Three-Dimensional Modeling of Lung Volumes in Application to Scoliosis
(Technical Report)

The Case of the Missing Red M&M's: A Study of Public Perception on Artificial Food Coloring and Manufacturer Response
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Socio-Technical Synthesis

My technical work and STS research both address the sociotechnical challenge of understanding polarized public perception towards new technology, and how the technology's "unnatural" qualities come from the fusion of two distinctive cultural categories. While my technical project focuses on designing a hybrid device consisting of a human lung model in a machine, my STS project explores the resulting qualities and public perception of combining cultural categories. In what follows, I will reflect on the nature of the relationship between my technical work and STS research by looking at how the knowledge I gain from the STS portion informs and influences my design in the technical portion.

My technical work focuses on developing a 3D computational model of the lungs which provides a safer yet equally accurate method of measuring lung volumes in adolescent idiopathic scoliosis (AIS) patients. AIS is a common pediatric deformity of the spine and ribcage which can result in lung complications throughout development. Currently, surgeons perform spinal fusion surgery to correct for scoliosis by stunting growth of the spine; however, this procedure also stops chest growth and hinders proper lung development. Consequently, healthcare providers need to accurately measure patient lung volume in order to determine the optimal time for spinal fusion surgery. Current methods of acquiring lung volume are insufficient for younger patients and expose them to harmful doses of radiation. Therefore, my technical project aims to create a novel method to safely estimate lung volumes of AIS patients and aid medical providers in warranting the uncertainties of when to perform spinal fusion surgery, ultimately improving healthcare for pediatric patients.

My STS research explores polarized public perception of artificial food coloring, particularly Red Dye No. 2, using a case study of the disappearance of red M&M's in the 1970's.

Red M&M's were amongst the original chocolate candy colors, but new studies showing that Red Dye No. 2 caused fetal death in rats led to public fear of red food coloring and removal of the color from the M&M's palette. Later, an article discrediting the red dye studies subsided public angst and customer demands brought the revival of red M&M's. My claim is that the characteristics of artificial food coloring combined the cultural categories of nature and culture, resulting in the technology's "unnatural" qualities which caused polarized public opinions. Specifically, I use Martijntje Smits' monster theory which attributes divergent attitudes towards new technology to the perception that it fuses two discrete cultural categories to produce a "monstrous" technology. In my analysis, I demonstrate that the disappearance and reappearance of red M&M's were due to the changing interpretations of the combined cultural categories, resulting in three sequential public perspectives of red M&M's.

A technical solution was not enough to address the broader sociotechnical issue of understanding how the characteristics of new technologies influence public perception. In order for my technical project to succeed, I needed to understand how my device can fuse cultural categories to produce "unnatural" qualities that may instigate polarized responses. The advantage of working on my technical and STS project simultaneously was that the STS part provided information on social factors that I needed to consider while working on the technical portion. Based on the knowledge earned from my STS project, I designed my technical project with consideration of how my device's properties combine the cultural categories of organism and machine. Overall, the results of my STS work helped me better understand the broader sociotechnical issue of how polarized perception towards new technology is due to the fusion of cultural categories. Ultimately, this insight gave me a comprehensive understanding of how the resulting "unnatural" qualities can affect the full potential of my technical project.