Thesis Project Portfolio

Rock-Slide: Developing an Indoor Climbing Volume with a Linearly Actuating Hold

(Technical Report)

A Future for Transportation: A Sustainability Assessment of Electric Vehicles

(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

Tristan K. Gross

Spring, 2023

Department of Mechanical and Aerospace Engineering

Table of Contents

Sociotechnical Synthesis

My technical and sociotechnical papers are not directly related but they share a common thread in their attitude towards ecological preservation. The sociotechnical research paper examines a pressing issue for worldwide sustainability by investigating electric vehicle technology. Transportation technology is a huge consideration for improving global sustainability. Internal combustion vehicles make up a large portion of carbon emissions worldwide and electric vehicles are the currently proposed solution to this issue. While electric vehicles may be an adequate solution, they require greater scrutiny to ensure that they fully align with long term sustainability goals. The research paper employs sustainability decision making criteria outlined by Robert Gibson (2005). The main criteria which are discussed are the need for intergenerational equity and socio-ecological integrity.

The technical capstone project focuses on the sport of rock climbing, a sport which has long been centered on human interactions with our natural environment. Born from traditional mountaineering, it is a sport in which practitioners connect with nature and the land. The US national parks system is home to many of the greatest rock-climbing locales in the world and climbers are often large nature conservation advocates. For the sport to continue to thrive, our remaining wildlife must be preserved. The technical capstone project outlines the conceptualization, design and prototyping of a product designed to be used by rock climbers within indoor climbing gyms. The final prototype employed a mechatronic design to produce a novel form of rock climbing where the holds on the climbing wall were able to move while being used by climbers.