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Development of a Plug-In Hybrid Powertrain System with Double Continuously Variable Transmissions

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Abstract : This study developed a plug-in hybrid powertrain system which consisted of two continuous variable transmissions. By matching between the engine, motor, generator, and dual continuous variable transmissions, this integrated power system can take advantages of the components. The hybrid vehicle can be driven by the internal combustion engine, or electric motor alone, or by these two power sources together when the vehicle is driven in hard acceleration or high load. The energy management of this integrated hybrid system controls the power systems based on rule-based control strategy to achieve better fuel economy. When the vehicle driving power demand is low, the internal combustion engine is operating in the low efficiency region, so the internal combustion engine is shut down, and the vehicle is driven by motor only. When the vehicle driving power demand is high, internal combustion engine would operate in the high efficiency region; then the vehicle could be driven by internal combustion engine. This strategy would operate internal combustion engine only in optimal efficiency region to improve the fuel economy. In this research, the vehicle simulation model was built in MATLAB/ Simulink environment. The analysis results showed that the power coupled efficiency of the hybrid powertrain system with dual continuous variable transmissions was better than that of the Honda hybrid system on the market.

Keywords : plug-in hybrid power system, fuel economy, performance, continuously variable transmission
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