Gesture-Based Control of an OMRON Viper 650 Robot

Gabriel Alvarado[1], Fávell Núñez[2]
Facultad de Ingeniería, Universidad Tecnológica Centroamericana (UNITEC), Tegucigalpa, Honduras.

Abstract

This project focuses on the development and implementation of a robotic control system based on signal and gesture detection using computer vision. The main objective was to create an intuitive and efficient interface that would allow the user to interact with an OMRON Viper 650 industrial robot.

To achieve control of the OMRON Viper 650 robot through gestures, computer vision technologies were used to detect hands and fingers in real-time. The data was processed with a Python script and stored in a text file. A C# program with the OMRON ACE interface extracted this data and sent commands to the robot.

Development

The study focuses on four main objectives:

1. Hand and finger detection: Develop a Python script to detect hand and finger positions.

2. Gesture recognition: Use the OpenCV and MediaPipe libraries in Python to recognize hand gestures and translate them into commands for the robotic arm.

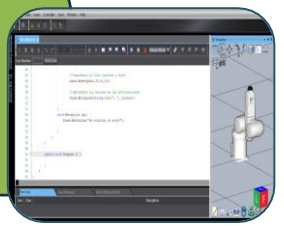
3. Control interface: Develop C# code in the ACE interface to access and process the detected gestures, sending the corresponding commands to the robotic arm.

4. Testing and validation: Conduct initial tests using the ACE simulator and subsequently test the system with the OMRON VIPER 650 robot.

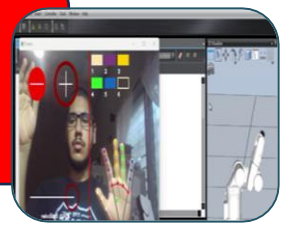
The project was divided into three crucial stages for successful implementation:

Development of the Python Script:
Process: A virtual environment was created to extract information about finger positions.

Python-ACE Connection:
Process: C# code was developed for controlling the robotic arm.



Program to Control the Robot :
Process: A program was created to interpret hand gestures into commands for the robotic arm.



Gesture-Based Control of an OMRON Viper 650 Robot

Gabriel Alvarado[1], Fávell Núñez[2]
Facultad de Ingeniería, Universidad Tecnológica Centroamericana (UNITEC), Tegucigalpa, Honduras.

Results

The application interacts with the screen and the camera, recognizing gestures and landmarks from both hands. The right hand selects the joints to control, while the left hand sets the speed and angle of the joint movements. After testing with a simulated robot in ACE and then with the physical robot, the program successfully controlled all six axes of the manipulator.