Dynamics Study of Plug-In Hybrid Vehicles Using PSAT
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Why PHEV?
- The transportation energy sector is reliant on fossil fuels
- Production of oil predicted to decline
- Recent advances in hybrid technologies have significantly increase vehicle efficiencies
- Hybridization allows a significant reduction in battery capacity
- Additional battery pack increases the use of renewable energy

Goals of this study
- Dynamics modeling of U of Manitoba PHEV vehicle
- Comparison of the model with experimental data
- Design of energy management control strategies for PHEVs
- Study the effects of battery size on improvement of total efficiency
- Find methods of studying the driving behavior on energy efficiency
- Study the methods of optimal use of renewable energy

Engine Operating Point
Power Split Speed
Engine ON/OFF
Engine Operating Point

Prius Battery Storage
Fuel Flow Rate
Battery Charging in Deceleration
Plug In Battery Current

Hardware
- Prius + HyMotion battery pack
- Kvaser Memorator
- OttoLink

Software
- PSAT
- MATLAB
- REVs
- PSCAD

Summary of Results
- PHEV model has a better fuel mileage compared to the baseline Prius vehicle model
- Adding the Plug In battery pack requires vehicle energy management modification for better efficiency
- Engine ON/OFF power threshold modification is required in Plug In version of Prius to work in efficient operating points
- Proper driving behavior of hybrid vehicles can reduce the gas mileage

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