Special Feature: Sensors

Overview

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The application field of electronic control in automobiles has expanded widely from basic functions such as engine startup and fuel injection, to ecological and safety functions such as powertrain control in hybrid vehicles and electric vehicles, emission control, motion control, brake control, and pre-crash safety systems. In all of these electronic control systems, signals from sensors are sent to an electronic control unit, which sends control signals to actuators. Sensors are therefore key components of electronic control systems, and many kinds of sensors exist.

In this special feature, we focus on three kinds of sensors: (1) acceleration sensors, (2) alcohol sensors, and (3) magnetic sensors. There are two papers on acceleration sensors. The first describes a highly accurate 3-axis accelerometer for motion control of vehicles. The second paper considers the combination of a 3-axis accelerometer and a 3-axis angular rate sensor, and their application to a partner-robot control system. There are also two papers on alcohol sensors. The first describes a sensor based on an organic field-effect transistor (OFET) for detecting exhaled alcohol. OFETs have higher gas selectivity than conventional sensors made of tin oxide. The second paper considers an inhalation-type nondispersive infrared (NDIR) sensor. The NDIR method can detect alcohol concentrations as low as 1 ppm. Finally, there is one paper on magnetic sensors, in which a magneto-impedance (MI) sensor is proposed. An MI sensor has sensitivity about one order of magnitude higher than a conventional magnetoresistance sensor. These magnetic sensors can measure the wheel rotation rate and the angle of the crank shaft in the engine.