Progress Review 3

Global Health – Spring 2017

ORIENT

Objectives

Product Values

PROTOTYPES

Heating System

Interface

PLAN

Future Plans

Vietnam Visit

Team Health

Semester Objectives : Technical

Formalize **product technical specifications**

- Stakeholder interviews
- IEC standards
- Conductive warming literature

Creating proofs of concept to bring to Vietnam

↳ two tangible prototypes: **works like** + **interacts like**

AFFORDABLE

SAFE

EFFECTIVE

USABLE

POLISHED

product values

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Exploring the feasibility of a single layer bassinet

- Discussion with the manufacturer: MTTS
- Initial CNC experiment
- Reduces COGS by $66, MTTS selling price by $110
- Searching for ways to heat uniformly enough without the air cushion

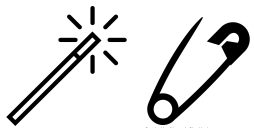
ITO Film

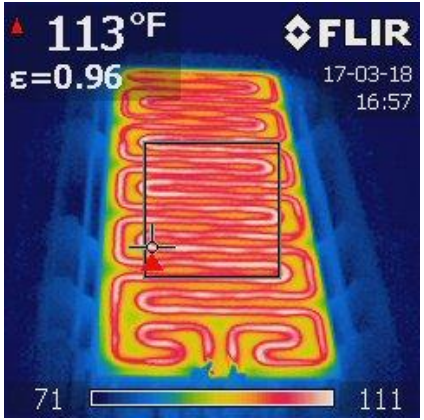
+ **Initially more uniform heating**
+ **Better translucence**
+ Easy assembly
- Sensitive to humidity & temperature
- Cycling → changes in resistance, hazy spots
- Might be less durable, and failure mode has hot spots
- Difficulty with sourcing + tooling cost

Resistance Wire

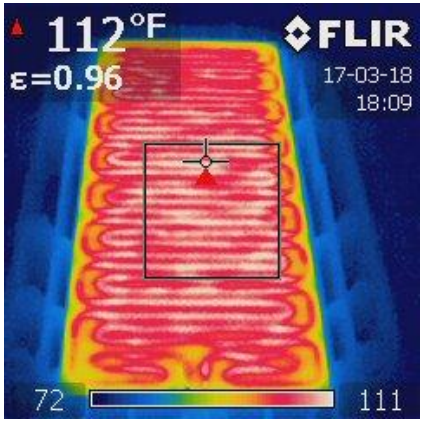
+ **Safer failure mode**
+ **Longer life**
+ Less expensive + no tooling cost
- Need to explore patterns to attempt to achieve needed uniformity, without blocking phototherapy

WINNER

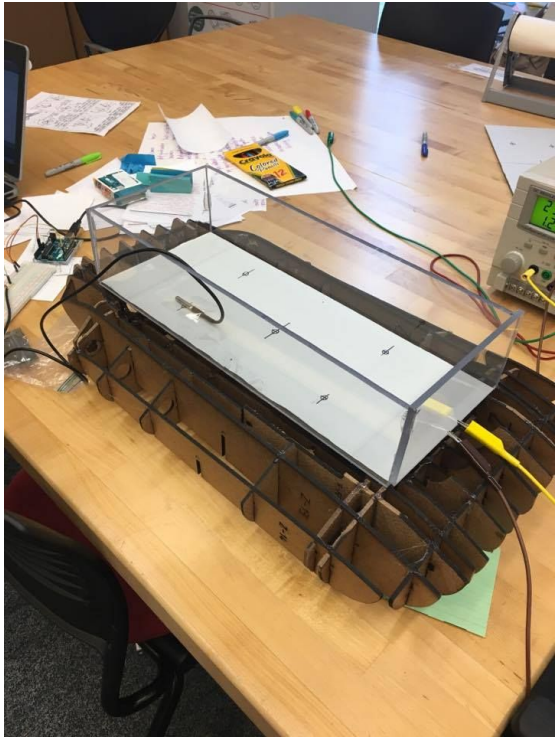




¾” : 36.7-45 C



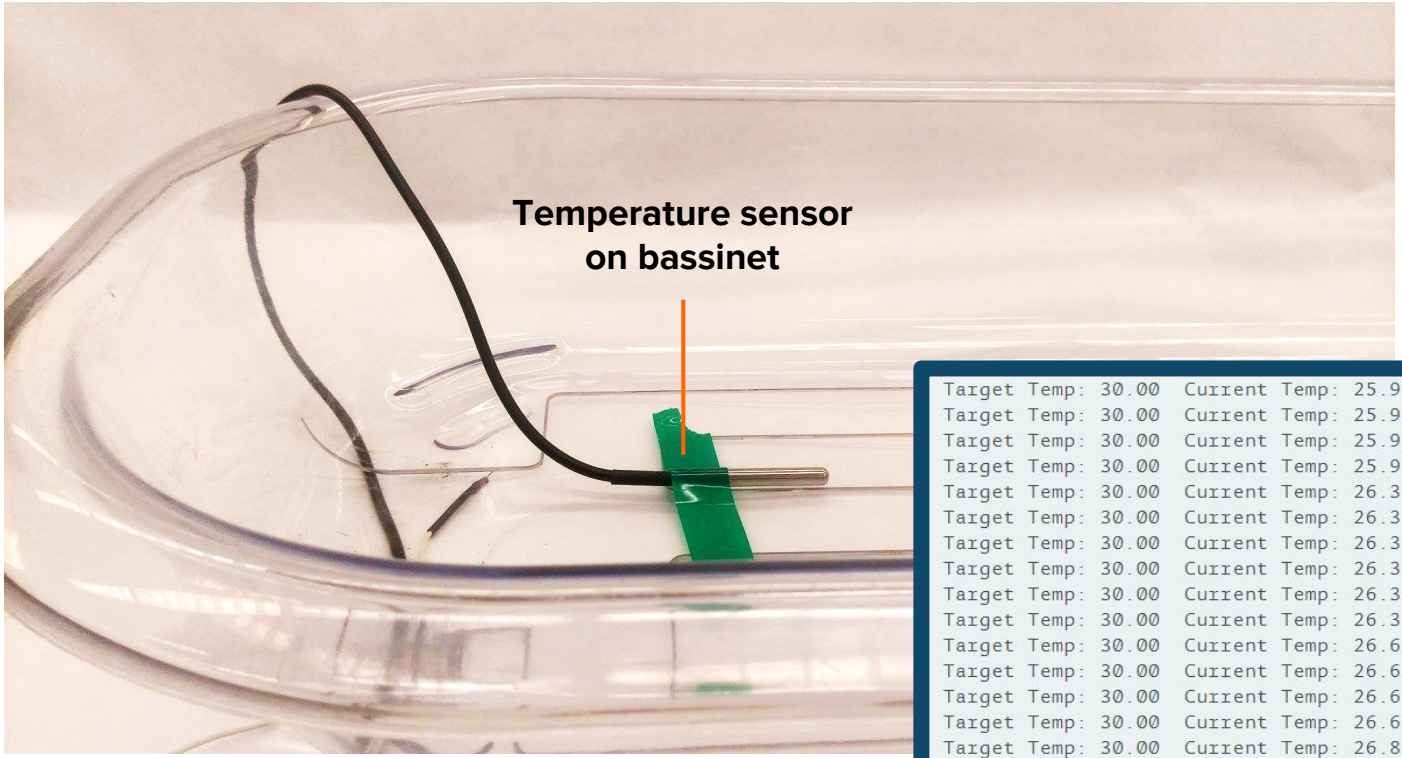
½”: 39.5- 44.5 C



IEC Testing ½”: **36-38.5℃**
Goal: 2℃ spread

⅜” Prototype

.75” Initial avg: 28.59




```
Target Temp: 30.00  Current Temp: 25.96  Error: 4.04  Control Sig:  35
Target Temp: 30.00  Current Temp: 25.96  Error: 4.04  Control Sig:  35
Target Temp: 30.00  Current Temp: 25.96  Error: 4.04  Control Sig:  36
Target Temp: 30.00  Current Temp: 25.96  Error: 4.04  Control Sig:  36
Target Temp: 30.00  Current Temp: 26.32  Error: 3.68  Control Sig:  37
Target Temp: 30.00  Current Temp: 26.32  Error: 3.68  Control Sig:  37
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Target Temp: 30.00  Current Temp: 26.32  Error: 3.68  Control Sig:  38
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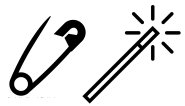
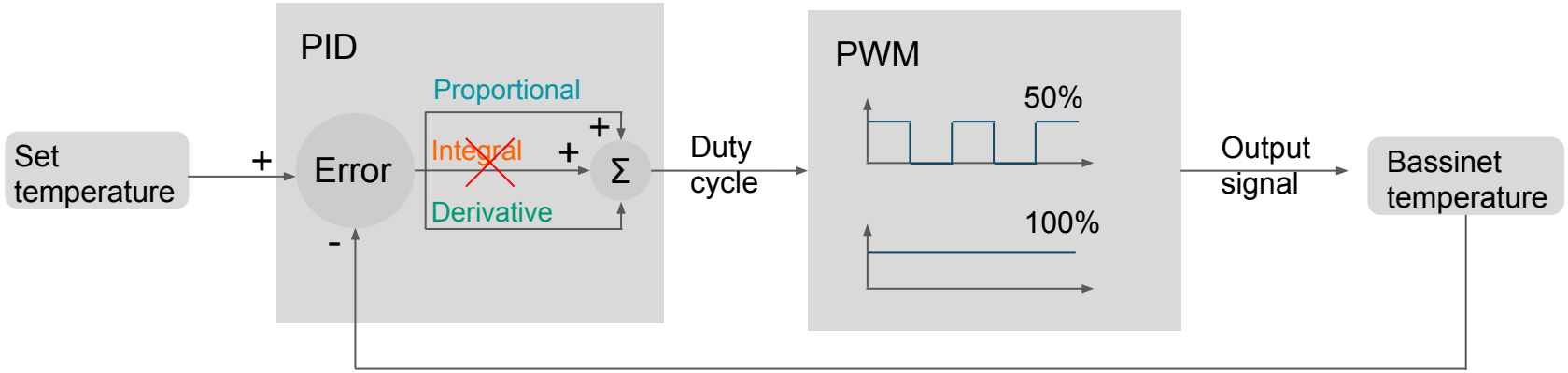


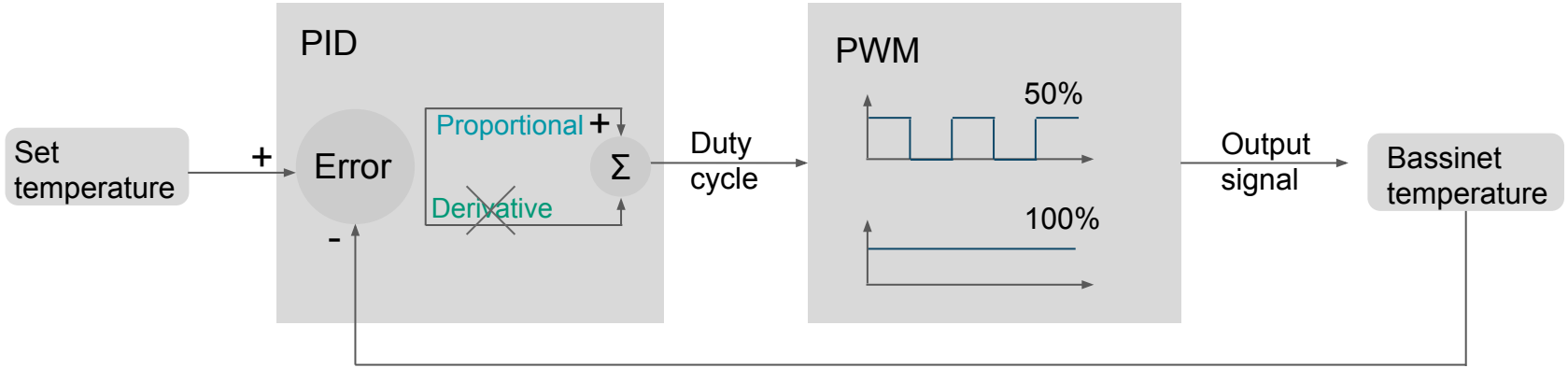
PID Control with Pulse-Width-Modulation



Challenges

- Voltage spikes with PWM
- PI terms for reasonably quick heating with no overshoots

PID Control with Pulse-Width-Modulation



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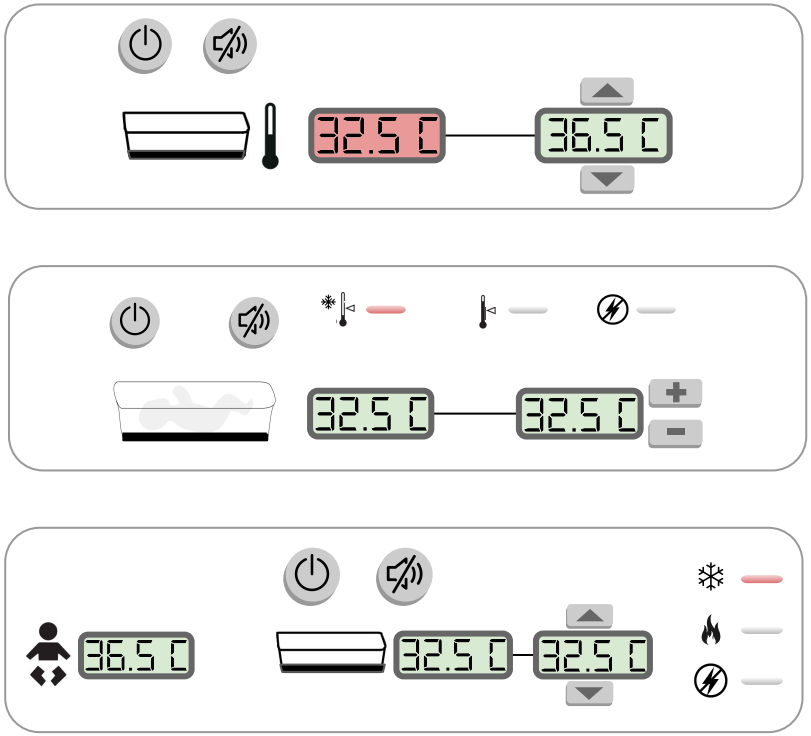
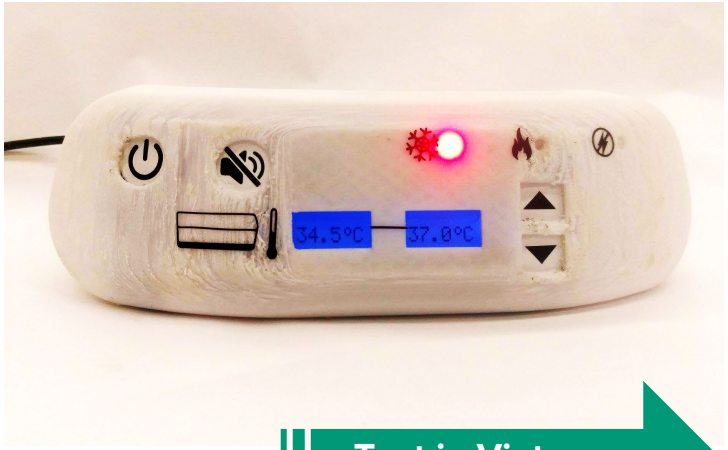


INTERVIEWS:
02 medical professionals
15 laypeople



Test in Vietnam, Newton-Wellesley

Separate icons are clearer and glanceable

Error messaging needs more testing

Monitoring is treated separately from warming

INTERVIEWS:
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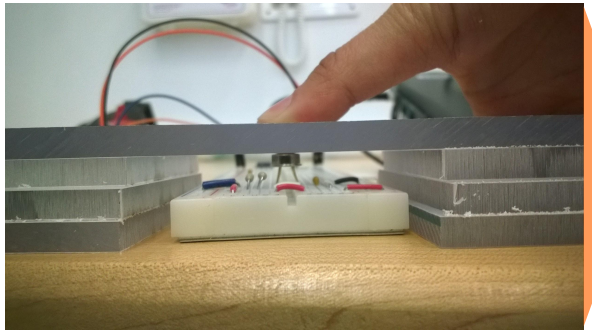
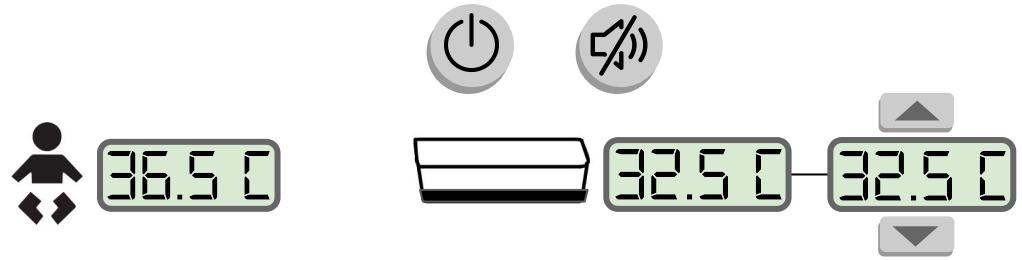
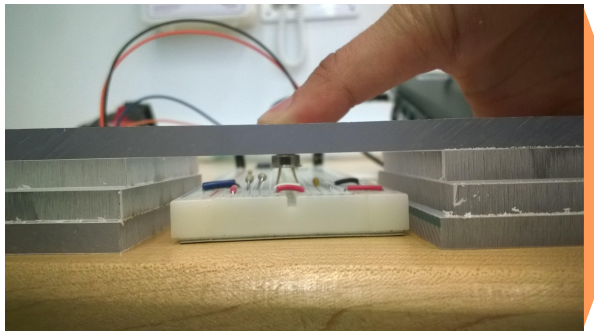
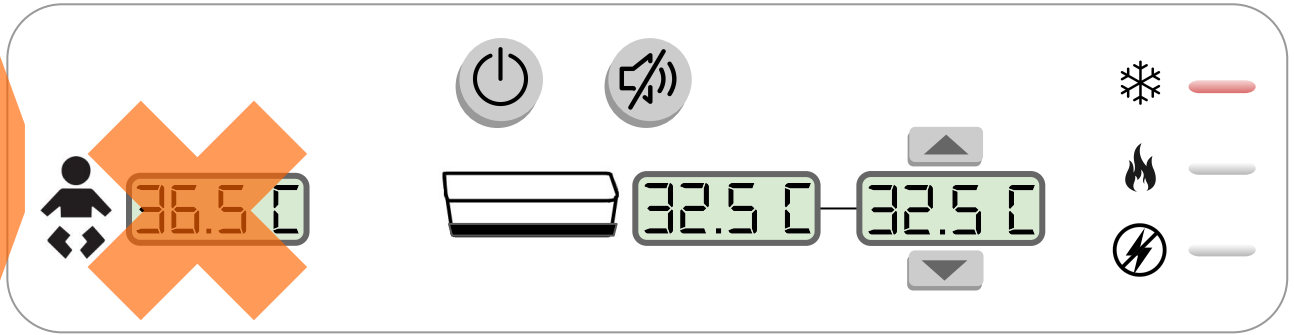
Test in Vietnam, Newton-Wellesley

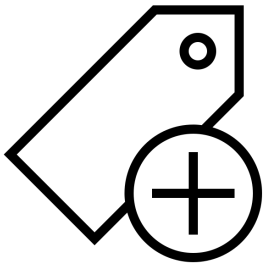




OHMEDA STYLE







- **Test in Vietnam**
- **Explore other markets**
- **Different product?**

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Future Work

HEATING SYSTEM

-Finalize uniformity, water bag, and irradiance **tests for works-like**
-**Integrate closed-loop control** with new heating
- **Contact** CNC wire bending **manufacturers** and MTTS in Vietnam

INTERFACE

-Test Workflow in Hospitals (Vietnam, US)
- Refine and make scalable
- Integrate into works-like

VENTURE

-Narrow pricing (benefit equation)
- Further value chain map of Myanmar market
    -add role of servicing equipment
    -role of donors & foundations

Future Work

HEATING SYSTEM

-Finalize uniformity, water bag, and irradiance tests for works-like
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- Contact CNC wire bending manufacturers and confer with MTTS manufacturers in Vietnam

INTERFACE

-**Test workflow** in hospitals (Vietnam, US)
- Refine and **make scalable**
- **Integrate** into works-like

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Future Work

HEATING SYSTEM

-Finalize uniformity, water bag, and irradiance tests for works-like
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INTERFACE

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VENTURE

-**Narrow pricing** (benefit equation)
- Further **value chain** map of Myanmar market
    -add role of servicing equipment
    -role of donors & foundations

Vietnam Plans

Goals

Test value proposition with district hospitals market

Understand Otter workflow and test interface

Partner with MTTS on scalability, standalone vs. Firefly companion

Preparation

Formalize hypothesis value propositions

Identify informations gaps in previous interviews
Develop and practice protocols (with translator)

Document current prototypes (e.g. BOM)

Items to bring

Works like prototype

Interacts like prototype

Spare parts, BOM

Translated cards/
Co-design kit

Team Health & Function

“It’s him! The Creator!”

Team member continuity, future onboarding

Questions?

First, interface feedback!

Phototherapy light blocking?

PID parameter tuning?

What do you think these icons mean?

What do you think each number means?

What do you think is wrong right now?

Why?

Feel free to draw arrows or scribble all over!

Appendix Slides

Progress Overview

Water bag test without bassinet temperature control

Literature search for clinical evaluation

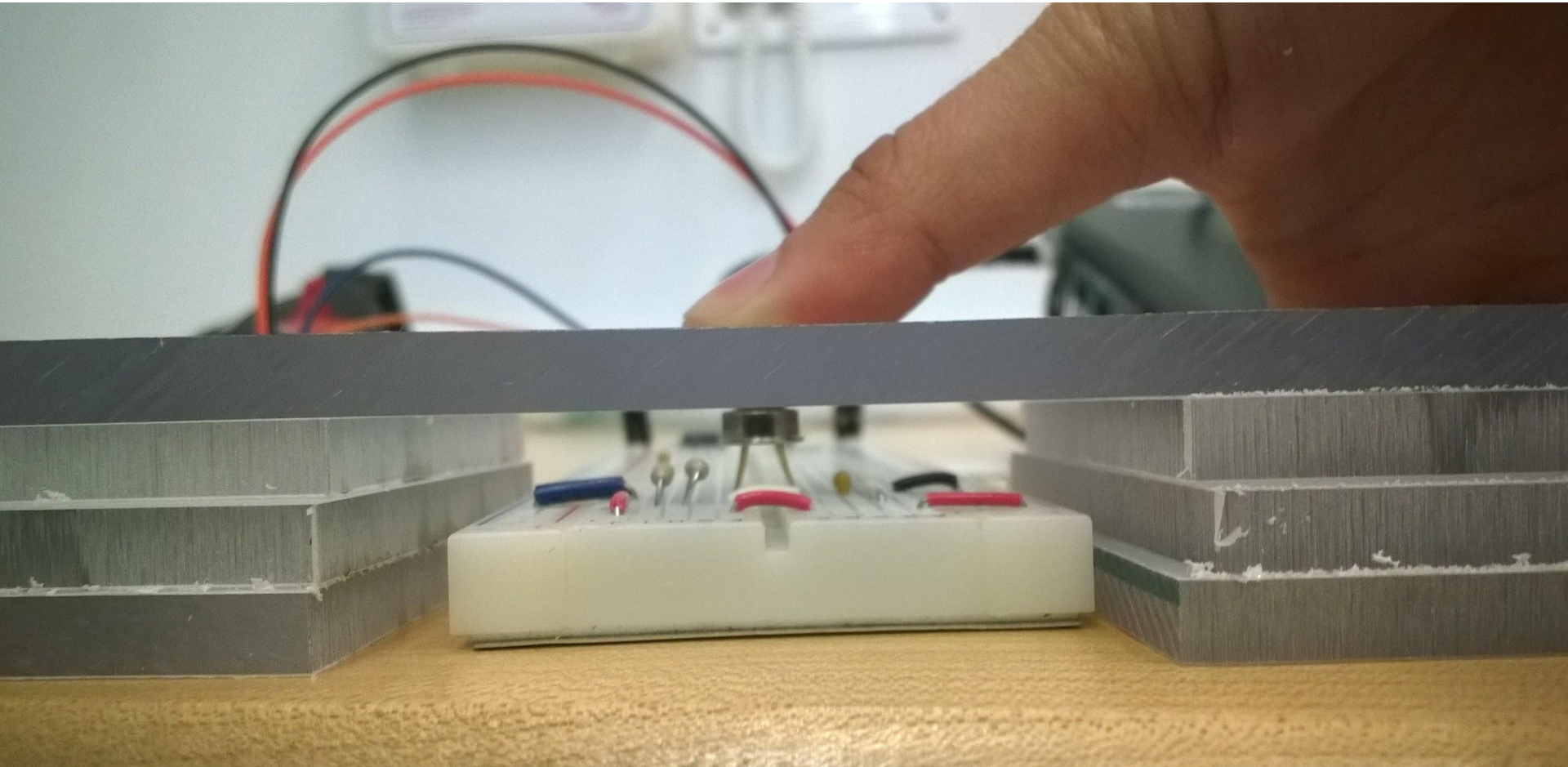
Translated IEC requirements to product specifications table

Chose heating element

Implement closed loop control around bassinet temperature

Review Product POV: Removed baby temp display, IR temp measurement,

IR thermometer



AFFORDABLE: $500 - 700 price point

DURABLE: 5-year lifespan

EFFECTIVE: even temperature control

USABLE: hard to use wrong, accessible, cleanable

AESTHETICS: looks high-quality & professional