Project Work at MPIK

Temperature control system

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1 Experimental setup

A temperature sensor, a heater and a cooler are to be connected to a Arduino board. In order for it to work we need to have shifters for the voltage range to fit the inputs/outputs on the Arduino. This was first done by Vanessa Scheller using cables and a breadboard, I took her design and reworked it to be used on a milled circuit board and SMD parts.

1.1 Temperature sensor circuit

The circuit for the temperature sensor looks as follows:

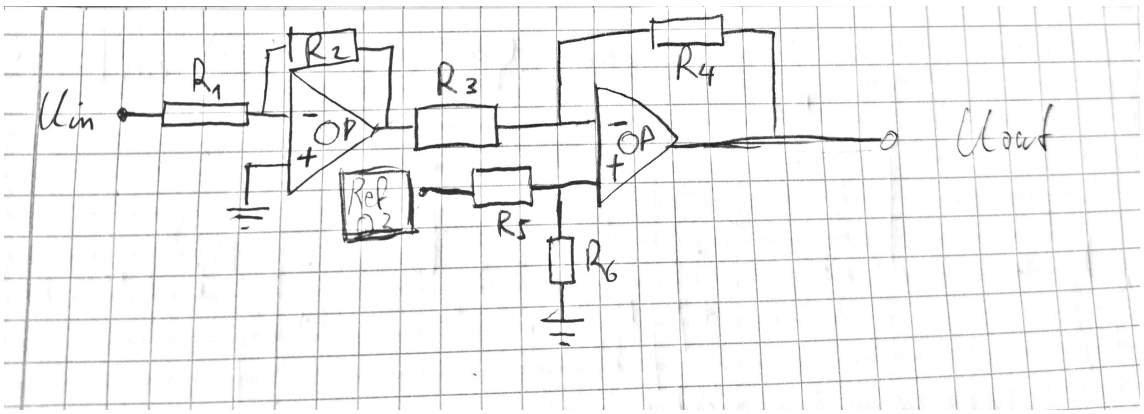

Figure 1: temp. sensor shifter circuit

The input range from the temperature sensor we are interested in is

$$-1.6V < U_{in} < 1.6V$$

The supply voltage of the op-amps is 15V. We want to have a cutoff after the first op-amp at the input range boundaries. This can be achieved with setting the amplification factor with R_1 and R_2. The output range should equal the input range of the Arduino analogue input which goes form 0-3.3V. The values found for the resistances are as follows (in $k\Omega$):

$R_1 = 15k\Omega$
$R_2 = 133k\Omega$
$R_3 = 133k\Omega$
$R_4 = 12k\Omega + 10k\Omega$(potentiometer)
$R_5 = 10k\Omega$
$R_6 = 15k\Omega + 5k\Omega$(potentiometer)
This gives to following response to the input Voltage U_{in}

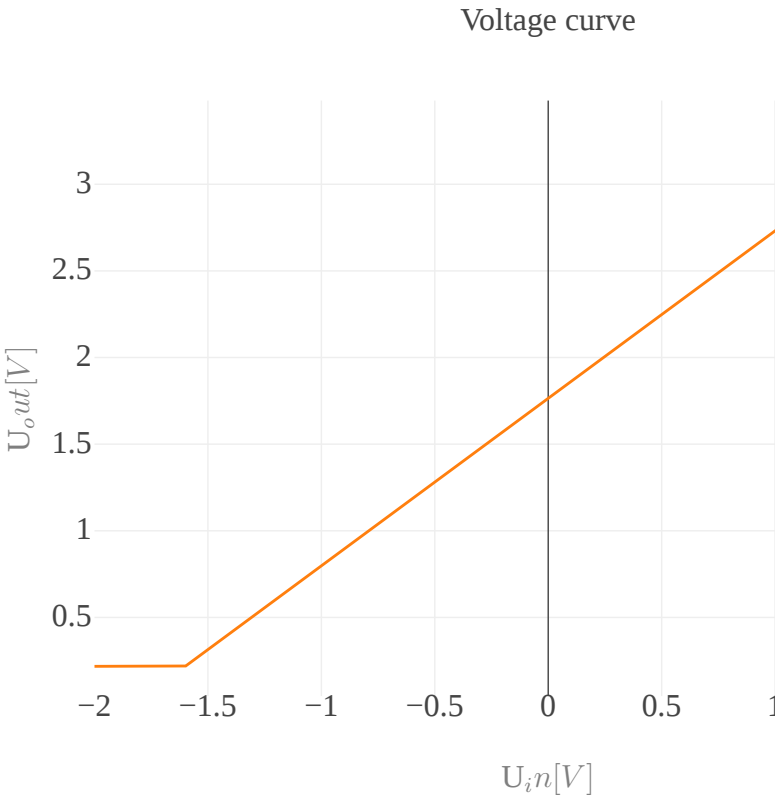

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Figure 2: temp. sensor shifter circuit