

Assignment 7

ADC

Embedded Logic Design

September 18, 2015

1 Description

Along with the Arduino kit came a Negative Temperature Coefficient (NTC) thermistor (the blue bubble) and an Light Dependent Resistor (LDR). The thermistor is a temperature sensitive resistor, which changes its resistance according to the environmental temperature. The LDR has a very high resistance in darkness, but the resistance decreases when the light intensity that falls on the resistor, increases.

Since the ADC can read only voltages, a voltage divider needs to be built, if the thermistor or the LDR is connected to it. In figure 1 such a voltage divider is shown as an example. Imagine the variable resistor to be the LDR and in complete darkness. That would result in an extremely high resistance (almost a cut off of the ADC pin from the power supply V_{cc}) and the $1k\Omega$ resistor is able to pull down the charge that was at the ADC pin. If the brightness increases, slowly the resistance of the LDR reduces and more and more electrons are passing the variable resistor increasing the charge at the ADC pin. Obviously the $1k\Omega$ resistor keeps trying to pull down the charge as usual, but with further reducing the resistance of the LDR, the $1k\Omega$ becomes less and less successful to do so and an analogue voltage can be measured at the ADC pin.

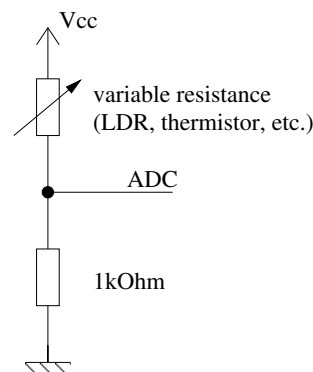


Figure 1: Voltage Divider

2 Assignment

1. Built two voltage dividers, one for the LDR and another one for the thermistor. In addition connect two LEDs to pins of your choice.
2. Activate one of the LEDs, when the LDR measures darkness (e.g. you cover it with your finger). This LED is turned off again, when the brightness increases.
3. The other LED is turned on, if you touch the thermistor and your body heat causes the change of the resistance. The LED turns off again, when you let the thermistor cool down.
4. Think an appropriate time interval in which you measure the analogue voltages at the ADC pins.

5. In your program, turn off the periphery that you do not utilize and put the CPU to sleep to reduce the power consumption.

3 Deliverables

All files must be submitted to nanu.iiitd.edu.in via `git` or `subversion`. Late submissions are not evaluated nor will be submissions through <https://www.usebackpack.com> or mail. Your repository has to contain:

- Source code
- Makefile

3.1 Remarks

If you encounter a problem, ask Google, DuckDuckGo, Bing, etc. first. The TAs will not type the question that you have, into the mask in the search engine for you. Required resources, textbooks, etc. are available on the ELD course website of <https://www.usebackpack.com> or in the Internet (datasheets, AVR library documentation, etc.)