Web Development: Art and Web Design Illuminate the Korean War

Technical Project

Superconductivity: Its potential societal implication and environment

STS Project

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Technical Project

The Smithsonian Institute has offered a project to create a website that combines art with historical facts, specifically focusing on the Korean War. My role in this project involves using web development skills, primarily HTML, CSS, and JavaScript, to build a website that presents animated art pieces to engage users. The website's main goal is to present the Korean War in a way that is both educational and engaging. This project next semester will begin in the Spring 2024 semester, under Professor Panagiotis Apostolellis, in his independent study. To achieve the main goal, I divided the whole journey into several steps.

-Collecting art pieces/images to put on the website. This project is not finalized yet, due to source issues, but the sources will be provided by Dr. Paul Michael Taylor, who is a director and curator at the Smithsonian Institute.

-Writing HTML code to form the structure of the web pages. This aims to be completed by the 3rd week of the semester.

-CSS styling, which allows styling website components. This step involves creating a visually appealing layout and design for the website. Implementing CSS to ensure the site is aesthetically pleasing in styling aspects, with a focus on making the art pieces and historical facts stand out. This process includes selecting color schemes, fonts, and animated images and arranging content in a user-friendly manner. The goal is to have the CSS styling completed by the mid-semester.

-JavaScript integration. This step is crucial for adding interactivity to the website. Using JavaScript, I intend to create dynamic user experiences, such as interactive timelines of the Korean War, clickable art pieces that reveal more information, and possibly animation effects that bring the art to life. This part of the project will require careful coding to ensure smooth user interactions and I aim to finish this process before the 12th week of the semester.

Since the initial plan of the website is to show the facts and art pieces of the Korean War, Back-End development is not intended to be developed yet. However, this could be explored in the future.

-Upload website files to the host server using FTP/SFTP. This will be done after assuming the website has purchased a domain. Setting domain address will be done in the spare time.

History is a fact of the past, but it also provides wisdom for the present and future. Through the Smithsonian project, implementing a website that showcases facts about the Korean War and art pieces using my skills is crucial in imparting knowledge and facts to users.

STS Project: Introduction

Technology, some say, is the key to solving the problems that humanity must address. The challenges that humanity must address are numerous— the Earth's environment is an increasingly urgent matter as it is intricately connected with economics, society, and politics. In the modern era, we all rely on electricity and IT. But, when transmitting electricity, there is an energy loss due to resistance. According to the U.S. Energy Information Administration (EIA), about 5% of the electricity transmitted and distributed was lost in the United States from 2017 through 2021(U.S. Energy Information Administration, 2022). Addressing this loss is crucial, as the economic, environmental, and social benefits of resolving it will directly benefit humanity as a whole. Superconductivity, which exhibits zero electrical resistance and the expulsion of magnetic fields, is addressed as one of the key solutions to electricity transmission losses, furthermore, climate change or global warming might be a better word choice as the Earth’s environment has already been used.

Superconductivity sounds like a revolutionary technology, however, harnessing superconductivity requires many complex, expensive, and difficult processes and factors. This explains why superconductivity has not been commercialized yet. Primarily, conventional superconductors require critically low temperatures to operate, and maintaining these conditions consumes more energy than the amount of energy superconductors save. In this paper, I aim to discuss the potential applications of superconductivity and focus on a superconductor that works at room temperature (the superconductivity of LK-99 has not been verified yet, several attempts have resulted in failure), called LK-99, which was announced by Korea University (Lee, S. Korea University Research Team, 2023).

The SCOT theory will be used to analyze how various social groups perceive and interact with the potential implementation of room-temperature superconductors like LK–99 (Bijker, Wiebe E., 2015). In this paper, the SCOT framework provides a lens to view the diverse interpretations and responses to the environment that different social groups have regarding the commercialization of LK-99, or room-temperature superconductors. The main tenets of SCOT are the relevant social groups, interpretive flexibility, problems and conflicts, and closure and stabilization. This framing helps to analyze and understand the development of technologies and societal progress. The paper will analyze or compare how different social groups perceive the application of superconductivity to the Earth's environment, thereby offering a comprehensive view that connects the gap between technical potential and societal reception.

Room-Temperature Superconductors: LK-99 and its applicants to the global energy challenges

In the movie Avatar, by 2129, Earth's ecosystem was destroyed entirely due to overdevelopment, deforestation, and overfishing (Cameron, 2009). Humans continued the wars to steal resources, and the main character Jake Sully participated in the war due to the energy crisis and became paralyzed from the waist down. Humans began to look for resources outside of Earth, but the resources on the Moon and Mars were insufficient, so they ventured outside the solar system. They discovered Pandora planet in the Alpha Centauri system, located 4.37 light-years away from Earth. On Pandora, there lived the highly intelligent Na'vi tribe, and humans discovered the room-temperature superconductor "unobtanium." (Avatar Wiki, n.d.) The movie Avatar is set around the premise of Earth's energy crisis and the pursuit of this unobtanium, a superconductive element.

To understand room-temperature superconductors, it is essential to first understand the concepts of electric conductivity and electrical resistance. Electric conductivity is a measure of

how well a material allows electricity to flow through it, while electrical resistance indicates how much a material, a conductor, opposes or resists the flow of electricity (Wikimedia Foundation, 2023). As we can feel wind resistance when we drive a car forward, similarly, resistance occurs when electricity moves from point A to point B. It generates heat based on the amount of resistance, unlike the wind resistance from the example above. This explains why electronic appliances heat up during use, and this heat generation represents a loss of energy reducing the efficiency of electrical transmission.

A superconductor is a material that exhibits no electrical resistance and has no energy loss due to heat. This means that the electric transmission using a wire made of Unobtanium, or superconductive material, all the units of electricity will reach the destinate point without any loss. This is a significant advantage over traditional conductors. Additionally, superconductors display a phenomenon called the Meissner effect. The Meissner effect means that in the presence of a magnetic field, a superconductor will repel 100% of that field, demonstrating perfect diamagnetism. It can completely oppose the magnetic force, allowing it to float above a magnet. This implies the potential applications in transportation or construction that were shown in the SF movie.

Room-temperature superconductors refer to materials that can exhibit these superconducting properties at temperatures above 0 degrees Celsius (Castelvecchi, D., 2023). This is a significant breakthrough because, historically, superconductors required extremely cold temperatures to function. These cold conditions were energy-intensive and costly to maintain, which limited the practical applications of superconductors. However, in July 2023, a team from Korea University announced the discovery of a potential room-temperature superconductor called LK-99 (Lee, S. Korea University Research Team, 2023). This is the first

room-temperature superconductor in the world. But subsequent research and replication attempts disproved that LK-99 did not maintain superconducting properties at room temperature (Harris, M., 2023). Despite this, as the potential of room-temperature superconductors becomes more apparent, the possibility of solving societal problems remains evident.

The development and commercialization of room-temperature superconductors will bring many benefits to humanity, including solving energy problems and offering transformative solutions to many of society's energy challenges. With no electrical resistance, the efficiency of transferring electricity is 100% thus maximizing energy efficiency. In the energy sector, room-temperature superconductors could revolutionize how we transmit and use electricity. Currently, traditional copper wires lose 4-5% of electricity as heat during transmission due to resistance. In the US alone, approximately $20 billion worth of electricity is lost during transmission each year (Chen, 2018). If we switch from traditional copper wires to superconductor wires, not only will we save energy and money, but the thickness of the superconductor cable will be about 1/3 of the copper, making it lighter and allowing more efficient use of underground space (Wikimedia Foundation, 2023b).

STS Theory: SCOT Framework

With the Social Construction of Technology (SCOT) framework, this section aims to examine the interrelationship between society and technology (Bijker, Wiebe E., 2015). In the context of superconductivity and its potential role in optimizing energy uses among other prevalent use cases, the SCOT framework becomes particularly relevant. Room-temperature superconductivity presents a paradigm shift in energy transmission and involves various social groups, including energy companies, governments, environmentalists, and the general public.

Energy companies, for instance, might view the commercialization of room-temperature superconductors as a lucrative business opportunity. With the superconductive material technology being developed, large corporations will be presented with the potential for increased energy efficiency and reduced transmission losses. Not only would several businesses bloom out of production for this technology, but existing energy companies would be positively affected by superconductivity.

Another large stakeholder in the emergence of this technology would be the government. There are several ways that the government would be affected by the invention of room-temperature superconductivity. In order for everyone to benefit from this technology, there would have to be global cooperation between governments to make this available to the general public. This also allows the government to use this product within militaristic developments as it could prove very useful in the implementation of tools that the military directly utilizes (U.S. Code, n.d.). However, as with any emerging technology, the government must process specific policies and regulations to discourage any malicious intent with the products that are being created utilizing superconductivity.

On the other hand, environmentalists would likely attribute superconductivity as a vital solution to climate change, as it will play a significant role in reducing energy wastage and our carbon footprint. A decrease in wasted energy means that there is a more optimal use of natural energy sources which could lessen environmental degradation. An environmentalist would undoubtedly be in support of such effects if there are no particularly negative outcomes to the environment.

Meanwhile, consumers, ever-conscious of their monthly expenses, might perceive superconductivity as a means to reduce their energy bills, given the promise of efficient

electricity transmission, getting higher quality products while decreasing their costs. Each of these stakeholders interacts with and influences the room temperature superconductor based on their unique perceptions, needs, and expectations; shaping its development and societal acceptance.

Conclusion

In the realm of technological advancements, room-temperature superconductivity may offer various solutions to problems that the world has faced. Especially in the energy paradigms, this technology is considered a vital step to achieving a new era of energy efficiency that can address both economic and environmental challenges. Contrasting these benefits, the results of LK-99 refutation led modern society to recognize it as a mirage or illusion. However, I personally think it is too early to validate the consensus of LK-99 disproof with limited test cases and research.

Although this paper mentioned the current facts about room-temperature superconductors and it is yet inapplicable, the application of the SCOT framework amplifies the understanding of the broader implications of such technological development. For a fair perspective and to deliver the facts, this paper has mentioned that the facts of LK-99 remain as disproven. However, the publication of the technology opened another possibility and provided an opportunity to view the technology of room temperature superconductors positively through the perceptions of other stakeholders with using the SCOT framework. While time is the only key to revealing the facts about LK-99, the essence of this paper emphasizes the potential and applications of this technology.

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