DESIGN OF COST-EFFECTIVE AND ACCURATE LASER CUTTER

USING AUTONOMOUS ELECTRIC VEHICLES TO PROMOTE SUSTAINABILITY

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A SOCIOTECHNICAL SYNTHESIS

Climate change and production of carbon emissions has reached an alarming level in the past decade, with many nations declaring the issue a global emergency. The STS research explores how sustainability can be improved in the field of transportation. Implementing autonomous electric vehicles would greatly reduce overall carbon emissions from the current state of fuel combustion vehicles. The technical project seeks to promote sustainability in the field of solid waste by means of designing an affordable, highly efficient laser cutter. Both the technical research and the STS research attempt to promote sustainable efforts, albeit through different avenues.

Solid waste management has become one of the most critical environmental challenges of the modern age and has negatively impacted climate change, particularly in the field of engineering. A laser cutter with high precision and accuracy yields very little waste as material can be reused multiple times until the waste generation is minimal. Unfortunately, this technology tends to be very expensive and not readily available for average companies.

For the technical project, existing laser cutter products on the market were surveyed and using this data, the design parameters were chosen. Consequently, high precision, accuracy, and affordability is maintained to present a more sustainable product that is not readily available on the market. After completing the marketing survey, design parameters such as cost, resolution, focal length, and tube power were agreed upon. The resolution and focal length correspond to the accuracy of the laser, with the former defined as how many dots can be lined up in an inch without overlapping and the latter a measure of the cutting performance of the laser.

The STS research aims to combat climate change in transportation as the industry is largely responsible for the pure volume of carbon emission produced globally. The transportation industry is uniquely positioned to enact meaningful change because of the sheer size and impact of the field, thus allowing sustainable practices on a large scale and causing a significant impact that small scale practices simply cannot. The STS paper specifically observes how autonomous electric vehicles can provide a potential solution to fight climate change on a grand level. Extensive research was done to discover the complications surrounding the technology and how these issues could be resolved. Furthermore, through the exploration of surveys and scientific journals, the societal benefits of implanting autonomous vehicles are also investigated.

Introducing autonomous fleets of electric vehicles would provide a direct path to overcoming the automobile industry's carbon emissions as personal vehicle travel would be exponentially reduced. Researched data shows that autonomous vehicles decrease fuel consumption and vehicle ownership, while also presenting benefits on a societal level. In addition to environmental sustainability, autonomy can also lead to a dramatic increase in social sustainability such as fair labor practices, social equity, and satisfactory health and safety conditions. The technology presents several complications including the public skepticism towards autonomy from an economic perspective, the complicated process of achieving free flow transportation with little to no accidents, and the political polarization and subsequent political gridlock that often occurs when discussing issues considering sustainability. These concerns can be alleviated by implementing the autonomous technology in a gradual manner to gain the trust of the public at large. Transferring to complete electrification in the automobile industry should be the first step.

The loosely coupled technical and STS research both seek to promote environmental sustainability. While a universal solution to fight climate change is difficult to achieve, given the proper time and resources, the technical and STS research can mark a monumental step towards waste prevention.

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