

Metal Shop Robot

Ben Boardman | Utsav Chaudhary | Hezekiah Dombach | Joel Hecht | Bennett Lehman | Jake Marchese

Background

A metal shop needed a way to attract customers and showcase their work remotely. Our team assisted in the development of a teleoperated robot that serves as an interactive ambassador, allowing potential customers to virtually visit the shop floor and communicate with staff in real time. Customers are able to connect to the robot through the company's website and control it, allowing them to browse the shop. The robot combines wheels, two controllable arms, a camera, and a monitor for two-way interaction.

Project Objective / Goal

- Rewrite the existing prototype into a maintainable robot software suite.
- Migrate from a Windows/Unity-based prototype to a Linux ARM64 platform on an Nvidia Jetson board.
- Use ROS2 as the central messaging layer for WebRTC, camera, inverse kinematics, and motor-control nodes.
- Handle motor functions and IK locally on the robot. Create a base for future automation and safety features.

System & Hardware Overview

Software Stack: React 19, WebRTC, ROS2, TURN Server, Cloudflare

Hardware: Lattepanda / Nvidia Jetson, ESP32 Controllers, XIAOMI Cybergear Motors, FeeTech Servos, VR Camera

What We Did

We successfully redesigned the previous existing prototype and were able to demonstrate a teleoperated robot capable of real-time remote control through a web interface. The system achieves low-latency video streaming and responsive motor control, enabling natural interaction between remote customers and on-site staff. The robot will serve as a novel customer engagement tool for the metal shop.

Hardware Architecture

