Non-Contact Temperature Measurements Dataset

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Abstract

The dataset titled The influence of the distance of the pyrometer from the surface of the radiating object on the accuracy of measurements contains temperature measurements using a selection of four commercially available pyrometers (CHY 314P, TM-F03B, TFA 31.1125 and AB-8855) as a function of the measuring distance. The dataset allows a comparison of the accuracy and measuring precision of the devices, which are very important features in the reliable non-contact prediction of COVID-19 symptoms without interference from external disturbances during fast patient recognition.

Keywords: temperature measurement; pyrometer; measuring distance; COVID-19

https://doi.org/10.34808/x55q-sz53_dyr_roz12

Specification table (data records)

Subject area	Metrology, Electronics, Sensors, Biomedical engineering
More specific subject area	Non-contact temperature measurements
Type of data	Text
How the data was acquired	The data was collected at the Gdańsk University of Technology using commercially available pyrometers (AB-8855, CHY 314P, TM-F03B and TFA 31.1125) on a special optical stand with an Omega BB703 temperature blackbody calibrator
Data format	The tables are in .xlsx format
Experimental factors	The data contained in the dataset were not processed

Experimental features	The selected emissivity of the pyrometer was identical to the target plate emissivity (ε = 0.95)
Data source location	MOST Wiedzy Open Research Data Catalog, Gdańsk University of Technology, Gdańsk, Poland
Data accessibility	The dataset is accessible and is publicly and freely available for any research or educational purposes

Background

During the COVID-19 pandemic, non-contact temperature measurement has become one of the ways to monitor the spread of the disease (Guan et al., 2020; Zhang et al., 2020). There are more and more devices on the market that allow for the quick assessment of people's health. One such device is the pyrometer, which can measure temperature without being in contact with the measuring object, such as the human skin (Costanzo and Flores, 2020; Ebeid, Selem and Abd El-kader, 2020). Unfortunately, there are some limitations that could affect the results: the ambient radiation, the absorption of radiation by the atmosphere, scattering, and the optical resolution (Fig.12.1).

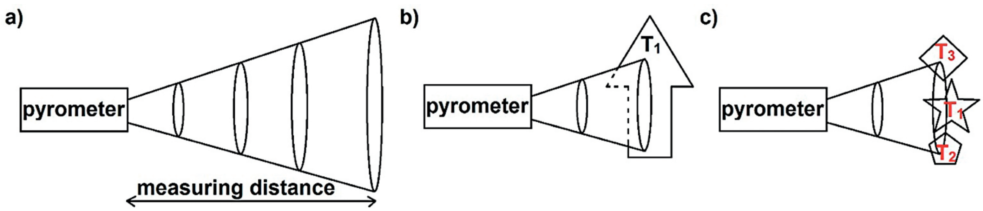

Fig. 12.1. (a) Schematic of the relation between the measuring distance and the field of view; (b) a measurement carried out correctly; and (c) ambient radiation negatively affecting the results

The dataset, The influence of the distance of the pyrometer from the surface of the radiating object on the accuracy of measurements, has been designed to help understand how important it is to choose the right equipment due to differences in optical construction. The dataset contains comparative results for four commercially available devices with different optical resolutions and consists of two parts: temperature measurements as a function of the measuring distance and the calculated field of view for each pyrometer based on the known optical resolutions.

Methods

An Omega BB703 blackbody temperature calibrator with a target aperture of 2.9×10^{-2} m was used to generate thermal radiation. The temperature was measured using the following pyrometer models: CHY 314P, TM-F03B, TFA 31.1125 and AB-8855. The selected emissivity of the pyrometer (ε) was identical to the target plate emissivity and equal to 0.95. The blackbody calibrator and pyrometers were mounted on stands on an optical bench so that the pyrometers were on the same axis as the blackbody target. There were no obstacles in the measuring path. The target set temperature was 81°C and the room temperature was 23°C during the entire experiment. The target temperature was selected so that it was within the measuring range of all devices and, at the same time, was easy to distinguish when the results contained radiation not only from the target (Fig. 12.1c). The only parameter that was changed was the distance between the pyrometer and the radiating target. The exact distance was measured with a ruler attached to the optical bench; the smallest division on the ruler was 10^{-3} m. The distance was varied between 5×10^{-2} m and 1 m.

Data quality and availability

All measurements were collected at a stable blackbody target and laboratory temperature using pyrometers with the same emissivity factor. Catalogue data were used to calculate the field of view of three of the pyrometers (CHY 314P, TFA 31.1125 and AB-8855). For the TM-F03B, unfortunately, the seller provides only information on the scope in which measurements are allowed. Nevertheless, the data contained in the dataset allow for a fair comparison of all pyrometers.

Dataset DOI
10.34808/wtyv-n266

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Acknowledgements
The generation of this dataset was supported by a statutory research grant from Gdańsk University of Technology.

References

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