Educational Robot

Mikroelektronik / Prof. Dr. Marcel Jacomet

In the technology world we are living in, the demand on high qualified and creative engineers is large. The education of an electronic engineer is associated with a lot of theory and often the "fun factor" gets lost. In the past few years the curriculum of the HTI changed a lot. The professors of the "MicroLab" and "Digital Signal Processing Lab" tried to break new grounds in their courses.
One new idea is that electronic engineering students build a robot that they use as a learning platform throughout their entire three-year curriculum. The idea should force the learning process and the willingness to spend time to develop new applications and features. This leaded to the development of the educational robot (eBot).

Every being on earth uses its six senses to exist. For robots, often seen as technical beings, the same rules are valid. They use sensors and intelligent software to act as autonomous beings. The goal of every robot designer is to design a machine which is intelligent enough to exist on its own. To realize such robots, a huge number of sensors are necessary. Motors and wheels for moving, infra-red sensors and CCD cameras for seeing, acceleration sensors for feeling, compass modules for orientating, microphones for hearing and a lot more. For starting, we focused with the eBot project to some fundamental sensors and modules like power, motor control, distance measuring, acceleration sensing and compass orientation. Due to educational reasons, our eBot modules each address specific technical problems to be handled by the students.

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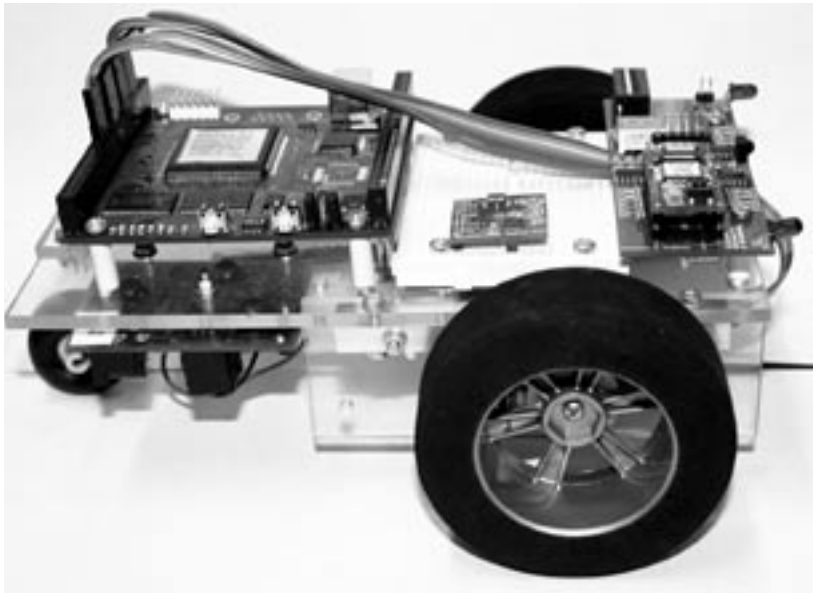
A first basic set of different eBot modules have been developed in this thesis, which should allow the students to have a motivating learning by doing approach:



eBot with modules

A "Power Supply Module" facilitates the work with the eBot because the students do not have to care about powering the robot anywhere. The "Infra-Red Module" allows the student to do the first steps with VHDL (maybe SystemC). Later on, with the same module, a more sophisticated behavior, like distance measuring, can be designed. For navigation, a "Compass Module" and an "Acceleration Module" can be added to the eBot. Conventional servo motors can usually be controlled by a simple digital signal. For control theory applications, we can remove the built in logic of the servos by a "Servo Module" and design our own PWM and encoder hardware. This allows the students gather experience with a feedback controlled system.