PHASE-1 OF AN ARTICULATED ARM 6-AXIS ROBOT

Cole Christensen • Joshua Dugo • Kris Magri • Cory Nann • Michael Tomin
Dr. Ramesh Varahamurti

MICRO·VU
Precision Measurement Equipment Since 1959

Project Overview

The Problem:

Loading and unloading Micro-Vu's vision measuring machines is a labor-intensive and time-consuming processes. When performed by a technician, only a small fraction of manufactured products can be checked for quality.

Purpose:

The purpose of this project was to design, build, and test the first four axes of an articulated arm 6-axis robot. It will provide 100% quality checking of manufactured parts when used in conjunction with a Micro-Vu vision measuring machine.

Project Requirements:

- Maximum Payload: 9 kg
- Horizontal Reach: 700 mm
- Cycle Time: < 10 s
- Repeatability: ± 500 µm
- Power Source: 120VAC
- Aesthetically pleasing design
- Incorporate control for all 6 axes
- Provide pneumatic and electrical interfacing for end of arm tooling

Project Outlook

This first-year prototype is competitive with industry robots and designed to be manufactured in quantity. With the addition of the fifth and sixth axes, Micro-Vu has a robot design that will achieve repetitive loading and unloading with high repeatability and speed.

Arm Design

The arm was machined from 6061-T6 billet aluminum. The Y-shaped design minimizes deflection and maintains stability under dynamic loading.

Gearboxes

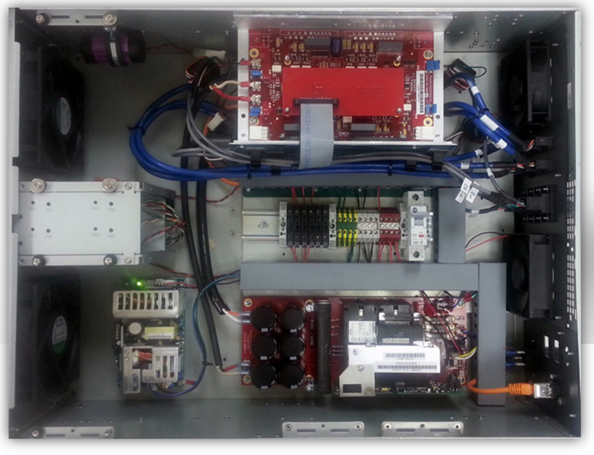
The design uses Nabtesco RDS Series cycloidal gearboxes (Axis 1, 2, 3) and a Neugart PLFN Series planetary gearbox (Axis 4).

Electrical/ Pneumatic EOT Interface

Interfaces for electrical and pneumatic end of arm tooling are integrated into the robot arm.

Brushless Servo Motors

All four axes are equipped with Tamagawa brushless servo motors and 17-bit absolute, multi-turn encoders.



Control System

The robot is controlled through a Precise Automation Guidance controller with an integrated kinematics package. The controller contains four 20A drives and two 10A slave drives. The controller's web interface can be accessed via a computer or tablet.