EmberEye
Safety Beyond Sight

Using Thermal Imaging to Create Safer Kitchens

TELEDYNE FLIR — **UC SANTA BARBARA College of Engineering**

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BACKGROUND

There are over 150,000 cooking fires each year. Traditional smoke detectors only alert you after a fire has started, and they're only effective if someone is present to hear them. This limitation motivated us to create EmberEye—a smart device designed to prevent kitchen fires before they start, keeping you safe no matter where you are. With EmberEye, you can take proactive steps to prevent disasters and enjoy peace of mind in your kitchen.

PRODUCT OVERVIEW

EmberEye, an over the stove kitchen safety device, uses a combination of infrared and visible cameras to detect human and cooking activity in the kitchen, and uses an accompanying app to ensure that you're always aware of potential fire hazards. The product works passively above your stove and is built to withstand the temperatures above your stove during cooking.
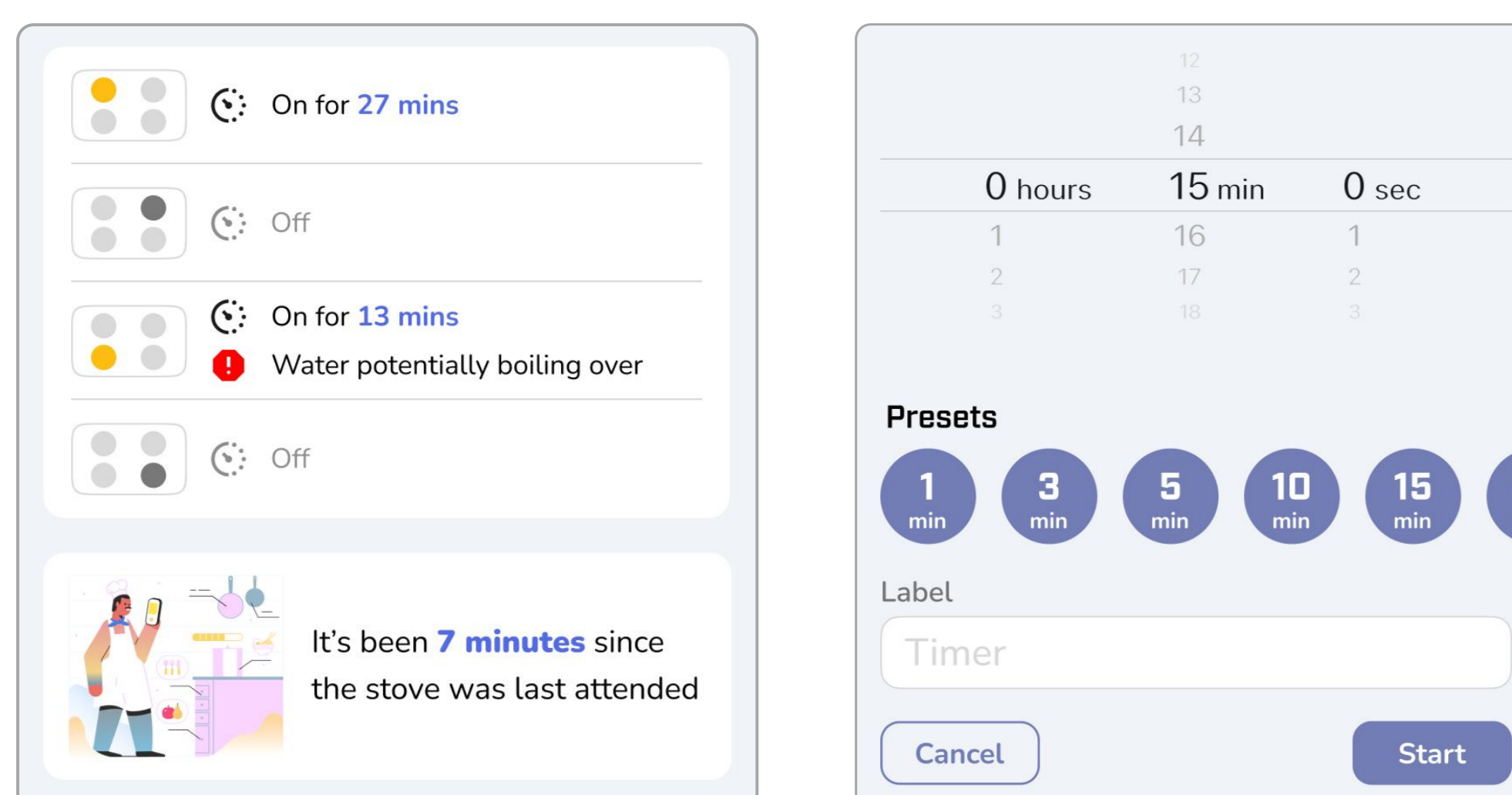
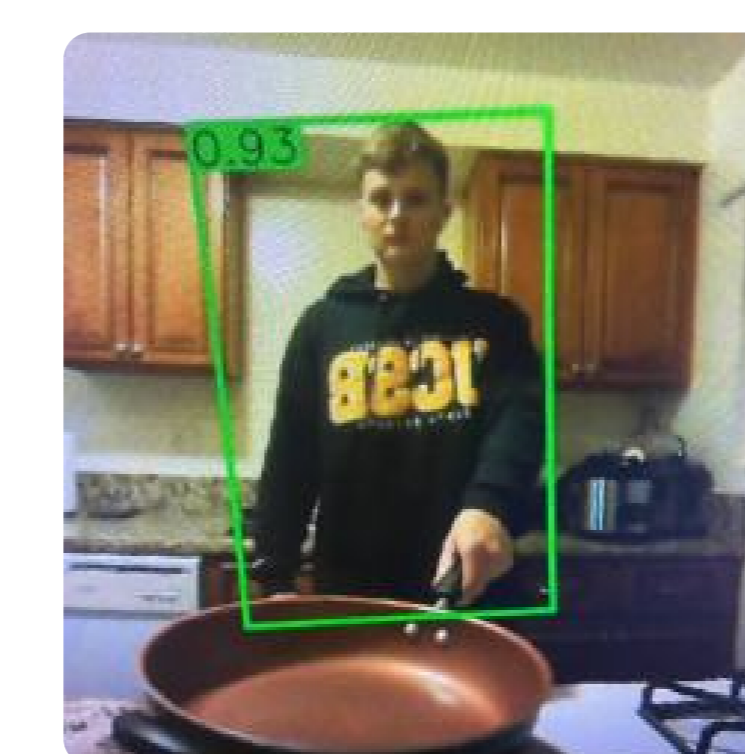## STATE DIAGRAM
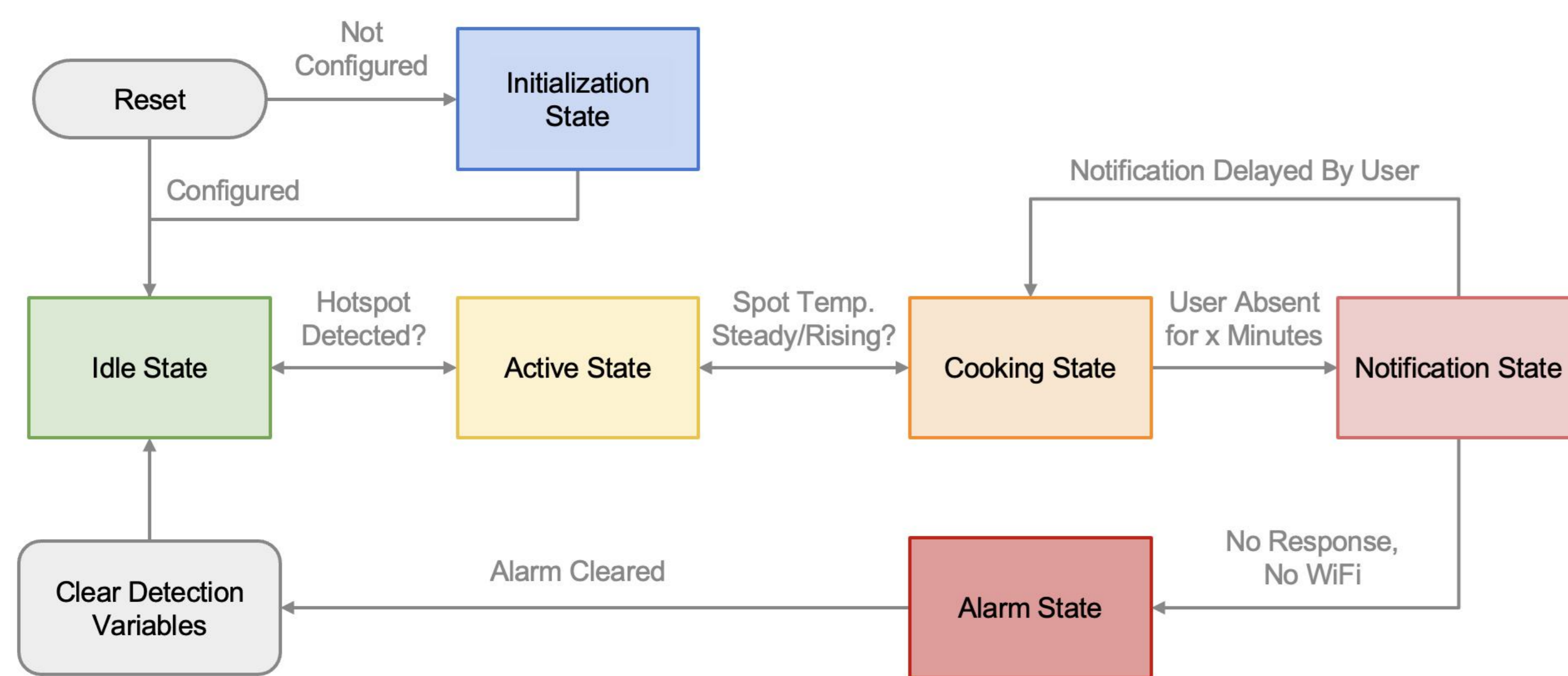
MOBILE APP
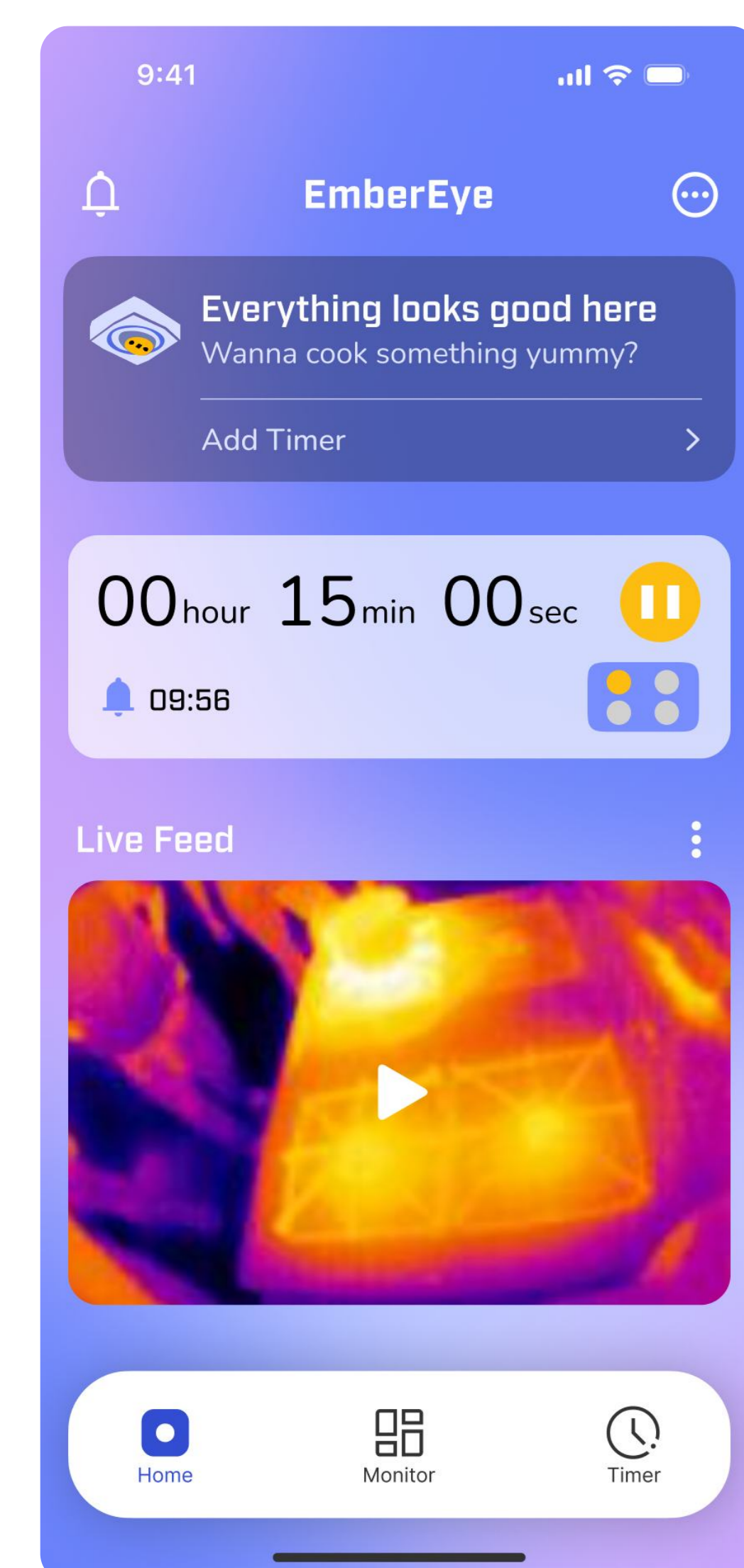
- Designed and developed for iOS mobile devices using Figma and Swift UI
- Monitor stoves through live-footage
- Receive real time push notifications in the case of dangerous events
- Track of the status of each burner (on/off, time active)
- Keep track of cooking with timers in-app
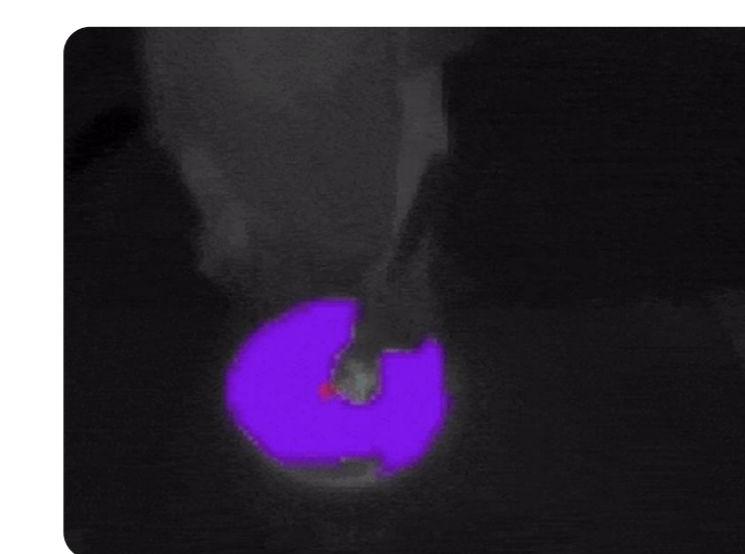
FINAL DESIGN of EMBEREYE

HARDWARE / KEY COMPONENTS

Person Detection with Yolo V7
In order to minimize unnecessary alarms, our device will make use of the Yolov7 Object detection model to detect an active user in the kitchen.


Cooking Detection
The cooking detection algorithm isolates hot regions in thermal images using adaptive thresholding. These "blobs" are tracked, with hysteresis ensuring robust cooking activity detection.
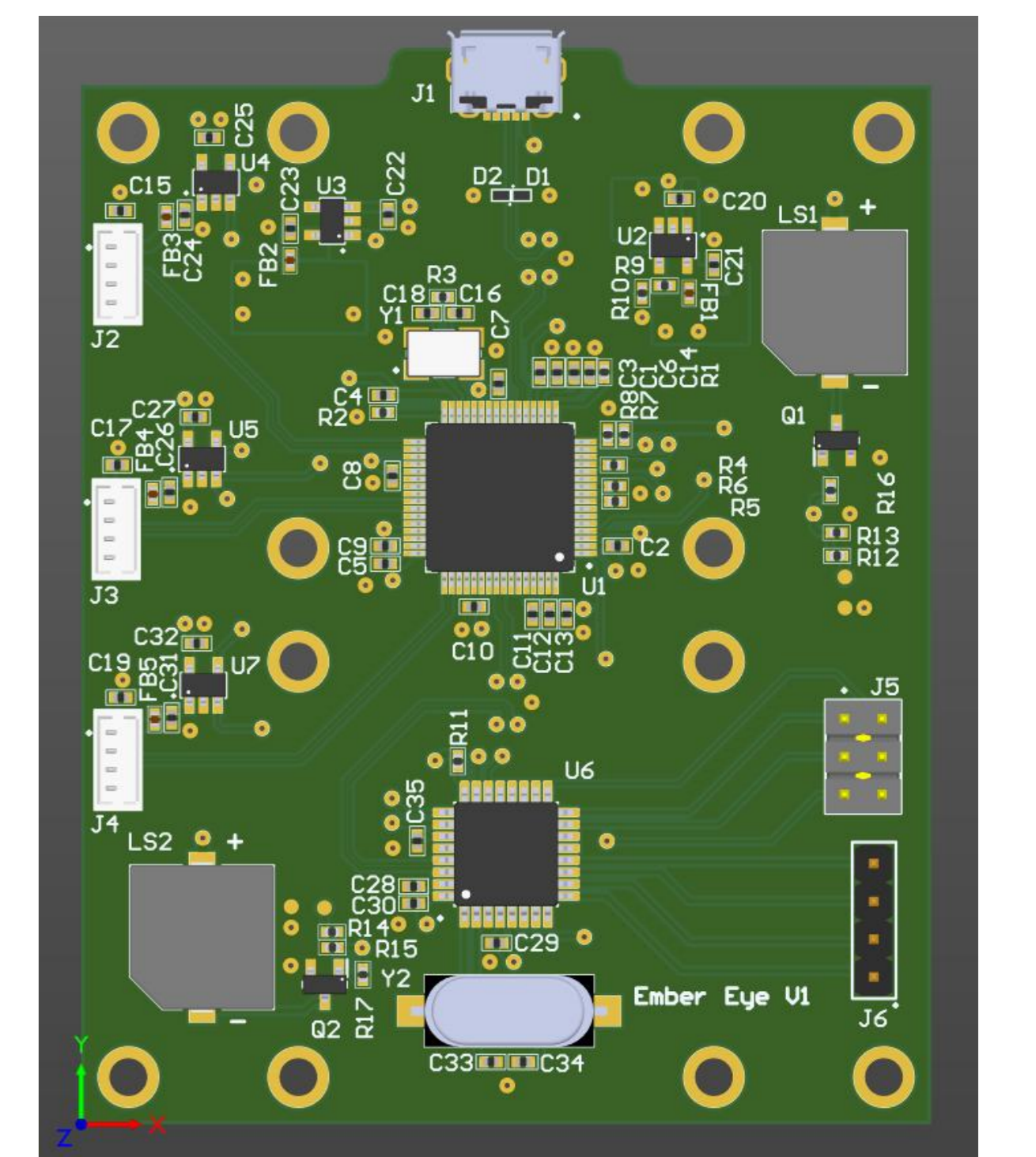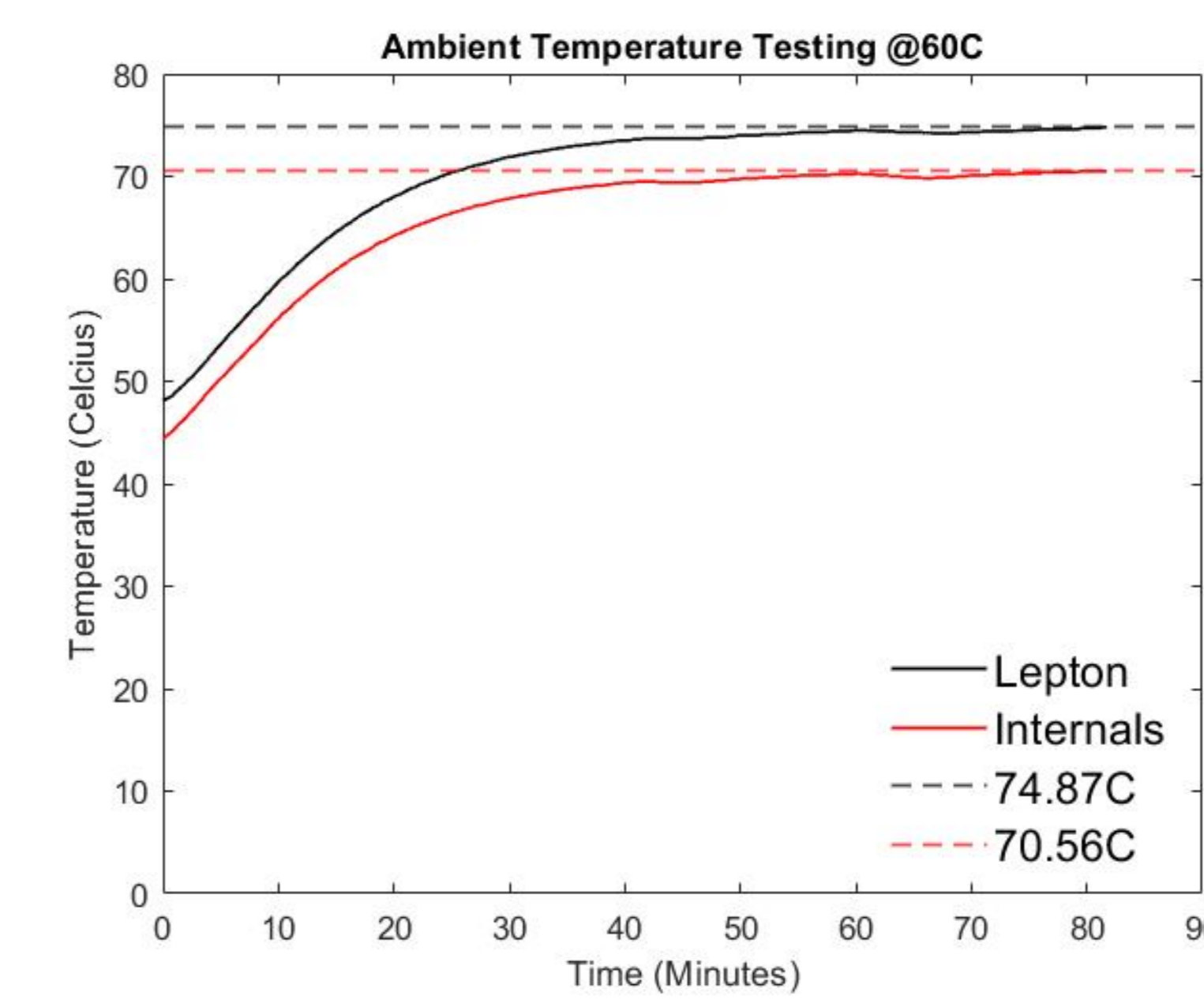

Thermal Strap
The thermal straps, constructed out of copper, were added to increase the maximum lifetime of the Lepton over the high temperatures over the stove.
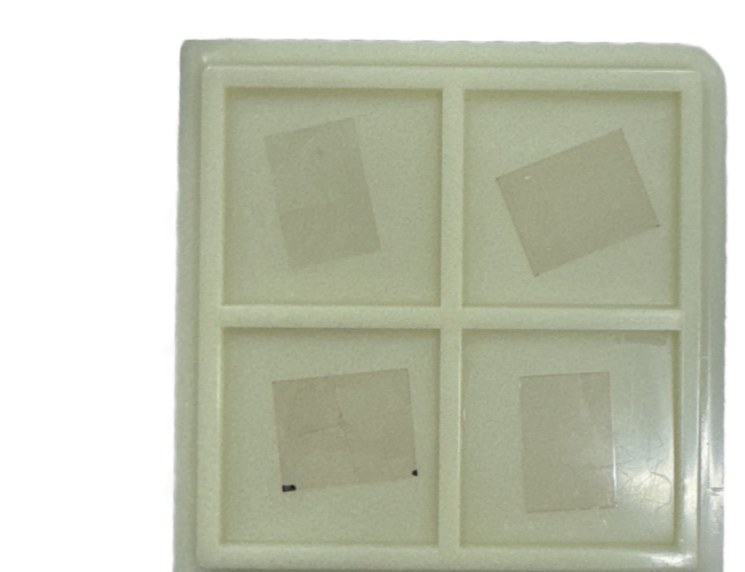
Metasurface
This collection of light scatterers yields passive aberration corrections, cleaning mechanisms, and abrasion/fluid resistance.

THERMAL CHAMBER TESTING

- Placed unit in 60°C thermal chamber for +1 hour.
- Successfully rated the unit for cooking in a 60°C kitchen environment for at least 30 minutes.
- Custom thermal straps increased cooling by 42%.

Designed a custom PCB that:
- Powers the device
- Sends and receives camera and alarm data

Singular USB cable can connect the unit to the main computing module.

EXPLODED VIEW
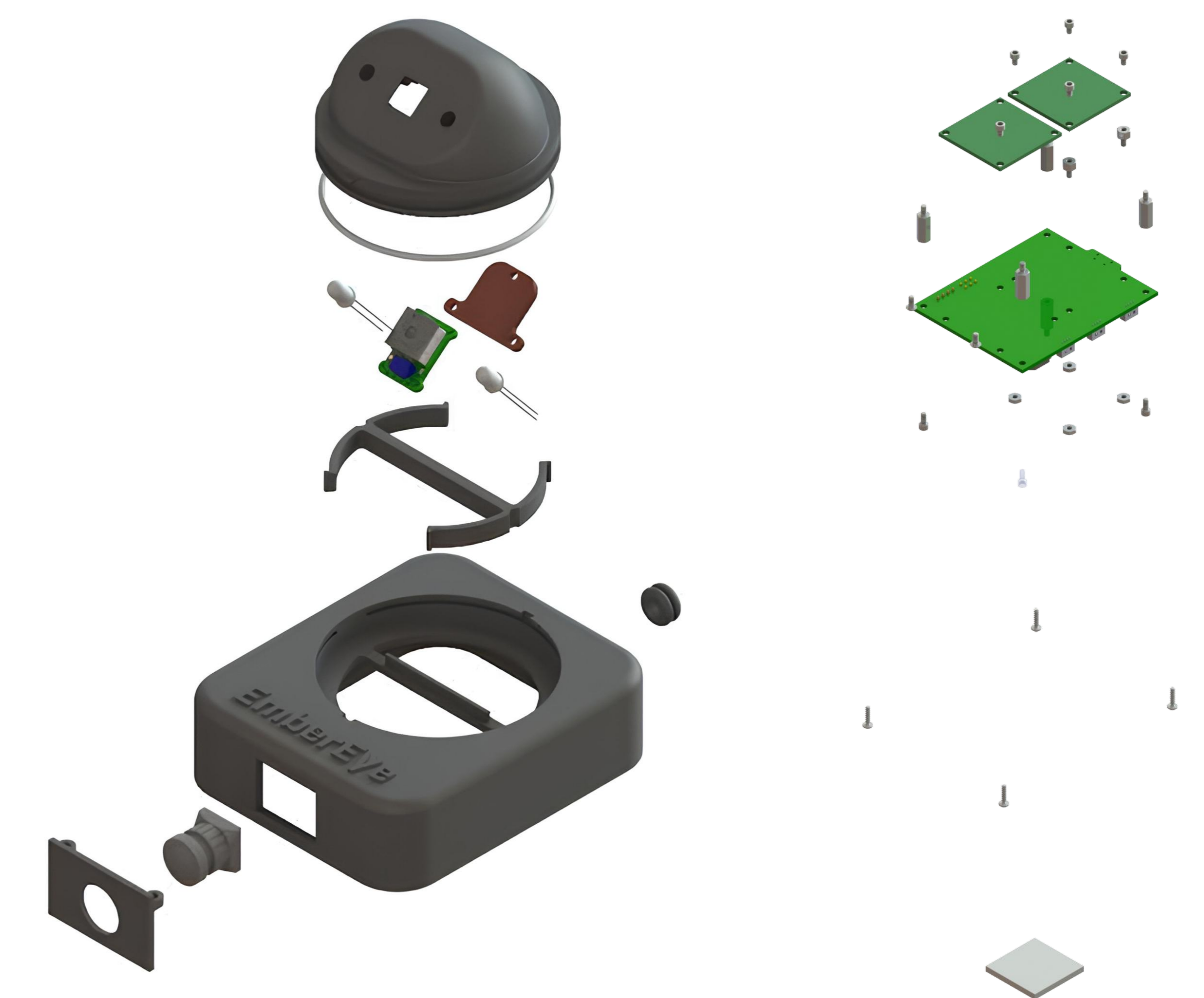
The design for the housing is a stationary base that allows for camera rotation through additional components. The components are the camera housing, the detent spring, the base, the baseplate, and the window cover. The other components shown in this exploded view are mainly the circuits and the fasteners to mount them.