# Providing Joint on Robotic Arm Unlimited Degrees of Freedom

Enrique Garcia, Barry Chen, Robin Lee, Haruya Tatsumi, Jonathan Tu

Sponsor: Archytas Automation

UCI Samueli School of Engineering

## Executive Summary

- Objective: design a system that allows the joints on a robotic arm to rotate 360 degrees.
  - Previous tensioners prevent full rotation of joints (past 180°).

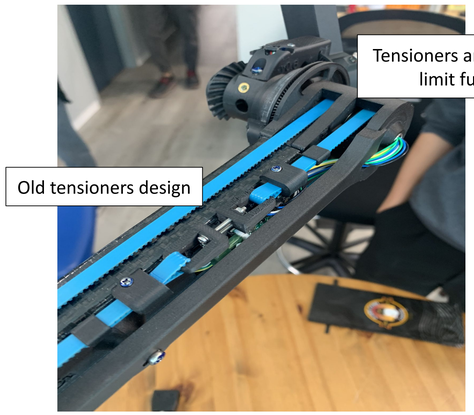


**Figure 1.** Previous tensioning system physically limited extent of belt movement.

- Solution: new tensioning system
  - Notches for tensioning.
  - Open housings for the pulleys along with a continuous belt.
- Overall success: effectively provides the same tension as before while allowing unlimited movement of the joint.

## Key Features

- New tensioning system using notches
- Continuous looping belt
- Open pulley housings

## Proof of Concept

- New notches provide sufficient tension.
- Open housings allow for the continuous belt to be looped on easily during assembly.
  - Continuous belt allows for unlimited movement without physical restrictions.

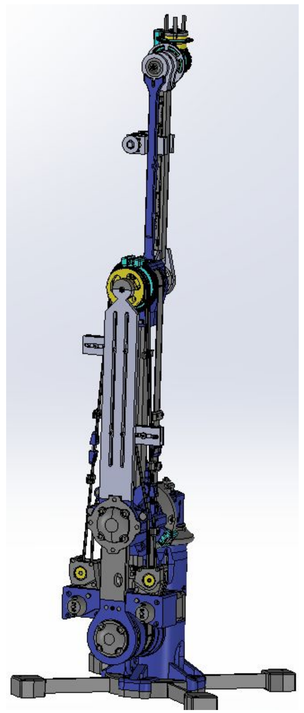

**Figure 2.** SolidWorks assembly

**Figure 3.** Fully assembled arm

## Analysis

- Tension applied to new open housing design in SolidWorks simulation.
- Simulation validates the new design's sufficient strength.

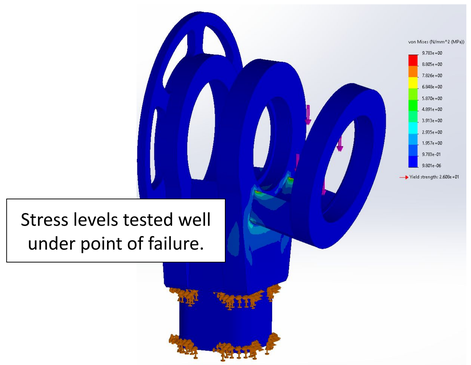


**Figure 4.** Tension testing using SolidWorks simulation.

## Recommended Future Improvements

- Main setback: incompatibility between new designs and existing parts.
  - Difficult to flawlessly incorporate new designs into a complex assembly without changing components.
- Future improvements: find ways to keep as many existing parts the same while implementing new designs.

**Acknowledgements:** Robert Caswelch and Archytas Automation**,** Sherif Hassaan, Mark Walter, and David Copp