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Thermal drift of the FLIR A325sc camera. Determination of optimal camera temperature

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Abstract

In this work, we have addressed the problem of thermal camera drift. The change of the temperature of the thermal camera influences the measured accuracy, up to 2 °C of error compared to the real temperature of the target. it is then essential to control the temperature of the camera. In this way, we built a cold box sized to Flir A325sc camera. The cold box is detailed. By varying the ambient temperature and camera one, we test the quality of temperature drift compensation by comparing the apparent temperature to a fixed reference temperature (50°C). We show that non-contact temperature accuracy can be improved by fixing the camera temperature for a given ambient temperature in range [10°C, 40°C].

1. Introduction

Infrared cameras are non-contact temperature measuring devices which allow them to be used remotely on large surfaces. However, depending on the model chosen, they can be less accurate than contact temperature detectors. Thermal drift noticed during apparent emissivity measurements. The causes of this thermal drift are the heating of the camera housing and the optics, which emits radiation that is detected by the FPA detector as in Figure 1.

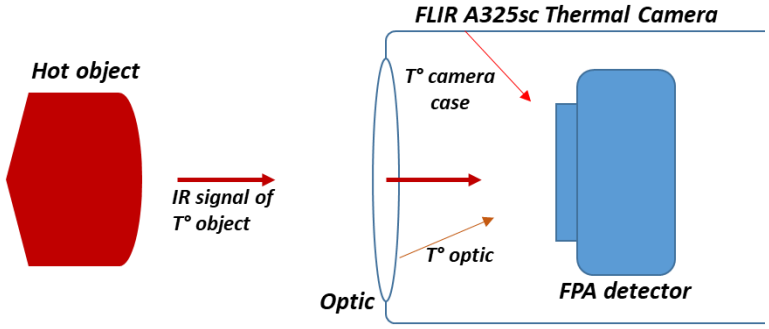

Fig. 1. *Diagram explaining the origin of the thermal drift of infrared cameras*

This problem is systematic for all LWIR cameras. The thermal drift is in principle managed by giving one or more control points where the internal temperature of the camera is measured. The equivalent thermosignals are then subtracted from the measurement [1]. However, the compensation has its limits, especially for the model used in this study.

2. Cold Box

It is essential to control the temperature of the camera. For this purpose, we built up a brass box with water circulation (see figure 2). The box allows us to control its temperature according to the water temperature. A thermocouple is glued on the camera to detect its temperature.

Fig. 2. *Cold box with cold water circulation (fig. 2a) for the FLIR A325sc thermal camera (fig2b)*

3. Error chart

The thermal camera in its cold box is placed in a climate chamber. The camera measures the temperature of a black body fixed at 50°C. Measurements are performed for several ambient temperatures controlled with the climatic chamber and several camera temperatures controlled with water circulation in the cold box. Figure 3 shows the deviations of the apparent temperatures from the black body temperature for different ambient and camera temperatures.

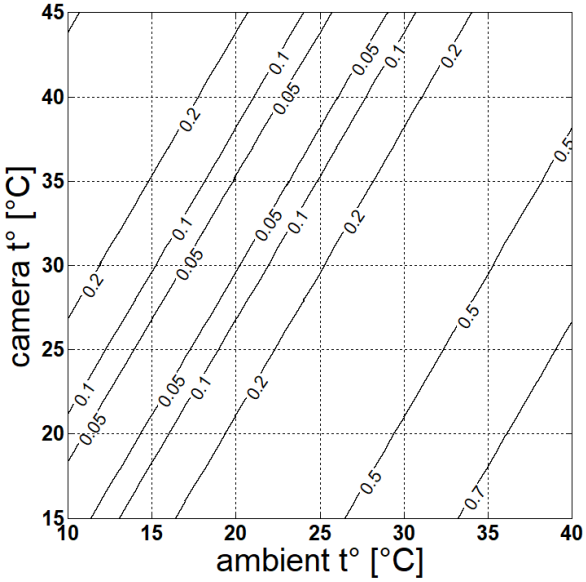

Fig. 3. *Measured temperature deviations [°C] as function of ambient and camera temperature*

The chart highlights a corridor that minimizes measurement errors.

4. Future work

The next task is to check the camera calibration for different ambient temperatures in order to test the stability of calibration coefficients with ambient temperature.

REFERENCES

[1] RIOU, O. (2004). Non uniformity correction and thermal drift compensation of infrared camera. Thermosense XXVI, Proc. SPIE 5405, 294-302. doi:DOI 10.1117/12.547807