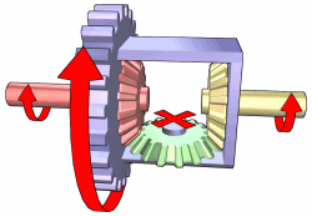
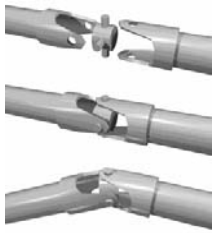
Hybrid Electric Vehicle Test Bed

Objective: to develop a small scale platform that simulates the working components of a hybrid electric vehicle (HEV). Through the design and construction of this platform, the typical components of a HEV are implemented on a lower power scale, simulating a real world system.

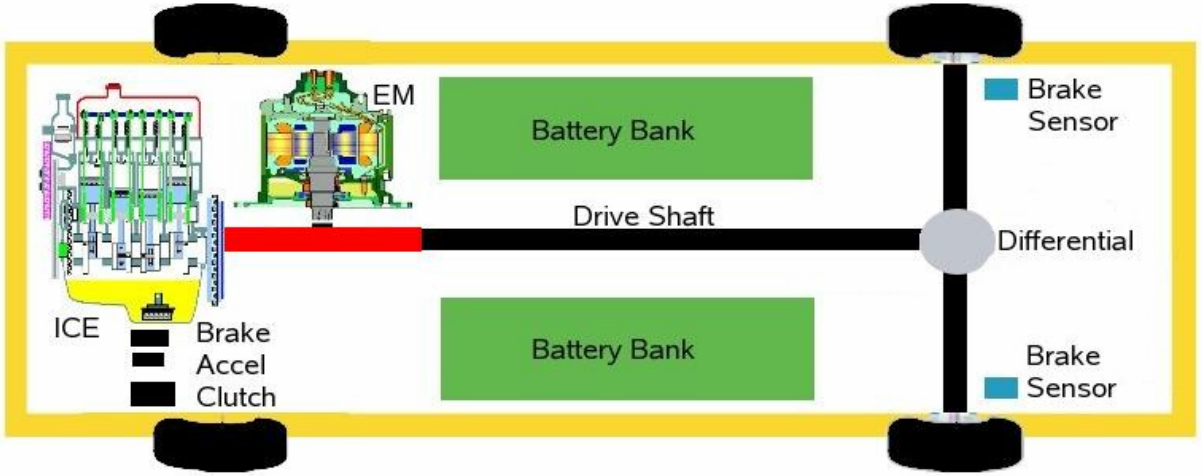
Test Bed: the testing platform (or "test bed") will take the form of a model HEV drive train, containing all essential components. This includes an electric motor to simulate an internal combustion engine, an electric machine to provide two way electrical-mechanical power transfer (for supplemental power delivery and regeneration), and the associated mechanical interfacing components between the two with the use of a planetary gear. At the present, preliminary designs have been completed (components sized and selected, requisite parameters established).



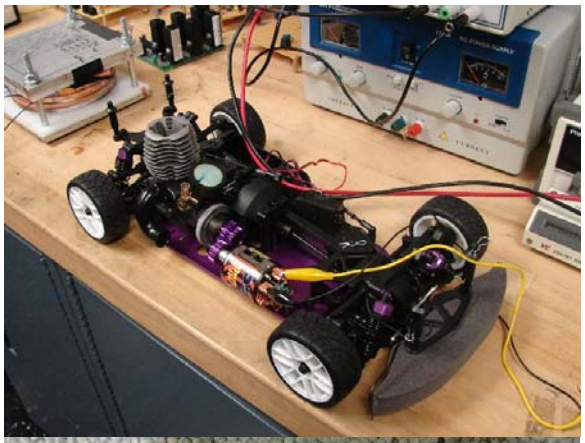
Planetary Gear



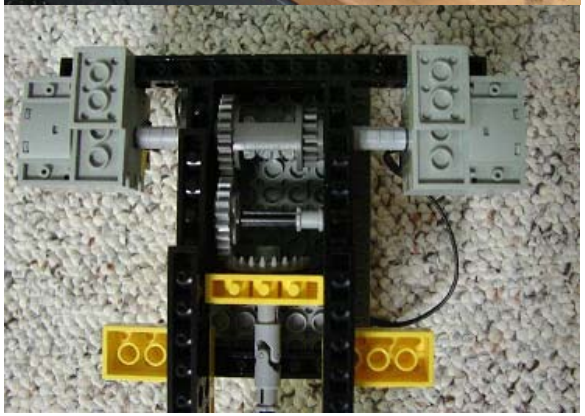
Drive Shaft



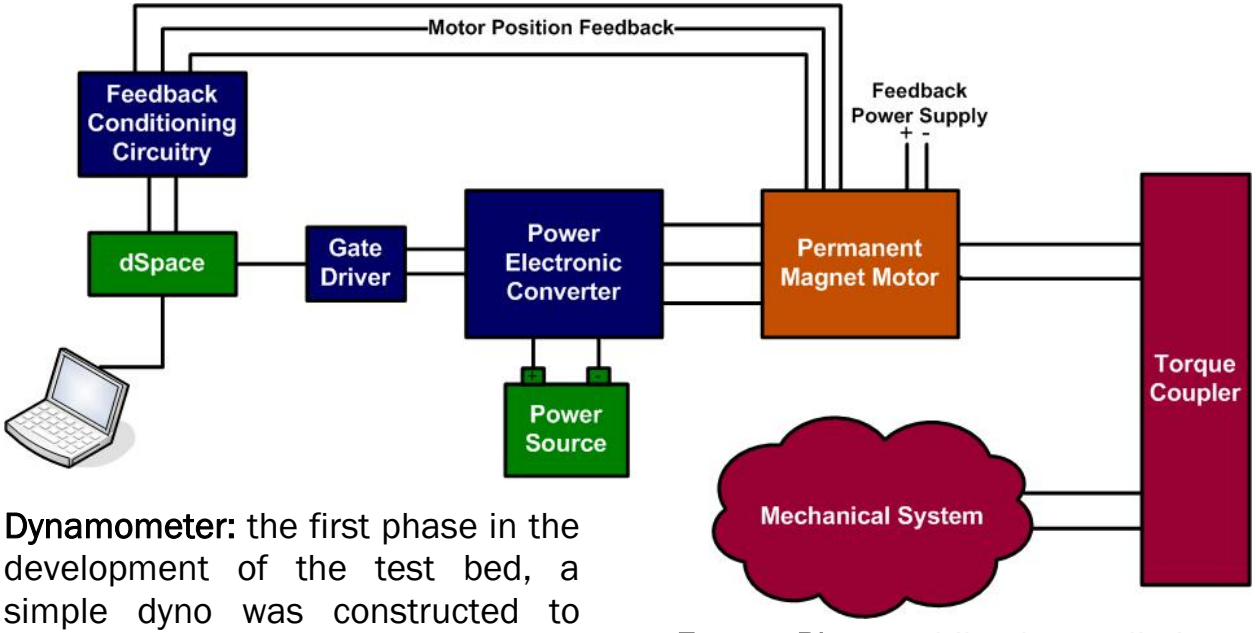
RC Model Car: demonstrates the hybrid concept on a very small scale. A typical model car using an internal combustion engine was modified to incorporate an electric motor. The model thereby employs a combined ICE/EM system to improve performance by increasing the total vehicle power and improving the instantaneous acceleration.



Lego Bus: also demonstrates the hybrid concept on a very small scale. It consists of two electric motors with one acting as the ICE and the other as the EM and generator, with both coupled together with a planetary gear. Also shows the concept of regenerative braking.

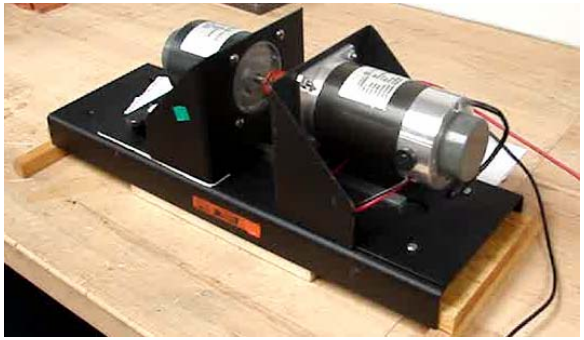


Dynamometer



Dynamometer: the first phase in the development of the test bed, a simple dyno was constructed to operate an electric motor under simple loading conditions. The dyno contains the intended drive motor for the test bed and its associated power electronic controller. This system interfaces with a computer through dSpace which is an interface package. The dyno also employs a load motor which applies running loads to the drive motor and a torque sensor. Through testing of the dyno, some of the mechanical and electrical problems are revealed to help with the construction of the final test bed (electronic control problems, mechanical vibrations, etc).

Future Plans: while the preliminary design for the test bed is complete, it remains to be built. The succeeding IPRO team should take the proposed design recommendations, the results obtained from the construction and testing of the dyno, and combine them together to develop a final test bed design.



IPRO 342: Hybrid Electric School Bus

Simulation, Design, and Implementation

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