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***Abstract*—Abstract is here.**

***Index Terms*—keywords.**

I. Introduction

INTRODUCTION is here.

II. Powertrain Modeling and Energy Management Problem

A. System Modeling

The structure of the parallel HEV powertrain is shown in Fig 1 and the specific parameters are listed in Table I.

The backward simulation process is used to study the EMS. By analyzing the longitudinal dynamics, the tractive force is defined as follows:

The fuel consumption and emission model of the engine and the efficiency model of the motor are modeled by static MAPs, as shown in Fig 2.

Through the torque and speed, the instantaneous value of fuel consumption, carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO_x), and motor efficiency can be obtained as:

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LIST OF FIGURES

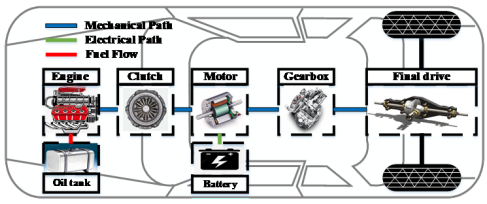
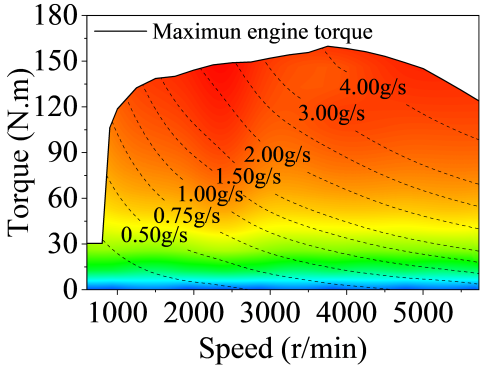
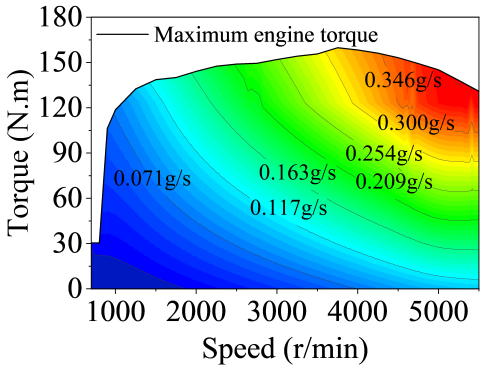


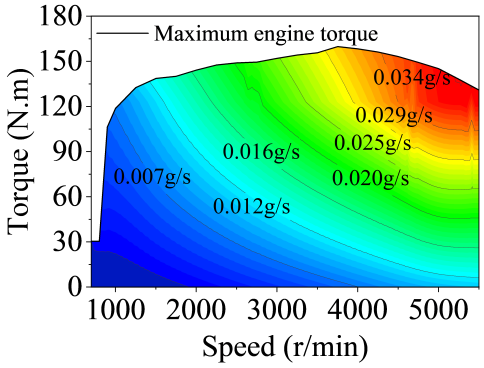
Fig. 1. The powertrain of the parallel HEV.



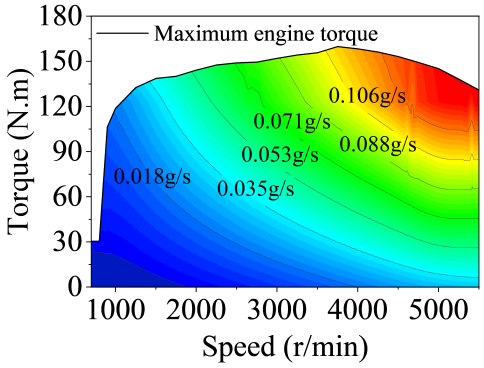
(a) Fuel consumption



(b) CO emission



(c) HC emission



(d) NO_x emission

Fig. 2. Fuel consumption and emission maps.

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TABLE I
PARAMETERS OF THE PARALLEL HEV

symbol	parameters	values
m	Curb weight	$1700kg$
A	Fronted area	$2.64m^2$
C_D	Aerodynamic coefficient	0.25
f	Rolling resistance coefficient	0.013
R	Tire radius	$0.3014m$
η_T	Transmission efficiency	0.9
Q_b	Battery capacity	$45Ah$
i_g	Automatic mechanical transmission gear ratio (AMT)	$2.563/1.552/1.002/0.72/0.52$
i_0	Final gear-ratio	4.438