6 Degrees of Freedom Robotic Arm Controlled by Hand Movement Through OpenCV

The main aim of the project is design six axis robotic arm which is controlled by the user through hand gesture.

The arm has six axis and six degrees of freedom. The six degrees of freedom allows the robot to moves in all three dimensions. This project makes a use of Servo motors are used as controlling elements for providing the different degrees of freedom to the robot ARM. Pi camera and OpenCV image processing is uses to detect the hand movement of the user. By using hand gesture user can control the arm movements like left, right, up and down. We use two push buttons to open and close the gripper.

The main controlling device of the project is Raspberry pi3B+ module, to achieve this task raspberry pi loaded program written in python language. pi camera, two control buttons, servo motors along with Arduino UNO interfaced to the raspberry pi. When the pi camera detects the hand movement this data process to the raspberry pi then raspberry pi processes this data using image processing and control the arm accordingly through servo motors. When the user presses the buttons, this data reads by raspberry and control the gripper accordingly. Arduino works as a servo motor driver.

Objectives:

- Design a six-axis robotic arm.
- Hand gesture-based ARM movement.
- Using OpenCV image processing to recognise the hand movement.
- Using raspberry pi and pi camera to achieve this task.

Components used:

- Power supply.
- Raspberry pi.

- SD card.
- Pi Camera module.
- Servo motors.
- Arduino uno.
- Two buttons.

Software's used:

- OpenCV image processing.
- Linux OS.
- Python language.

Block Diagram:

Block diagram of the project