Lab 2: ADC and sensors

In this lab, the main goals are

1. To get familiar with ADC conversion
2. To get familiar with sensor characteristics
3. To get familiar with sensor configurations

Important knowledge

Functions: analogReference(), analogRead(), pinMode(), digitalWrite(), digitalRead()

Please make sure you create one sketch for each exercise and copy the code to the report! Do not submit your code directly, the submission only allows doc, docx or pdf.

Exercises

1. **Easy (15 min):** Connect the photocell sensor to an Analog Pin, read the sensor data and report to host PC through serial communication. Be aware that you need to choose a proper resistor when connecting the photocell sensor.
2. **Easy (15 min):** Turn on/off LED when the photocell sensor is covered/uncovered, and send a message to host PC through serial communication when the status gets changed. Be aware that you need to choose a proper resistor.
3. **Easy (15 min):** Connect the temperature sensor to Analog Pin XXX, read temperature sensor data every 1 second and print the reading to the host PC.
4. **Medium (15 min):** Enable or disable temperature sensor based on user's input from serial communication, report "Disabled" to the host when the sensor is disabled, report sensor readings to the host when the sensor is enabled.
5. **Medium (15 min):** Change temperature sensor sampling rate based on user's input from serial communication (use "0" as the disable command) and report the current sampling rate and sampled data to the host PC.
6. **Medium (15 min):** Change the onboard LED's brightness based on temperature: the higher temperature is, the brighter the LED is.
7. **Medium (15 min):** Given a threshold configured from user's input, turn on the LED when the temperature is over the threshold; turn off the LED otherwise.
8. **Medium (15 min):** Change the temperature sensor's reference level based on user's input and report the new sensor reading according to the new reference level to host.
9. **Difficult (60min):** Report photocell sensor and temperature sensor value together in one message. In each message, the following information should be included **for each sensor**: PIN, sampling rate, value, and threshold. The message should be sent to the host PC periodically or upon receiving a user's request (on demand). The periodical report interval should be configurable by user's input.

What to submit

1. Your lab report, please use the template in canvas, and submit in word or pdf.
2. Please do follow the lab report template and don't miss any required content.
3. Please be sure to copy all your code to the report and follow the requirement.