Application note on fever detection with Evo Thermal 33

Technical support: support@terabee.com
Sales and commercial support: terabee-sales@terabee.com

Contents

Terabee, 90 Rue Henri Fabre
01630, St Genis-Pouilly, France (5km from Geneva airport)

Introduction

This application note describes the usage of a Terabee Evo Thermal 33 for facial fever screening applications (qualitatively not quantitatively). Using the recommendations below allows the integrator to eliminate sensor calibration bias and to build statistics and algorithms that are portable to new devices in production without the need of individual sensor calibration.

Following these guidelines will help to achieve reproducible facial temperature measurements provided that all recommendations are properly implemented. The actual decision as to whether the measured values indicate a potential fever of the person under test is the responsibility of the integrator and might require additional algorithms and testing.

Thermal sensing in the sub-Kelvin regime is challenging, especially in an operative mode that does not allow for reference targets in the Field of View as it is done in mass screening applications using high-resolution thermal imaging. The sensors proposed do not have a medical certification but experience by customers has shown that fever detection with statistical significance can be achieved if the below-mentioned guidelines are duly implemented.

The Evo Thermal 33

The Evo Thermal 33 is optimized to reach a repeatability (not accuracy) between sensors of +/- 0.3 °C or better.

Integration guidelines

1. Distance to face

The face of the person under test has to fill a sufficiently large portion of the Field of View of the sensor, covering at least 10 by 10 pixels. We recommend a sensing distance of 30cm to 50cm to achieve this (Figures 1 and 2). This distance needs to be chosen once and then kept the same for all measurements, we therefore highly recommend to use a contactless distance sensing solution such as the Terabee Evo Mini ToF sensor. This should be installed in close proximity to the Evo Thermal 33 sensor. The integrator has to make sure that the distance is correct before starting the measurement and is kept constant during the measurement. This can, for example, be achieved by visual and voice feedback to the person under test.

Terabee, 90 Rue Henri Fabre
01630, St Genis-Pouilly, France (5km from Geneva airport)

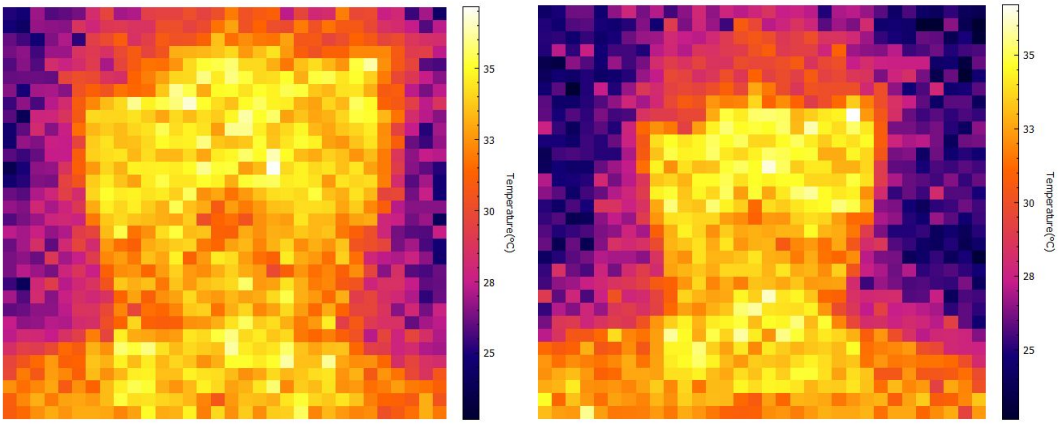

Figure 1: Thermal image of head taken at 30cm (left) and 50cm (right), no averaging

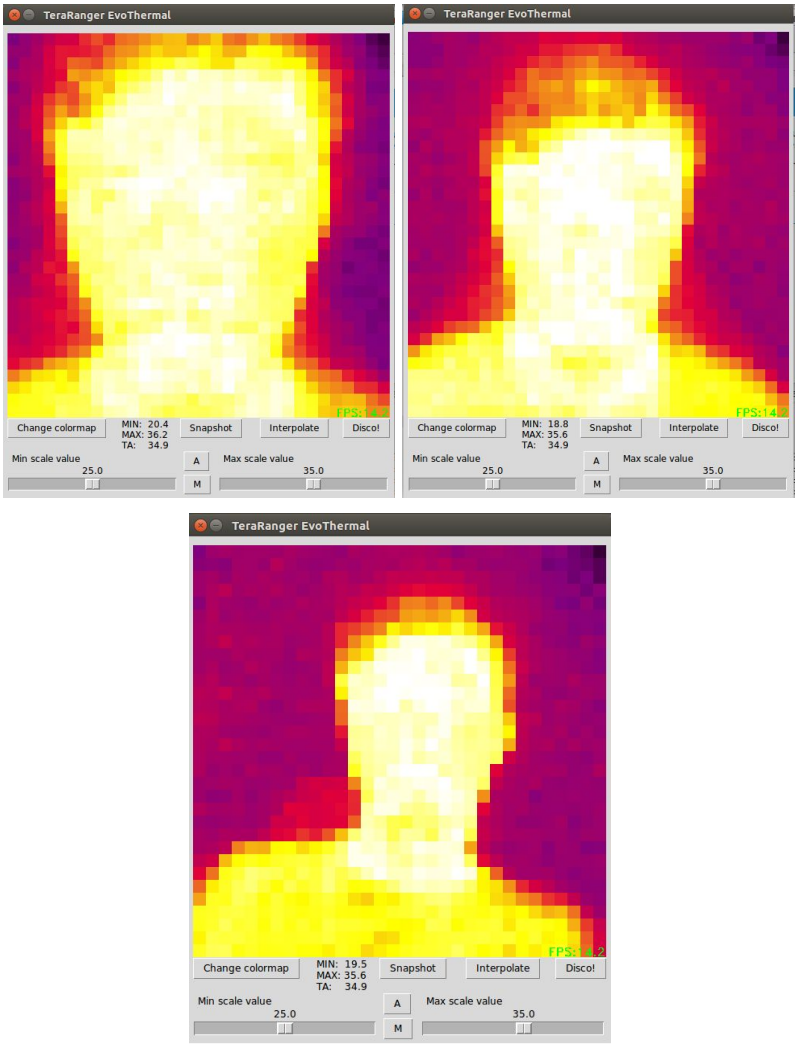

Figure 2: From top left to bottom: image at 30cm, 50cm and 70cm, each averaged over 20 frames

Terabee, 90 Rue Henri Fabre
01630, St Genis-Pouilly, France (5km from Geneva airport)

2. Stable operating conditions

It is essential to keep the sensor at a stable temperature during the measurement periods (this is the period in which the system is ready to receive persons under test). We recommend a warm-up time of at least 30 minutes. Afterward, the sensor should be kept running continuously to avoid any thermal drifting or switching effect. For best results, the ambient temperature of the sensor should be in the range of +15°C to +25°C. Therefore, do not mount it close to heat external sources. Avoid air convection around the sensor and ideally use indoors in a protected environment.

3. Raw data processing

To reduce measurement noise, it is necessary to build a sequential pixel average over a certain amount of frames, ideally 10-20 or more (Figure 2). We recommend prompting the person under test to stand still during this time (~1s).

4. Temperature data extraction

The procedure explained in points 1 to 3 above allows the integrator to achieve repeatable results over multiple sensors without the need of individual sensor calibration. The extraction of the temperature data can be done in many different ways. Terabee leaves the choice of algorithm and absolute calibration strategy to the integrator.

Terabee, 90 Rue Henri Fabre
01630, St Genis-Pouilly, France (5km from Geneva airport)

Additional application hints

1. Make sure the background that is covered by the Field of View of the thermal sensor does not include objects that are above the expected face temperature. If you cannot be sure of this, you can implement an algorithm that checks the background for heat sources when nobody is in front of the device (Evo Mini shows a distance >3m).

2. Glasses, hats, scarves and face masks can obviously cover the facial points of interest - in most cases forehead and eyes. If this is the case a reliable measurement is less likely. Ideally, the system will 'interact' with the person under test and ask them to remove these items accordingly. This could be achieved with an RGB camera and software algorithms to make sure this is the case.

3. Do not cover the thermal sensor with any kind of cover glass. Mount it flush to the front panel. A recessed mounting could lead to wrong measurements.

4. Cleaning and disinfection: The sensor surface should only be cleaned with a soft, lint-free cotton cloth or swab moistened with clean isopropyl alcohol. Dry immediately with a similar cotton cloth or swab.

Terabee, 90 Rue Henri Fabre
01630, St Genis-Pouilly, France (5km from Geneva airport)