Infrared Camera-Based Toaster

Cameron Barrett
Torin Schlunk

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1 Overview

The proposed project is an infrared camera-based toaster that can monitor the temperature of food during toasting. The toaster will use an infrared sensor to determine the temperature and use an algorithm to reach the desired toast amount. The algorithm will adjust the toasting time and temperature based on the food's temperature, ensuring that the food is prepared to the user's preference every time.

2 Peripherals

- Microcontroller: A microcontroller will be used to control the system and process data from the infrared camera.

- Infrared camera: An infrared camera will be used to track the temperature of the bread.

- Toaster: A toaster will be modified to integrate with the infrared camera and microcontroller.

- Bluetooth Module: An attached module will allow wireless communication to control the toast level and provide status updates.

3 Serial Interface Protocols

The microcontroller will communicate with the infrared sensor using the I2C protocol. The Bluetooth module will communicate via UART.
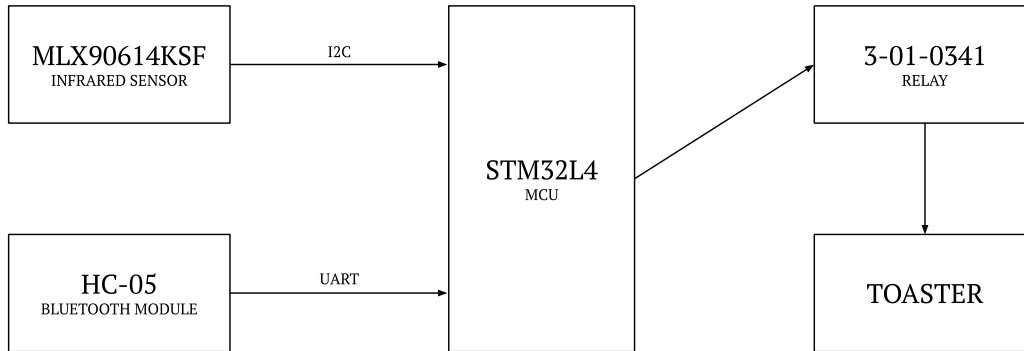
4 Block Diagram

MLX90614KSF INFRARED SENSOR — I2C → STM32L4 MCU — → 3-01-0341 RELAY → TOASTER

HC-05 BLUETOOTH MODULE — UART → STM32L4 MCU

Figure 1: Block Diagram

5 Responsibilities

Cameron Barrett:

- Infrared sensor integration

- Thermal management

- Heating element control

- State machine design

Torin Schlunk:

- Algorithm development

- Interface design

- Communication and semaphores

- Interrupt structure

6 Software Structure

The software structure of the smart toaster will consist of three main components:

- Sensor Data Acquisition: This software will process data from the infrared sensor to track the temperature of the object in the toaster.

- Toasting Control: This software will control the toasting process based on the temperature data received from the infrared sensor. Interrupts will be used to control temperatures and ejection.

- Communication Module: This component will establish wireless communication with a mobile app to transmit settings and toasting status.

7   Website

The website to track project progress can be found at: https://cameron-barrett.github.io/ir-toaster/splash.html