IrLaW an OGC compliant infrared thermography measurement system developed on mini PC with real time computing capabilities for long term monitoring of transport infrastructures

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One of the objectives of ISTIMES project is to evaluate the potentialities offered by the integration of different electromagnetic techniques able to perform non-invasive diagnostics for surveillance and monitoring of transport infrastructures. Among the EM methods investigated, uncooled infrared camera is a promising technique due to its dissemination potential according to its relative low cost on the market.

Infrared thermography, when it is used in quantitative mode (not in laboratory conditions) and not in qualitative mode (vision applied to survey), requires to process in real time thermal radiative corrections on raw data acquired to take into account influences of natural environment evolution with time. But, camera sensor has to be enough smart to apply in real time calibration law and radiometric corrections in a varying atmosphere. So, a complete measurement system was studied and developed with low cost infrared cameras available on the market. In the system developed, infrared camera is coupled with other sensors to feed simplified radiative models running, in real time, on GPU available on small PC.

The system studied and developed uses a fast Ethernet camera FLIR A320 [1] coupled with a VAISALA WXT520 [2] weather station and a light GPS unit [3] for positioning and dating. It can be used with other Ethernet infrared cameras (i.e. visible ones) but requires to be able to access measured data at raw level. In the present study, it has been made possible thanks to a specific agreement signed with FLIR Company. The prototype system studied and developed is implemented on low cost small computer that integrates a GPU card to allow real time parallel computing [4] of simplified radiometric [5] heat balance using information measured with the weather station.

An HMI was developed under Linux using OpenSource and complementary pieces of software developed at IFSTTAR. This new HMI called "IrLaW" has various functionalities that let it compliant to be use in real site for long term monitoring. It can be remotely controlled in wire or wireless communication mode depending on what is the context of measurement and the degree of accessibility to the system when it is running on real site.

To complete and conclude, thanks to the development of a high level library, but also to the deployment of a daemon, our developed measurement system was tuned to be compatible with OGC standards. Complementary functionalities were also developed to allow the system to self declare to 52North. For that, a specific plugin was developed to be inserted previously at 52North level. Finally, data are also accessible by tasking the system when required, fort instance by using the web portal developed in the ISTIMES Framework.

References
[1] FLIR systems, "Thermovision A320 et Thermovision A320G: User's Manual", FLIR A320 camera technical documentation, November 2007.
[2] VAISALA, " Transmetteur météorologique WXT520", guide de l'utilisateur, 2010.
[3] UBLOX, "u-blox 5 Evaluation Kits EVK-5", Technical note, 2009.
[4] NVIDIA, CUDA Toolkit Reference Manual, 2010 (www.nvidia.com).
[5] G. Gaussorgues, "La thermographie infrarouge : Principes, Technologies, Applications", Tec Doc, Lavoisier, 3e édition, 1989.