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A Short Commentary on Different Energy Management Strategies for Complex Hybrid Electric Vehicles

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Commentary

The overall performance of Hybrid Electric Vehicles (HEVs) is strongly stricken by their powertrain control techniques, especially while complex architectures are concerned. Therefore the purpose of this paper is to analyse, through numerical simulation, distinct methodologies to increase an energy management strategy aiming to minimize the overall CO2 emissions of the vehicle. In order to perform a complete comparison, distinct optimization algorithms had been decided on a number of the available solutions in the control theory. Foremost a global optimization method, the Dynamic Programming (DP), turned into used to benchmark the performance of the energy management systems. Then a local optimization strategy, the Equivalent Consumption Minimization Strategy (ECMS), was evaluated, to prove its suboptimal overall performance and to assess the opportunity to be applied on an actual Engine Control Unit (ECU). Finally, the potential of heuristic control strategies turned into evaluated because of their low computational requirements and due to the fact they constitute the most common answer in actual applications. The analysis focused at the case study architecture of the Chevrolet Volt, for which a Simulink version turned into constructed and examined on each regulatory using cycles and actual world using conditions, emphasizing pro and cons of every method.

Faced with environmental problems because of fossil fuel burning in the business and transportation sectors, innovations toward purifier solutions to update the ever diminishing fossil fuels had been the focal point of not only researchers however governments all over the world. The hybrid electric vehicle (HEV) technology is the end result of the preference to have vehicles with a better gasoline economic system and lower tailpipe emissions to satisfy the necessities of environmental policies in addition to take in the effect of growing fuel prices. The objectives are met with the aid of using combining a conventional internal combustion engine (ICE) with one or extra electric powered cars powered with the aid of using a battery % that may be charged using an on-board generator and the regenerative braking era to energy the transmission. The assignment is to increase an efficient energy management method (EMS) to meet the objectives even as now no longer having a discounted car overall performance. In this paper, EMSs which are proposed and advanced with inside the current years are revisited and reviewed. Additionally, the Plug-in HEV is mentioned in a brand new attitude from the EMS factor of view. The thru-the-road (TtR) HEV with in-wheel cars (IWM) is a reasonably new concept in the HEV design that functions much less complex configuration with decreased hardware necessities and decrease price. Recent studies findings are evaluated in the course of this paper main to a hypothetical TtR HEV materialization. A thorough dialogue is made encompassing the blessings and drawbacks of the idea, its overall performance in comparison to traditional HEVs and the manner forward.

Generally, hybrid powertrain control techniques may be categorized into the subsequent 3 categories

Global optimization strategies: (with full a-priori knowledge), wherein the dynamic nature of the machine is taken into consideration for optimization and an ultimate answer is determined over a predefined using cycle, which need to be recognised a-priori. For this reason, and for the excessive computational attempt requested, those strategies can only be used for benchmarking, and to advantage insights for the development of less complicated and implementable techniques, as in the present work.

Local optimization techniques: wherein the hassle of the energy management optimization is translated into the instant minimization of a pre-described price function, contemplating each the engine fuel intake and using the electrical energy stored into the battery.

Heuristic strategies: This might be primarily based totally on a set of rules, aiming to keep the inner combustion engine working situations within the region with maximum efficiencies. These are the maximum common techniques since way to their low computational necessities they may be easily implemented in an Engine Control Unit (ECU).

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