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Design of speed controller for EV using MATLAB Stimulation

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Abstract - Electric vehicles (EVs) are projected to become a future alternative energy source of transportation due to their shown capacity to minimize the use of petroleum-based and other high CO2 emitting transportation fuels. The components of the BEVs system were described in this work, and a BEV model was simulated using the MATLAB-Simulink platform. In addition, the relevant electrical system components were identified, as well as their associated equations for verification. This study lays the groundwork for future investigation.

***Key Words*:** Electric Vehicles, MATLAB, Simulink Platform.

1.INTRODUCTION

Thomas Parker created the first electric car in 1884, 25 years after lead-acid batteries were invented. Many electric car models appeared after that date. Electric vehicles, on the other hand, have fallen behind due to advancements in internal combustion engine technology and lower mass manufacturing costs. Between 1970 and 1980, an energy crisis propelled electric vehicles back to the forefront. However, they were unable to achieve the high speeds and vast ranges achieved by conventional vehicles. As a result, adequate technological development was not possible.

Many firms have created electric automobiles up until now. These vehicles, however, have a limited range and cannot go at high speeds. Longer-distance vehicles have become possible because to advancements in electric motor and battery technology. The influence of different gearboxes on energy usage has been explored by T. HOFMAN and C.H.DAI. Fixed gear has been used to explore the powertrain system.

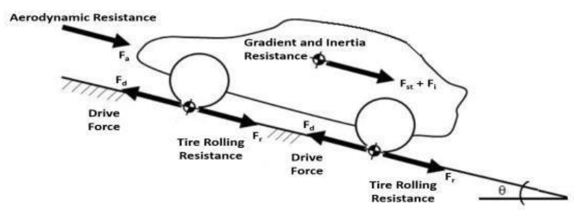
system, manual transmission, and CVT transmission .Consumption of energy (kWh) A. Kerem, as the world's electric car technology advances, interest in electric automobiles will grow. This demonstrates that pollution will be reduced and reliance will be reduced the amount of money spent on gasoline will drop .MATLAB/Simulink. The battery in this variant is 30 kWh. This In the city, a vehicle consumes 0.58 kWh/100km and 0.44 kWh/100km. Outside of the city, kWh/100km. The vehicle's maximum range is 500 kilometers. An electric car was created and modeled by E. Schaltz. This a car consumes.

2. PROPOSED WORK SIMULINK MODEL

Modeling of Electric Vehicles (A) (EV) We created an electric vehicle with four-wheel drive. vehicle. The front half has wheels, and the back portion has one. The other two are positioned in the back. Both front and back an induction motor drives the wheels, and with the help of an inverter controller, a synchronous motor can be controlled. circuit. The vehicle's body is mounted on the vehicle's four wheels. Drive using basic environmental conditions such as wind, throttle and inclined Prior to beginning the modeling of We've completed the four-wheel electric vehicle drive train the vehicle body's parameters and behavior on the outside we used a synchronous motor with a controller on the wheel side connected to the voltage source of the battery Circuit of an inverter applied to the controller in order to deliver a suitable amount.

Longitudinal Dynamics of Vehicles Some equations are used to assess the longitudinal nature of electric cars. Vehicles that run on electricity model based on the forces of motion resistance, similar to an Rolling and climbing resistance, as well as aerodynamic drag the speed of the vehicle The rolling resistance (is that a phrase?) is a term used to describe the amount of resistance This has something to do with the energy losses caused by tire deformation and contact area adhesion When moving at a low speed, the rolling computed resistance represents the function's weight, and is the speed of the rubber tire multiplied by the rolling coefficients The physical qualities of the tire are resistance. Other factors to consider are aerodynamic drag, which is estimated to be is the air density, which is defined in equation. The vehicle's frontal area is reflected in the resistance force. Depicts the heaviness

As a result of the evaluation, permanent magnet synchronous motor is considered to be suitable for the model. For this reason, technical specifications of the MOTIVE MV255 electric motor of TM4 have been used in our model.



3. RESULT

Depicts the planned EV prototype structure, which consists of independently operated front and rear wheels. Systems with four wheels to improve driving performance and keeping the expected torque and speed conditions in an EV is a challenge. In a MATLAB/Simulink environment, it was proven. Previously, stated, to improve traffic steering ability congestion and the need for effectively generated electricity Low-speed permanent-magnet synchronous torque in the front drive system, a permanent magnet synchronous motor (PMSM) is used. To preserve driving torque in high-speed, overload situations in the rear drive system, the induction motor (IM) operates under certain conditions preferred These motors have a straight rotor connected with a differential gear for each, and with the help of these the generated motor driving torques are delivered through gears to the corresponding wheel the simulation results from both the controlling and non-controlling phases, i.e.

with and without WOA optimization, were studied to show the viability of the suggested electric vehicle (EV) drive system model the electric vehicle's speed and torque are controlled. through the distribution of torque in the front and rear wheels the following running modes can help you get around.

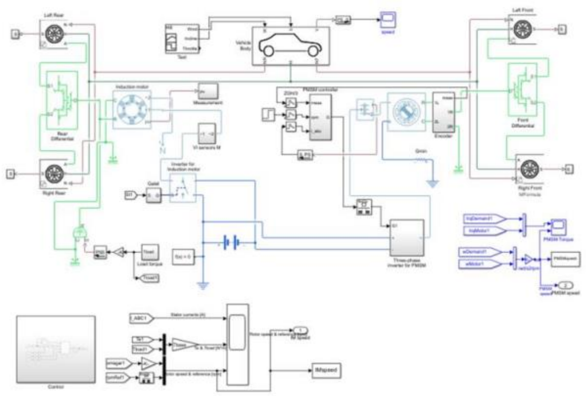


Fig. 1 Proposed EV wheel drive system Simulink model

This mode emerges when the key linked to the battery source is turned on, and the front and rear wheel drive motors receive power and begin to operate. The EV then begins to accelerate, with the reference torque generated by the accelerator being transmitted to the rear-wheel-drive system.

It switches to normal mode operation instantly after sensing the rotor position, and this is distributed favorably to the front drive system. The speed of an un-optimized and a WOA-optimized front-wheel-drive system is compared in Figure Because we are using standard PI controllers in this phase, the un-optimized speed is oscillating to its reference speed in this picture. This can lead to shaky steering and seeding operations, and a lot of effort is expended as a result.

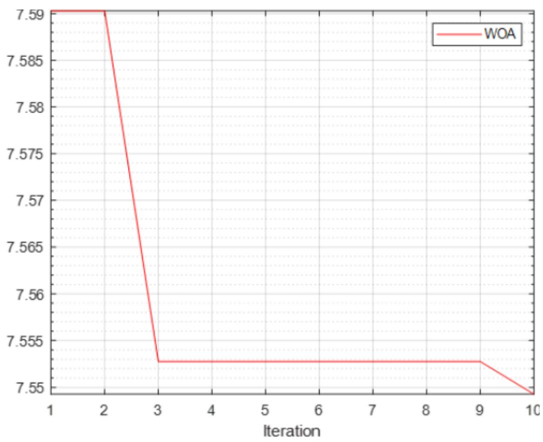


Fig. Optimizer convergence curve

The generated reference torque is primarily transmitted to the front wheel drives during this period, resulting in steering stability on bad roads. Furthermore, torque distribution in the rear wheels is done in such a way that the rear wheels are always in sync with the front wheel drive systems' speed. Figures 8 and 9 show that during normal running conditions, the speed of both the front and rear wheels stabilizes around 1600 rpm. The synchronization between these wheel drive systems is also plainly visible.

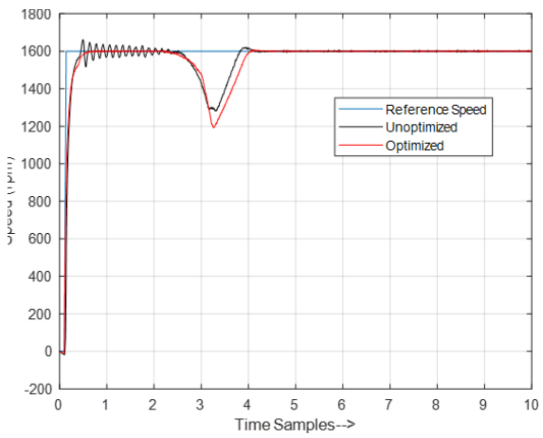


Fig. Front wheel drive speed

4. CONCLUSIONS

The proposed EV wheel drive system increases EV performance by providing individual front and rear control stability of torque and speed, steering ability, drivability, and Low-speed and high-speed operations are both safe. In addition, the wheel drive systems were designed in such a way that they could move above the ground the stated EV performance standards were met in a greater number of cases. Efficiently. The drive systems work well as well. Synced in such a way that, in the event of an undesirable event, Front-wheel-drive torque is created under certain conditions. Proved insufficient to drive the electric vehicle at the specified speeds same time rear wheel drive system gives the adequate torque to the electric vehicle First and foremost, this synchronization is addressed in this study.

The drive system is controlled and monitored by PI controllers that haven't been optimized. Then, later the simulation results also suggest that using optimization over PI controllers is useful. EV system that has been optimized in both beginning and stopping, the model maintains a constant speed and torque. In regular running mode, everything happens swiftly. In addition, the as a result of WOA optimization, the results are quite accurate. against non-optimized controls as a result, the implementation the presence of WOA in the EV wheel drive control system has been discovered successful.

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