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Mini Project Work-II (EC6MP2) Report
on
"ROBOTIC ARM"

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Mini Project Work-II (EC6MP2)

Abstract:

A robotic arm with a smart approach to implement sorting of objects on the basis of colour. Here a robotic arm which sorts small cylindrical objects after which it picks and places them in designated place and pre-defined angles. This is a low-cost system with simple concept to implement sorting efficiently by saving manual time and work.

The colour detection is done by colour sensor (TCS3200) which uses light intensity to frequency conversion method. The colour sensor detects three different colours namely red, green, blue (RGB) and power supply is given to the microcontroller and the robotic arm is controlled by the microcontroller-based system which further controls servo- motors.

Introduction

Automation is one of the leading development fields mainly because it advances the industry further than ever before, providing the potential of almost fully automated production lines. Automation is stated to be the 3rd phase of the industrial revolution. A remarkable technological advancement that pushes mankind up a step in the ladder of industry tech. It makes products cheaper to produce and at larger quantities making the technology worthwhile to invest in. Since the beginning of the industrial revolution mechanical engineers developed machines to ease on the workforce. Electricity and computer science provided the gateway to something new – robotics! Automized machines capable of human activity. So current technology allows us to build machines that are capable of performing human-like actions. To do so, robots must have similar autonomy consisting moving parts that are electromechanically driven and a "brain" component to control them by following pre- determined instructions, or make them make up on its own.

Robots are used in different fields such as industrial, military, space exploration, and medical applications. These robots could be classified as manipulator robots and cooperate with other parts of automated or semi-automated equipment to achieve tasks such as loading, unloading, spray painting, welding, and assembling. Generally, robots are designed, built and controlled via a computer or a controlling device which uses a specific program or algorithm. Programs and robots are designed in a way that when the program changes, the behavior of the robot changes accordingly resulting in a very flexible task achieving robot

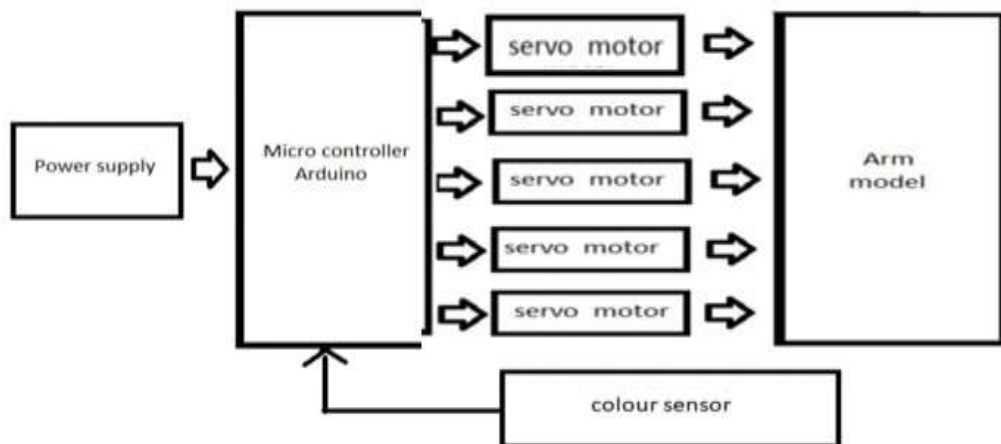COLOUR SORTER ROBOTIC ARM

Block Diagram

Fig. Block diagram of proposed model

In the Fig. Pick and place robotic arm involves a color sensor that senses the object's color and sends the signal to **Arduino**. The Arduino sends a signal to six servo motors of the robotic arm to grip the object and place it in the specified location. Based on the color detected, the robotic arm moves to the specified location, releases the object, and returns to the original position. The main objective of the Pick and Place Multi-Axis Robotic Arm is to basically sort different colored objects. However, there are also subtasks that need to be accomplished for the proper functioning of the whole system. C language is one of the languages used to program Arduino. Interfacing sensors with an Arduino board is very easy to understand.

Robotic arm operates in environments that are either hazardous (e.g. radiation) or not accessible. The primary justification for using robotics is to protect people from working in dangerous environments and handling hazardous materials. Robots are regularly employed to perform tasks that could potentially harm or injure individuals, ranging from handling explosive chemicals to managing radioactive substances. In most factories, specialized robots, designed for specific tasks and incapable of being reconfigured for other tasks due to their mechanical setup, can be found. The robotic arm deals with multi-axis machines to achieve the same pick and place task effortlessly. The machine possesses intelligence and a color sensor, enabling it to determine the color of an object. This, in turn, allows the arm to autonomously move to the ideal position for grasping the object using the color sensor.

Methodology

- The robotic arm consists of 2 rotation, 2 revolute and 1 twist joints, overall it has 5 joints.
- 5 servos are used in order to move the joints and a mechanical gripper is used to hold the object.
- First the gripper lifts the object that is present and then the colour sensor detects the colour of the object and sends the data to the Arduino.
- The microcontroller Arduino receives the data and instructs the arm to place it in the same-coloured area.

Advantages
- Capable of performing tasks with high precision, ensuring consistent quality and reducing human error.
- Able to complete tasks more quickly than humans, boosting overall productivity.
- It can operate continuously without breaking for 24/7.

Applications
1. Laboratory Automation.
2. Home Automation.
3. Small-Scale Manufacturing.
4. In Warehouses.

Results and Discussions

Fig.1 Gripper   Fig.2 Arm model

- The Fig.1 represents gripper and Fig.2 represents arm model.
- The above picture represents a working robotic arm that is capable of performing task like pick and placing the object that has a same color.
- The arm is capable of lifting up to 100g.
- It can sense up to 3 different colors which are red, blue and green.

Conclusion

- The block diagram of the proposed model is given.
- The robotic arm is constructed and is capable of pick and placing the objects based on its colours to their designated places with pre-defined angles.

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