Thesis Project Portfolio

3D Printed Stroke Rehabilitation Exoskeleton Design

(Technical Report)

Sustainable Practices In the Ski Resort Industry

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Strokes are one of the leading causes of death in the twenty-first century. Most victims however will survive a stroke but will need extensive treatment and therapy in order to return to a sense of normalcy. One of the primary systems of a stroke is a loss of muscle function that can cause difficulty in day to day life. Current methods of rehabilitation include physical therapy and exercises. One new, upcoming method of expedite recovery in stroke patients is the use of an exo-skeleton. Many designs exist however one major drawback can be that they are heavy and expensive and not practical for most every usage. The purpose of this project was to design a cheap, cost effective design for an exoskeleton that is 3D printed for use to rehabilitate stroke victims with limited muscle function. The exoskeleton uses stepper motors and pneumatic muscles, paired with IMU and EMG sensors in order to assist patients with movement of their shoulder and elbow motions. It is important to consider the human and social dimensions of this newer technology especially as it operates in a medical faculty. One major consideration was that the exo-skeleton is external and therefore non-invasive to the patient.

In recent years there has been less recorded snowfall in many parts of the world. A decline in average global temperatures and reduced snowfall affects many aspects of human society, one of which being the skiing industry. It is becoming increasingly difficult for results to operate with limited snow and this in turn is impacting their influence on local economies. The paradigm shift theory is used to examine how a revolutionary discovery impacts how a part of society works and how technology adapts to it. Before the only focus of technology was its local impact, now the environmental impacts must be taken into consideration. A promising technology is AI and software that can be used to more efficiently conduct snow making. This is in hopes of finding better ways to keep ski resorts open and also minimizing their waste and carbon footprints.

The technical project and STS research topic are very loosely related but with a clear connection. When considered in concert they address how many issues that are faced involve both a micro and macro component. In order for a person to enjoy the sport of skiing, both aspects are equally important. If they are injured and unable to function properly that inhibits their ability to participate. While also if climate change decimates resorts and snowfall becomes unsustainable the end result will be the same. In order for skiing to survive, both halves must be addressed; the skier themself as well as the environment as a whole.