

Energy management strategy for a parallel hybrid electric vehicle equipped with a battery/ultra-capacitor hybrid energy storage system

搭载电池/超级电容混合储能系统的并联式混合动力汽车能量管理策略

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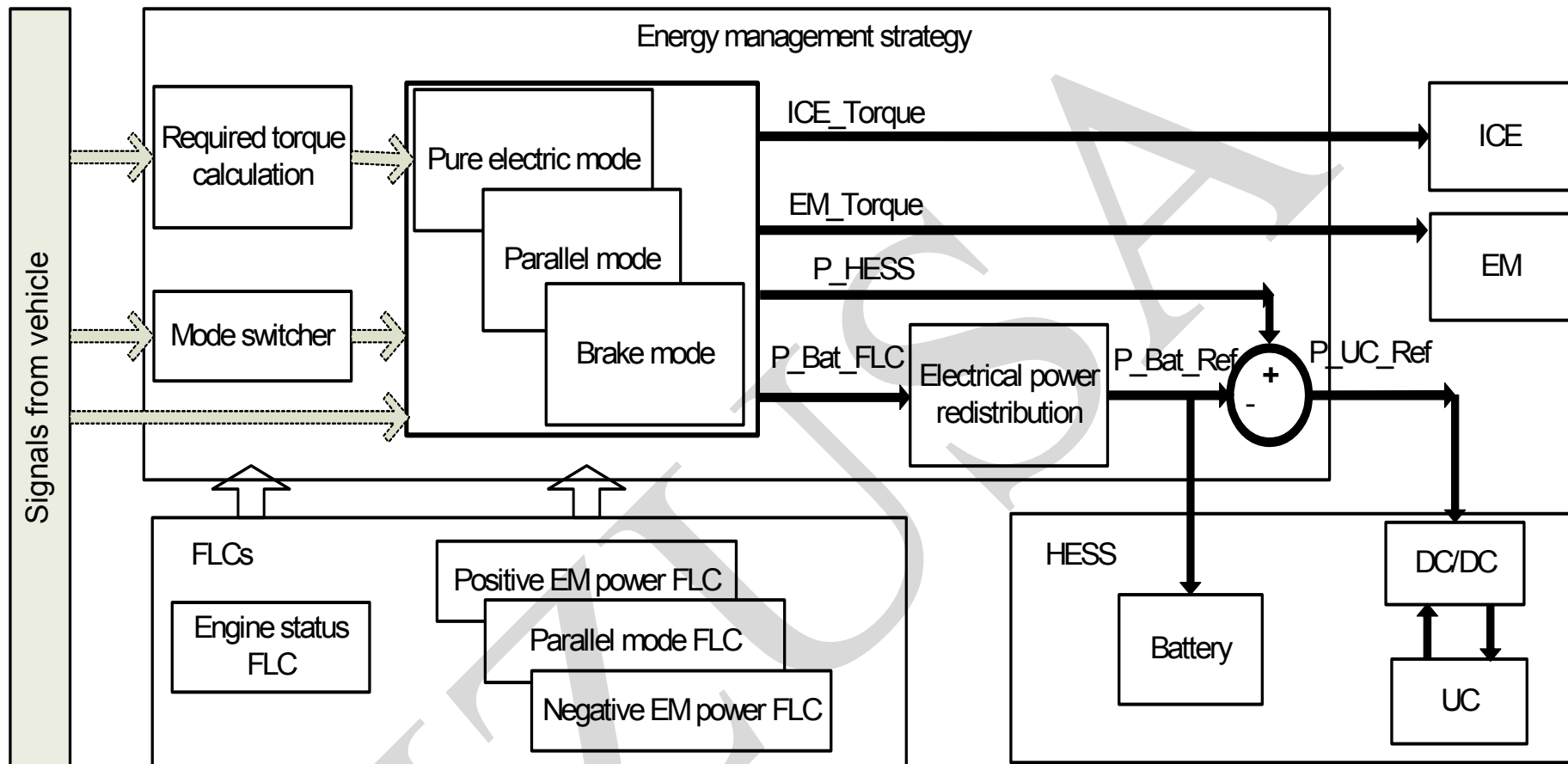


Fig. 1 EMS topology

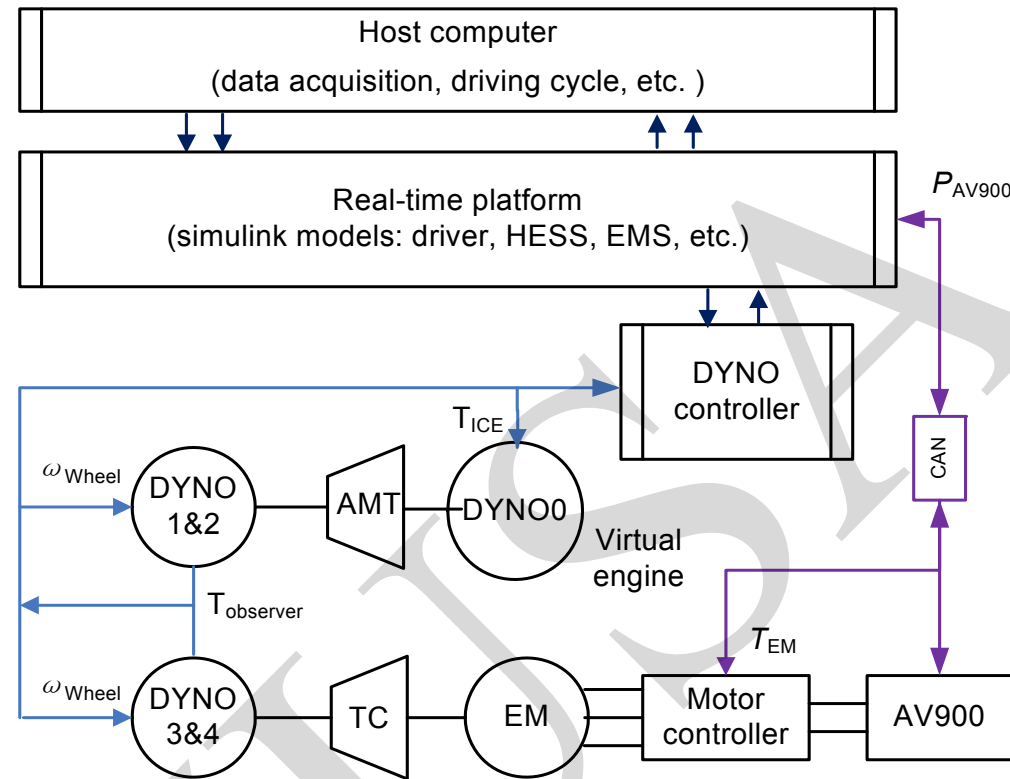


Fig. 2 Topology of the dynamometer power train system

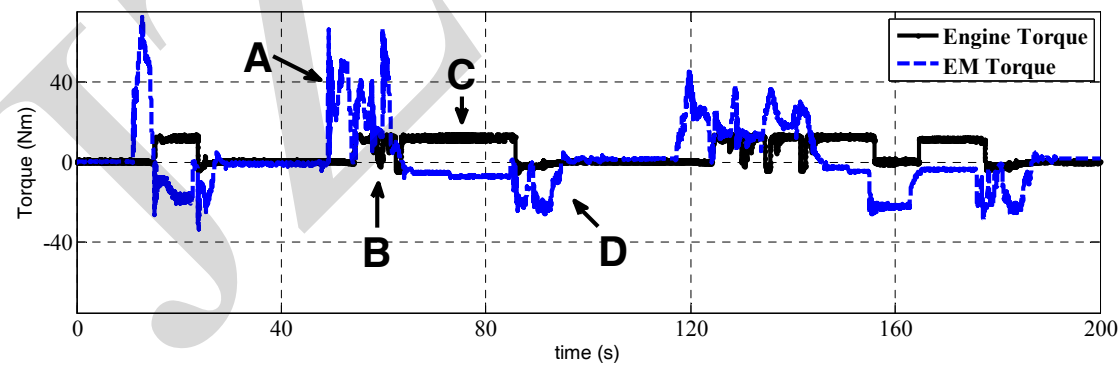


Fig. 3 Torque distribution and mode transition under ECE driving cycle

Table 1 HESS energy efficiency result

ESS type	BSOC		UC voltage		Energy consumption (Wh)	UC energy consumption (Wh)	Total energy consumption (Wh)	Energy efficiency improvement (%)
	Initial (%)	Final (%)	Initial (%)	Final (%)				
Battery only	70	67.21	—	—	80.82	—	80.82	—
HESS	70	67.52	45.6	41.76	71.90	5.76	77.66	3.91

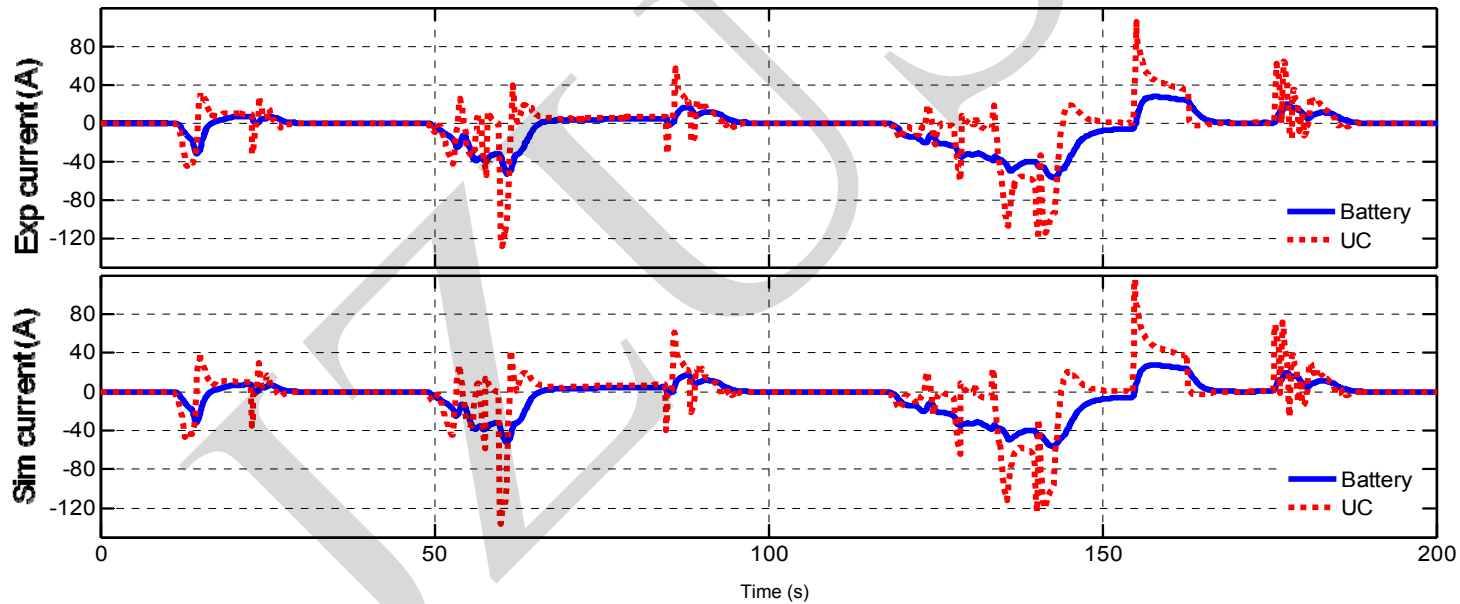


Fig. 4 Current of battery/UC under ECE driving cycle
 (a) Experimental current; (b) Simulation current