EVERSE: Electric Vehicle Energy Recovery and Safety Enhancement

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In the U.S., semi-trucks on average travel about 140B miles, often over hilly terrain,annually producing 1.34B metric-tons of CO2, as well as diesel-fumes, which the IARC links to cancer. Electric trucks are environmentally-friendly alternatives, but safety and driving range improvements are necessary to be competitive in today's markets. The Electric Vehicle Energy Recovery and Safety Enhancement System (EVERSE) was engineered as a proposed solution. The prototype harvests kinetic energy from an EV descending an incline, converting it to electrical energy using a 3-Phase AC induction motor, charging the vehicle's battery while excess energy is stored in a capacitor bank, providing improved power production potential. PIDs regulate energy flow to the battery using PWM and manage a reverse engineered speed controller, both methods controlling vehicle descent, preventing runaway vehicle accidents. A gyroscope automatically activated incline harvesting unlike regenerative braking requiring error-prone driver input. Over 236 system functionality/behavioral experiments were undertaken and data mathematically modelled including parametrization of kinematic forces acting on the vehicle, model-conformity established, and prototype system validated using MATLAB simulations of system operation. Maximum power recovered for prototype was 4.43W, to be scaled up to a full scale truck. Energy Recovery and Speed Control systems were further validated with empirical data collected on varied angles on a testing ramp, varying PID gains.The engineered prototype successfully demonstrates novel use of combined features of EVERSE technology that offers industry improved safety and energy sustainability, using a capacitor bank and an incline power-recovery system, useful for transport trucks.

Awards Won:

Fourth Award of $500

International Council on Systems Engineering - INCOSE: Certificate of Honorable Mention