

Thesis Portfolio

Leonardo Bot Vinci
(Technical Report)

An Analysis of the United States Space Agency and Its Role in America
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The technical portion of this thesis describes the design, implementation, and testing of an automated drawing machine – endearingly known as the Leonardo Bot Vinci. In many engineering practices, detailed drawings of mechanical parts and machines are required for documentation and design purposes. Drawing orthographic projection drawings of objects is something taught in even the most basic engineering classes. This drawing machine was designed and built to fully automate that process. The Leonardo Bot Vinci machine uses many integrated engineering concepts: mechanical structures, image processing, electrical circuitry, etc, to draw the X-axis, Y-axis, and Z-axis projections of physical objects. Any object can be placed inside an enclosed box that was fitted with LED lights and LifeCams that took pictures of different faces of an object. These images were then put through very extensive image processing techniques that were coded and implemented in LabVIEW which allowed each image to be isolated to just its edges. These edges were then translated to coordinates which were sent through the MyRIO microcontroller to a printed circuit board. The circuit board provided an essential interface between the imaging of an object and the actual automated drawing of it. The circuit board allowed the mechanical X-Y drawing table to be controlled via switches and motors that could be toggled using the microcontroller. All of these moving parts were carefully stitched together and documented to create a fully functional drawing machine that was able to go from taking pictures of an origami dragon inside a wooden box, to drawing the X, Y, and Z faces of that paper sculpture onto a white board. Although drawing tables already exist in the industry, making one from absolutely nothing required the integration of many years of engineering classes and concepts, which truly let this project live up to its name as our undergraduate “Capstone”.

The STS portion of this thesis describes the nuances of public opinion when it comes to the space agency and its engineering pursuits. The space agency in the United States has gone through many different historical contexts: from the US-Soviet Cold War all the way to the modern age of telecommunication. Similarly, the opinions of the American civil society and tax paying community has changed and shifted over time as well. Slowly, civil society opinions and polls have shown a more and more diverging view of what projects the US space agency should pursue versus the projects that the space agency is actually pursuing. This thesis aims to analyze the different contexts of space, how that has shaped the definition and discourse of engineering and technology for space applications, as well as the shifting views of American civil society with regards to the space agency’s project pursuits. At one point in time, Americans greatly supported a mission to the Moon as this was analogous with patriotism during the time of the Cold War. With the introduction of climate change, discovery of other planets, development of very advanced unmanned robots, and the rise of telecommunication, this support for the space agency and its current pursuits to send more humans into space and to Mars has dwindled.

The technical and STS thesis are not related.