DynaCap: A Dynamic Wheel Cover System for Improving the Range and Performance While Reducing CO2 Emissions from Automobiles

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Climate change continues to worsen through greenhouse gasses as up to 40 billion tons of gasses will be in the atmosphere by the end of 2023. With a fourth of those emissions coming from gas-powered passenger vehicles specifically, a dynamic, accessible wheel cap system was developed in order to increase the vehicle's range and reduce its CO2 emissions. When the vehicle's brakes heat, the system autonomously opens based on temperature to allow for cooling. To demonstrate this system, a proof of concept model was developed using a custom CAD wheel cap moved by a contact free pushing mechanism created through repelling neodymium magnets. A thermistor and servo motor circuit was connected to a microcontroller and was programmed to rotate the servo motor once the thermistor reading exceeded an established threshold. The system was tested for its contribution to reducing the vehicle's fuel consumption and its accuracy in opening the wheel cap for cooling, which was conducted through simulations based on previous data comparing the fuel consumption of vehicles with different drag coefficients. The system was able to successfully and instantaneously respond to a temperature spikes through maximized brake cooling, and the wheel cap itself was able to provide a 10.17% decrease in fuel consumption during the average driving speed, resulting in potentially saving 123.8 million metric tons of CO2 annually and 6.3 billion dollars in CO2 damages if nationally applied. Overall, the system was an accessible solution, maintaining vehicle functionality while reducing its carbon footprint.

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