

Abstract

In my Master's thesis I try to solve the problem that arises, how to measure weight in such a narrow place where the well-known measurement methods are not applicable. In my dissertation I describe the methods of mass measurements and their physical basis. I illustrate the operation of the weight measuring instruments (scales), especially the strain gauge and the force sensing resistor (aka FSR), which is used for my measurements. I present in detail of the structure, electrical behavior and the differences between the resistor types what I examined.

For the purpose of mass measurement, the voltage measured on a resistor connected in series with the FSR corresponded to the mass dimension. The calculation and power supply were solved with an Arduino. The Atmel processor on Arduino, is capable of converting analog voltages into a 10-bit digital signal (ADC), which I used to determine the voltage. In my measurements I tried to make the sensor give the most accurate mass returned value. Applying different known weights I paired the measured voltages with the applied value of weights. Using the coordinates which is obtained during the pairing, I made a five-degree polynomial function fit. The function what I obtained by function fitting is approximate well on the nonlinear characteristic of the force sensing resistor. The FSR typical resistance decreasing is considerable up to 2 kg limit (several hundred $k\Omega$), and therefore nearly negligible (few hundred Ω). As a result, for weights which is greater than 2 kilograms, I did not use the function what I get from the curve fitting just only one linear approximation. I also mention the occurrent inaccuracy of the measurement (such as temperature dependence or power supply drop) and their correction. Based on the results obtained, I make a description of the application of the force-sensing resistor, its advantages and disadvantages.

I created my own device from the used electronic devices which is able to display the amount of weight that placed on the force-sensing resistor surface.