Power Management Strategy designing for Plug_in Hybrid Electric Vehicles with the goal of energy consumption and emission reduction

Abstract:

Proper vehicle components designing and control strategy are two important parameters for the plug_in hybrid electric vehicles (PHEVs) success. An appropriate power management strategy can increase the system efficiency without sacrificing the vehicle performances. Consequently, these strategies can have suitable effects on the fuel consumption and emissions. In fact, the PHEVs have many advantages in comparison with conventional vehicles. However, these advantages are largely dependent on the power management strategy. Usually, manufacturing of PHEVs are more expensive than HEVs, and they can use energy of an external electric source. Therefore, the design of power management strategy for PHEVs is more important and complicated than HEVs. In a PHEV, the batteries stored energy should be discharged before the end of the trip. The power management strategy of a PHEV has one more mode than a HEV's control strategy. Therefore, considering the charge depletion mode complicates the power management strategy. In this thesis, different strategies are studied. Then two strategies for fuel consumption reduction and one strategy for simultaneous fuel consumption and emissions reduction are proposed for parallel PHEVs. These strategies have simple mathematics, and they are practical. Moreover, to increase the system efficiency, the driver behavior and driving cycle conditions are considered by using the previous driving information by using tools such as GPS. The proposed strategy can adapt itself for different driving patterns. So, the efficiency of the system is increased and the total fuel consumption is decreased. Finally, the proposed strategies and two other comparative strategies are simulated for different urban, highway and combined driving cycles. The proposed strategies cause considerable fuel consumption and emission reduction that is confirmed by the simulation results.