordinate].
- **Robot Navigation:** Uses these positions.
- **Benefit:** Reduces the need for real-time position adjustments.



Pick and Place Operation

- **Process:**
  1. Camera detects cube color.
  2. Robot moves to the detected position.
  3. Robot picks the cube.
  4. Robot places the cube in the designated location.

System Workflow

- **Step-by-Step:**
  1. Camera scans the workspace.
  2. Color detection algorithm processes the image.
  3. Robot retrieves position data.
  4. Robot executes pick and place action.
- **Automation:** Entire process is automated for minimal human intervention.

Advantages of Our System

- **Speed:** Rapid sorting process.
- **Accuracy:** High precision in color detection and placement.
- **Scalability:** Can handle multiple cubes and colors. .

Challenges and Solutions

- **Challenge:** Ensuring consistent color detection under varying lighting conditions.
- **Solution:** Calibrated camera and advanced algorithms.
- **Challenge:** Robot accuracy in placement.
- **Solution:** Pre-recorded positions and precise control mechanisms.

Future Improvements

- **Dynamic Positioning:** Implement Inverse Kinematic Model of the arm. (Denavit Hatenberg Model)
- **Expanded Capabilities:** Sorting objects based on additional criteria (e.g., size, shape).

Conclusion

- **Summary:** Successful implementation of an automated color-based cube sorting system.
- **Impact:** Demonstrates the potential of vision-guided robotics in industrial automation.
- **Next Steps:** Explore further applications and improvements.

Questions and Answers

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