

Ultra Time Domain Infrared Thermography in outdoor monitoring

Jean Dumoulin¹

¹Components and Systems, IFSTTAR, France

Being able to perform full field easily non-invasive diagnostics for surveillance and monitoring of transport infrastructures and structures is a major preoccupation of many technical offices. Among all the existing electromagnetic methods, using uncooled infrared camera is a promising full field technique both for long term thermal monitoring and non-destructive testing. Furthermore, latest technological improvements in low-cost infrared cameras have brought new opportunities for long-term infrastructures monitoring. In the particular context of thermal monitoring, such sensor can provide an interesting option thanks to its full-field observation capability allowing to embrace large areas. In this paper, we address a review of some studies, carried-out at IFSTTAR this last decade, based on the use of uncooled infrared thermal cameras at ground level. We first discuss how different outcomes extracted from Non-Destructive Testing (NDT) laboratory studies and experiments may be extend to outdoor application and analysis. Then, long term thermal monitoring by uncooled infrared thermal camera is introduced with its natural environment constraints and issues. However, retrieving with time over long period, current targeted object's apparent surface temperature from those measurements is a challenge that needs to be addressed with care. Captured thermal image depends on spatial parameters, the target's environment and its thermo-physical properties that are usually unknowns or roughly estimated. Part of a possible solution is therefore to use complementary environmental sensors in order to get a better estimation of time present measurement environmental conditions that will have an influence on the apparent surface temperature reconstruction. Then we propose alternative on-site instrumentation strategies to reduce amount of additional sensors. Results obtained for surfaces' temperature measurements with time on different test sites are then presented and discussed. To complete such review, we present few recent experiments where thermal model, control-command methods or condition monitoring may take benefits of Ultra Time Domain Infrared Thermography used on real site instrumentation configuration. Finally, conclusion and perspectives are proposed, with a focus on last trends in term of uncooled infrared sensor technological evolution, instrumentation system and ongoing research works associated.