To each driver the appropriate vehicle

January 3 2017

The data logger designed by the project group for New Drive Systems NAS in Karlsruhe is useful when developing new hybrid and electric vehicles, and also increases the efficiency of vehicle fleets. Credit: Fraunhofer ICT

Bringing mobility into Germany's transition to a new energy economy is a complex undertaking. While carmakers are developing more economical com- bustion engines and alternative drive systems, research establishments and companies are working on making more efficient use of vehicles. A new data logger developed by Fraunhofer researchers simultaneously collects data from vehicles with combustion engines, electric drives, external sensors, and location data, and permits the development of new hybrid and electric vehicles.

Our mobility is currently undergoing rapid change. Trends such as electromobility, autonomous driving, and car sharing are changing how we drive and opening up new markets for the future. Researchers from the New Drive Systems NAS project group at the Fraunhofer Institute for Chemical Technology ICT have designed a data logger that will make possible a new generation of cars that are tailored to individual drivers' requirements and driving behavior. The data logger provides insights into how vehicles are used. Once installed in a car, it records all the relevant operational data from the journeys the car makes over a period of several weeks or months. This helps researchers evaluate in a usage-specific way how a car is used, including characteristics such as route profiles or driving style: when does the driver drive more cautiously, when more aggressively?

Analysis allows the researchers to draw a variety of conclusions about how drivers handle their vehicles – for instance whether they are using a

car that is tailored to their needs. "Collecting many such profiles allows us to bracket a large number of users into user groups, and to analyze driving data on a group-by-group basis," says Tobias Burgert, a scientist at Fraunhofer ICT. "These profiles can produce typical driving cycles that can be used in the development of new cars, for instance as part of a virtual test drive during vehicle simulations."

Numerous application scenarios

What makes the data logger exceptional is that it is flexibly configurable; its use is not restricted to cars with a conventional combustion engine. Besides standard powertrain parameters such as engine speed or lambda value (heat conductivity), researchers are also able to collect data from an electric drive, for instance the level of the battery charge. This flexible configurability means the quality of the analyzed signals can be improved. By not recording non-relevant data, the prioritized parameters can be recorded at a higher scanning rate. At the same time, data from an external sensor such as a GPS module, an acceleration sensor or a gyro sensor can be recorded and analyzed in combination with pure vehicle data.

The data logger's versatility makes it appealing to partners from industry. In the first collaboration, an international original equipment manufacturer (OEM) is using it at the design stage for hybrid vehicles. Another potential area of application is vehicle fleet management. Analyses allow operators to understand exactly how existing vehicles are deployed and enables them to always allocate the right vehicle to a particular driver. Moreover, use scenarios that include route profiles and their respective energy needs allow operators to judge whether future investment in their fleets should go towards the procurement of vehicles with a combustion engine, or purely electric vehicles, or hybrid vehicles.

Affordable and easy to use

The technology of the data logger is based on the Raspberry Pi single-board computer in which all the electronic components are housed on a single board, making purchase affordable for prospective customers. Installation and activation are straightforward, and can be done by users themselves. The device reads vehicle data via an OBD-II interface that is already built in to every vehicle. Bluetooth data transfer between the OBD-II interface and the data logger is accomplished by means of an adapter manufactured by PACE Telematics GmbH, a Karlsruhe-based start-up.

Provided by Fraunhofer-Gesellschaft