



Smart and Light data logger for thermal and environmental monitoring

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With the last evolutions of the French Thermal Régulation (Réglementation Thermique 2012 RT2012), an important gap for building energy performance requirements has been crossed. Another important step is planned for the next Building Thermal Regulation RT2020 that will address positive energy performances as a reference for new building projects. So being able to conduct accurate thermal diagnostic of building envelope has become crucial for building retrofitting but also to control energy efficiency of next building generation.

In the research framework of the RESBATI project, we study and develop a robust and smart Data Acquisition System (sDAS) able to qualify thermal performances of building envelope. This sDAS system must be able to: (i), acquire in-situ data from different sensor in autonomous configuration, manage and control active components and the acquisition parameters, (ii), and process data in line or off-line to estimate the thermal properties of walls (iii).

The design system leans on an initial autonomous data logger (Th-01 [1]) developed by the start-up Themacs Ingénierie and complementary smart components. The new designed sDAS is composed of Data Acquisition Card (DAC) which allows to connect environmental sensors and make data acquisition. It is connected to an Arduino board (ATmega2560) to manage the DAC. Arduino offers some critical advantage: open source (both software and hardware) and low cost (around 30 \$). The user can manage the acquisition (sampling rate, inputs (sensor, gain . . .)) thanks to an HMI (Human-Machine Interface) developed in C and displayed on a touch screen shield (ILI9341 TFT, 3.2”).

The new sDAS architecture studied and developed can be dividing in two parts: (i) Sensor part (local instrumentation) and (ii) Sensor Management and data processing. The sensor part is composed of Data Acquisition Card and the Arduino board to conduct local data acquisition but also to control active components (for instance a PWM unit to control heater). The sensor management and data processing part is composed of a “Raspberry PI 3” coupled with the Arduino through a serial connection. It allows to control a thermal infrared camera, to connect the system to various network (GPRS, 4G, LAN, WAN. . .) and to incorporate embedded processing algorithm. The whole system is controlled through a new HMI developed in Python and Matlab. Discussion on such design followed by conclusion and perspectives will be proposed.

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References:

[1] J-P. Monchau, “TH-01 : Système d’acquisition programmable 8 voies », User Manual, TEMACS Ingénierie, 2017.