

Thesis Project Portfolio

Hybrid Humanoid Robot

(Technical Report)

Automation and Aesthetics: The Tradeoffs of Robotic Manufacturing and Human Craftsmanship in Guitars

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science
University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree
Bachelor of Science, School of Engineering

Carson Douglas Peters

Spring, 2025

Department of Mechanical Engineering

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Introduction

My technical work and STS research both involve automation technology. My technical project involves building a robot that can be programmed to function autonomously and assume the role of a human in a working environment. My STS research examines how automation technology changes the roles and values of humans in a manufacturing environment. Together, they give a holistic image of the interaction between people and robotic technology.

Technical Report

Robots are increasingly used in military applications to make tasks easier and safer. This project designs and builds a hybrid humanoid robot, capable of navigating the obstacles and terrain of an aircraft carrier's interior while doing various basic maintenance operations. Sponsored by the Navy, the primary focus of this project is the development of a lightweight, cost-effective robot equipped with transforming limbs which enable it to traverse multiple environments.

The idea of a hybrid humanoid robot is an advancement in robotics in several ways. The current state of humanoid robotics forces engineers to make a tradeoff, choosing between mobility and functionality. This hybrid robot design can move quickly on flat terrain and climb a steep set of stairs, fulfilling the requirements of the Navy better than commercially available robots. A robot with these capabilities has the potential to reduce the number of sailors required to operate an aircraft carrier, removing sailors from potentially dangerous jobs. This technology reveals potential for autonomously operated aircraft carriers in the future.

By the initiative of the project's technical advisor, the scope was reduced to create a more achievable goal for the end of the year. Initially, the project involved designing and developing

the entire robot, from the transforming limbs to the frame and the electronics. These requirements were refined to focus on designing and manufacturing the robot, while a prototype for the transforming limbs was developed as a separate project. The improved focus of the project enabled increased attention to a practical and tested design of the robot body.

STS Project

My STS project examines how the advent of robotic automation in manufacturing has changed the role humans play in the creation of products. Machines perform tasks that once required the hands of skilled laborers, improving manufacturing speed, cost, and quality. I focus on the guitar industry to investigate the tension between automation, craftsmanship, and the human experience. Guitars as an artifact are interesting, holding both practical value as a device of music creation and artistic value in their cultural meaning and reflection of personal identity. This duality of meaning is reflected in the two methods of modern guitar production: handcrafted by skilled luthiers and mass production by machines in factories. These vastly different approaches to production reveal the tension between technological choices and broader social and economic dynamics, raising questions about the role of human labor in an increasingly mechanized world. My research shows that an individual's role in the production of guitars as a buyer, business owner, or laborer determines the unique ways humans are impacted by and value automation technology.

Conclusion

Working on these two projects simultaneously has given me an appreciation for both the development and application of robotic technology. In my technical project, I experienced the challenges of creating a product while balancing the project requirements with the resources and knowledge available. The premises of the project given by the Navy assumed that the result

would be a net positive to their goals. Examining automation from a more value-driven approach and stepping away from the idea that technology is always good helped me ask questions about the assumptions surrounding the technical project. Together, the projects helped me realize that it takes effort for engineers to think about what they build outside of a technological mindset, and that examining the broader impacts of what they are building is crucial to ensuring that they are improving someone's life.