Mathematical calibration of sensors for embedded applications

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Mathematical aspects of the computer science are fundamental in the real-life implementations. One of these is the computer interaction with the real world. Modern trends in computerized automation involve use of sensorics and actuation, and computers (embedded systems) need to acquire physical phenomena in order to decide/calculate response. Crucial aspect of data acquisition is calibration of sensory output in order to comprehend the real physical value. This case study depicts the process of proper interfacing a computer with a NTC thermal probe in order to read current temperature of the environment the probe measures. The process begins with designing a basic electronics for required current excitation of the NTC probe. Than voltage it produces over its resistor is acquired via an A/D converter, it is sampled and digitized. It is calibrated for the preamplification and finally a set of exponential equations are used to determine key parameters for voltage calibration to convert it into temperature. Than decisions can be made consistent to the embedded application - home automation in this particular case study. Data used for modeling of the resistance-temperature dependence is issued by the probes manufacturer, and equations are already well known physical relations.