

SIMPLIFIED PARALLEL HYBRID VEHICLE

Yong-San Yoon

KAIST
Daejeon, Korea
(ysyoon@kaist.edu)

ABSTRACT

In the parallel hybrid vehicles, a planetary or differential gear system is used to merge powers from different sources and differential gears to split the merged power into two wheels. In this study, the author is presenting several mechanical devices that can replace the conventional planetary and differential gear systems saving parts, weight and space. Also, the author is proposing a new clutchless transmission for the parallel hybrid vehicle to save weight and fuel.

I. INTRODUCTION

There are two kinds of hybrid vehicles: Parallel and serial. In a parallel hybrid, the electric motor and the internal combustion engine can both individually or together power the vehicle while the series-hybrid vehicles are driven only by the electric motors. In this study, the author is going to present a new drive train for the parallel hybrid vehicle with simplified power merge/split device and clutchless transmission.

II. DUAL DIFFERENTIAL MECHANISM

The planetary gear system can be regarded as a special case of the differential gear system: The planetary gear system is two dimensional while the differential gear system is a three dimensional spherical mechanism that is more general. They have both 2 degrees of freedom that they may merge two input powers into one or vice versa. Thus, the differential gear system here is to represent either the planetary gear system or the conventional differential gear system.

In a conventional hybrid car, two differential gear systems are used, one for power merge, and the other for power split into two wheels. However, we may merge these two differential gear systems into one to make a 3-DOF mechanism named as dual differential mechanism. This new mechanism has two independent inputs and two outputs. The author developed 7 different kinds of dual differential mechanisms which may save parts, weight, and energy loss.

III. ENERGY EFFICIENT TRANSMISSION

There are several kinds of transmission systems for the hybrid vehicles. Most popular one is the continuously variable transmission used in Toyota, Honda, Ford, etc. Hyundai is suggesting a geared system with clutch for its hybrid¹ for the improved gas mileage in highway. Gray and Barba² patented a clutchless transmission using hydraulic drive.

Here, the author is proposing a more simplified automated manual transmission without clutch by utilizing the installed differential gear system to save weight and energy.

REFERENCES

1. Cho S, et al, "Power train for a hybrid electric vehicle with automated manual transmission," Korean patent 100951967, 2010.
2. Gray Jr, Barba D, "Vehicle drive-train including a clutchless transmission, and method of operation," US patent 7252020, 2007.