

Data logging LTH system

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Introduction

Several systems need a continuous surveillance of important parameters, e.g. measurement of temperature to protect against too high temperatures. To control systems, regularly microcontrollers (μC) are used. Since the μC also needs to react on e.g. too high temperatures, it would be convenient to put the logging of important parameters also in the μC . This document describes how it can be implemented in a LAUNCHXL-F28027 μC of the C2000 family of Texas Instruments.

Implementation

The here described set-up is able to measure 4 temperatures via a single SPI-bus and measures light via an ADC-input, both parts of the TMS320 μC . The typical working is as follows; the μC is programmed via Simulink and send continuously, e.g. each second, data to a Raspberry Pi (RPI). On this RPi runs a Python script, which processes and sends the data to a server-side PHP script that stores the data in a MySQL database. Representing the data from the database is done by another server-side PHP script, which displays the data in a web browser. A third PHP script checks every 24h whether the logger is still storing data and sends an e-mail when the logger went down. The typical data flow and the sensor positions are shown in Fig. 1 and Fig. 1a respectively.

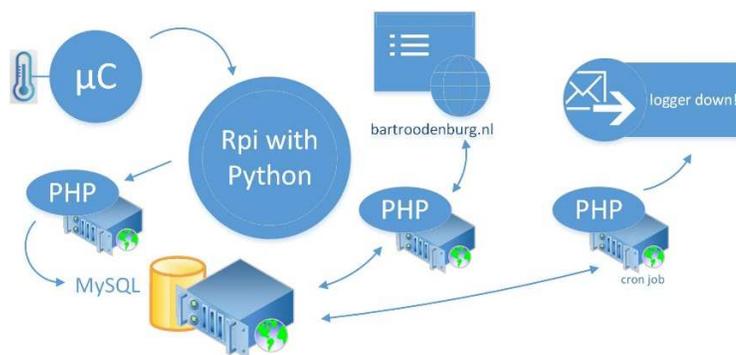


Fig.1 : Typical architecture of the logging system, where the microcontroller and PC are on the measurements location. PHP scripts and the MySQL database are located on a web server.

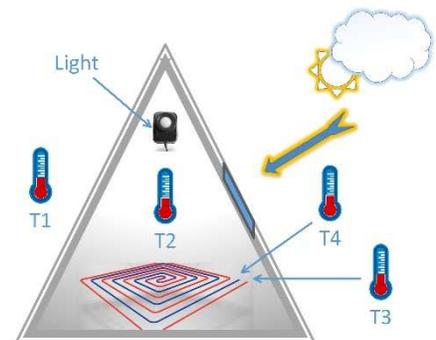


Fig.1a : Typical layout of the measurement system, where T1 is outside temperature, T2 is room temperature, T3 is inlet temperature and T4 is outlet temperature of the floor heating system.

Hardware

Web interface: RPi3, with Noobs v3.2.1 and programmed in Python

Microcontroller: C2000, LAUNCHXL-F28027, Texas Instruments

Peripheral Module: MAX31865PMB1# Pt100 to SPI-interface (based on MAX31865 chip)

Temperature sensor: 2-wire Pt100 Heraeus Nexensos W-EYK 6

Light sensor: LDR from Silonex, type: NSL-19M51

Representing the data

Via the main website one is able to display the actual data (or last logged 24h, when the logger is not running). Fig. 2 and Fig. 3 shows the graphs for October 23rd, 2019.

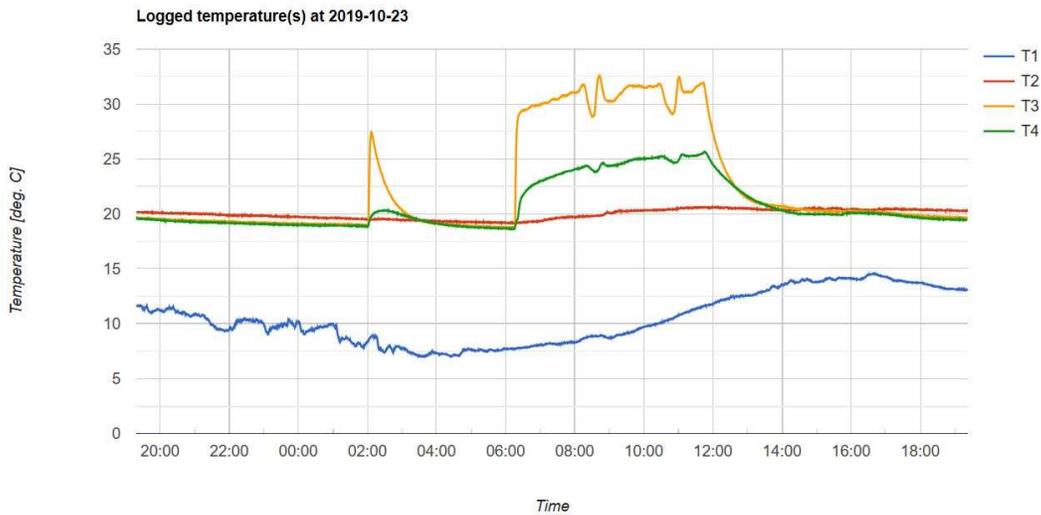


Fig. 2: Typical data in web browser.

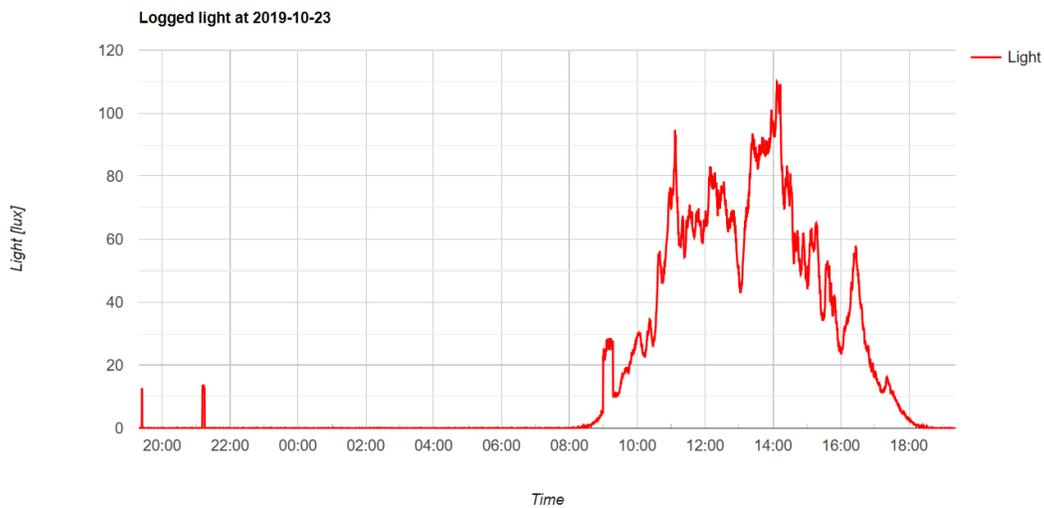


Fig. 3: Typical light data (for relative use only). The sharp needles/jumps in the graph represents artificial light.

Remarks

The outside temperature sensor (T1) is mounted in the shade, in the fresh-air inlet of the home ventilation system (roughly 12m above ground level). This value is compared with the KNMI measurements from “Hoek van Holland” and “Rotterdam Airport” the maximum difference that has been determined is approximately +/- 1.5 degrees. The room temperature (T2) is measured at a height of 1.5m above the floor. Both sensors to measure the water temperature (T3 and T4) are connected to the outside of the tubes and has a mechanical spring to assure proper contact. To avoid that an average temperature between water and air has been measured, the sensors are isolated on the outside.

Because the light sensor is mounted in house (see Fig. 1a), the represented light data [Lux] is not the actual light intensity at that moment outside. So this data can only be used relatively, thus compared with measured data from other days. Together with the date, it is used to get an idea about the heat in-flux caused by the sun that day.

Questions?

If you are interested in the hardware, schematics, scripts, measurement data over a longer period, or something else, please contact me at mail@bartroodenburg.nl