TELEDYNE FLIR

CAPSTONE 2024 CONCEPT

HANDHELD CALIBRATION TOOL FOR IR SENSORS IN HOSPITALS

AUGUST 2024

BACKGROUND / PROJECT OVERVIEW

Hospital use of radiometric cameras for accurate, human temperature measurements is a market of interest for TeledyneFLIR.

Our radiometric calibration process coupled with the intrinsic thermal characteristics of bolometers do not provide the require accuracy for FDA approval.

The goal of the project is to develop a handheld device with an integrated FLIR camera that improves the radiometric accuracy of our sensors to achieve FDA approval.

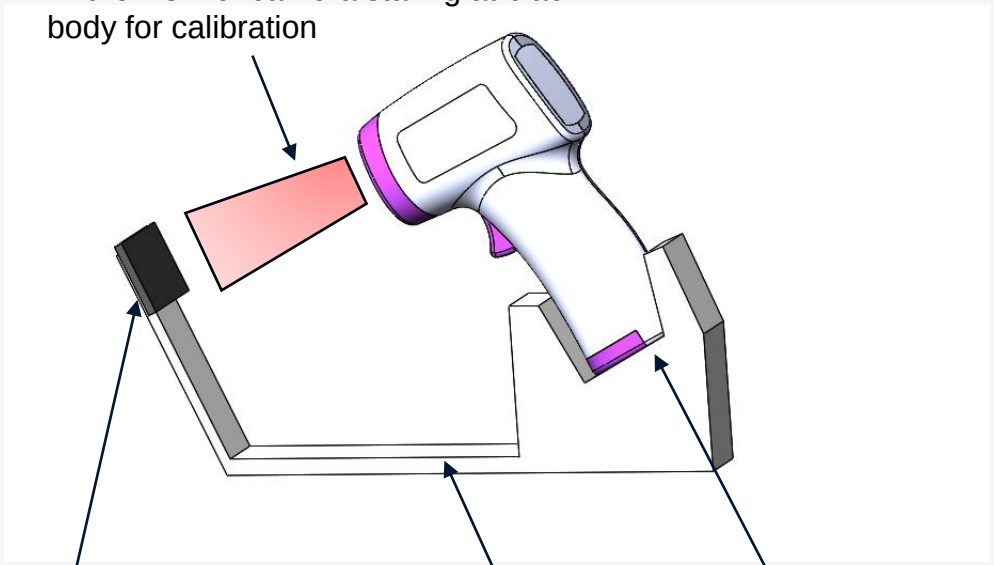
Current FDA requirements for infrared thermometers:

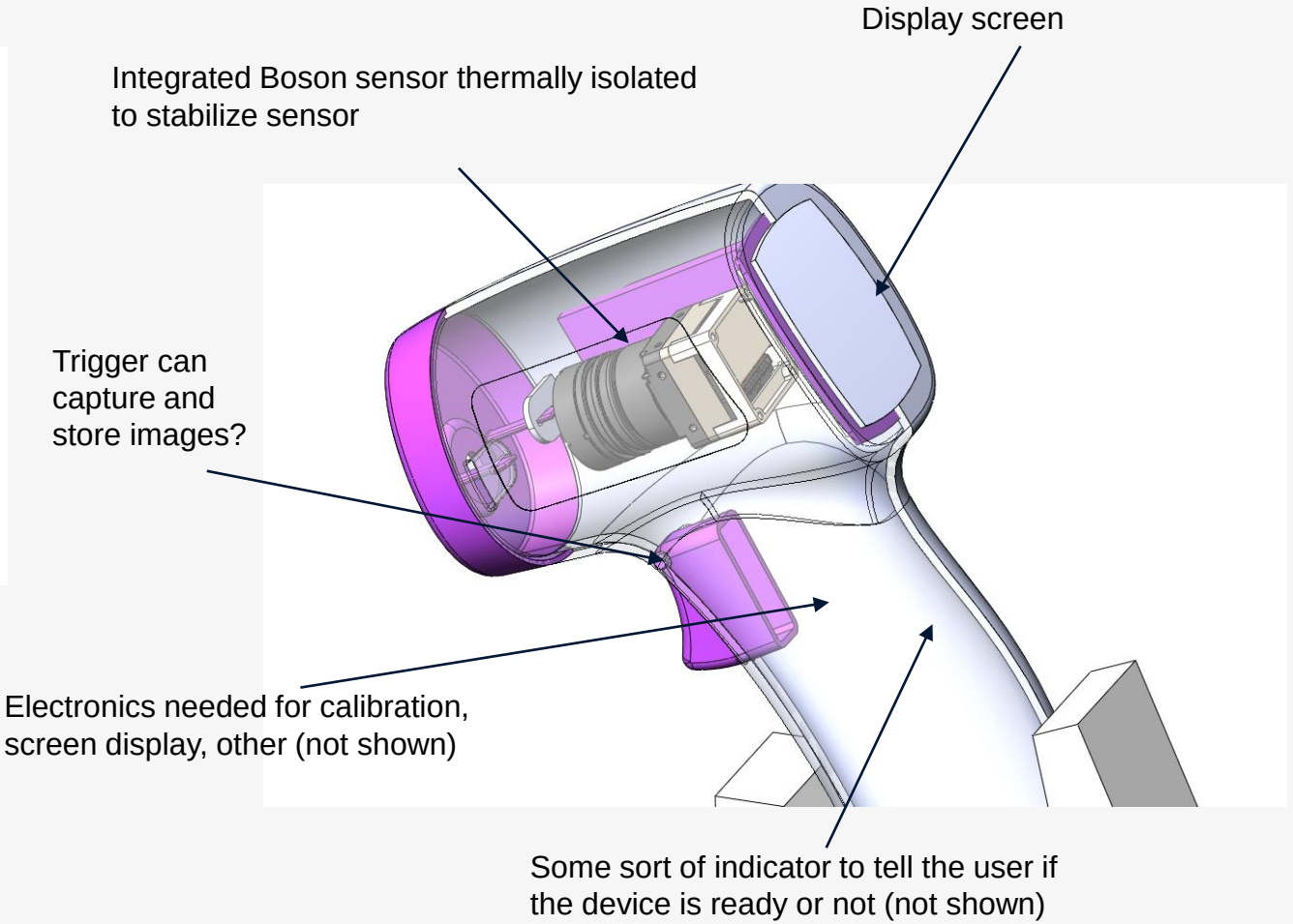
ASTM E1965-1998 and EN 980 standards outline requirements for infrared thermometers, specifically focusing on their accuracy, design, and operational guidelines in medical applications:

- **Accuracy**: The thermometer must have an accuracy of ±0.2°C (±0.36°F) within the range of 34°C to 42°C (93.2°F to 107.6°F), which is critical for ensuring reliable measurements in medical settings.

CONCEPT OVERVIEW

Initial concept is to have a stand that houses the handheld device. The stand will have a black body that is set to skin temperature so the bolometer will be continuously radiometrically calibrated to the required accuracy.





TRADE STUDIES

Trade studies that need to be completed (prelim):

- Integrated screen vs some sort of Bluetooth/wireless phone connection for viewing
- Wireless charging vs corded device
- Fixed black body temperature (one point correction) vs oscillating black body (multi point correction) for radiometric calibration
- Does AI have a use here? Auto detection of elevated/low temperatures?
- What requirements are typical for a device of this type?
    - Drop requirements?
    - Cleaning requirements (waterproofing, wipe down, etc)
    - Lifetime requirements?
- Might be worth meeting with local nurses/doctors/admin to determine requirements and price points to be competitive in the marketplace (and any other input)
- Emissivity of skin vs black body and radiometric accuracy

DESIGN STUDIES

Design studies that need to be completed (prelim):

- What sort of accuracy does a system like this allow us to achieve?
- How long after removal from the stand does the handheld maintain FDA accuracy requirements (how long before bolometers drift? How long is sensor thermally stable?)
- What sort of fault/failure safety is needed to make sure there are no failures?
    - Faulty black body temperature sensor, etc
- Black body gradients/quality and how they effect radiometric accuracy
    - How long for black body to stabilize
    - What if someone walks by or sneezes on this thing
    - Degradation of black body coating vs time / exposure

DESIGN

Mechanical Design Areas:

- Thermal testing/analysis to isolate and stabilize bolometer
- Design for manufacturing
- General design
  - Molded housing
  - Integrated screen
  - PCB housing/thermal management
  - Sealing based on hospital requirements
- Black body design and temperature control
- Wireless charging
- Ergonomics
- Trigger mechanism

Electrical Design Areas:

- Black body temperature control / feedback loop
- Wireless charging
- Video output / screen integration (or wifi/Bluetooth connection to phone)
- AI integration
- Trigger mechanism
- Calibration algorithms / status determination (how long is it appropriate to use)
  - Indication for device ready/not ready for use
- Capturing/storage of images with trigger
- FDA standards for electronics?