

Project Statement

The system is an inventory tracker. Using a range detection sensor, the system should be placed on the rear end of a consumer goods shelf in order to measure the amount of inventory in the container. The system aims to aid in food waste management by tracking how much of a shelf's inventory is occupied over the course of the work day and playing a speaker tone at the end of the work day to indicate when there is food remaining on the shelf overnight that should be taken home before it goes bad.

The goal of this system is to minimize food waste by tracking the amount of an edible product that is present in the container that the system is tracking and alerting anyone in the immediate surroundings with an audio alarm if there are still goods present on the shelf at the end of a work day, indicating that they should be taken home before they go bad.

Further development of this system will seek to track the increases and decreases in the amount of the product observed over the course of a day to track the demand of the good and indicate if the current supply of the good is significantly outside of the range of its historic values in order to inform the rate of further production to minimize overproduction.

Constraints

- The system will need to be placed at the highest elevation point of a container in order to measure the distance between itself and the farthest back product to measure used vs. empty space.
- The system will be limited to measuring the space used by a single container.
- The system will need to be informed of the time of day and when the store that it is placed in closes to sound the "items remaining" alarm.
- The system will need to be calibrated to operate with the "empty" and "at capacity" limits that are relevant to the container that it is placed into.
- The dimensions of the product in the container may limit the effective detection range of the sensor.

Specifications

- The system will use a buzzer alarm sound module to alert people around the system when the container's goods should be cleared out.
- The system will use a range detection sensor to measure the distance between the sensor and the lowest available point of the container.
- The system will use an LCD to inform its operator of the currently detected distance by the range detector in order to assist in calibrating and troubleshooting the system.
- The system will include a 16-button matrix keypad to provide an operator with the ability to input a current time and a "closing time" after which the system will consider any goods within it as needing to be taken home before they go bad.

Purpose

This system aims to reduce food waste by alerting workers at the end of the day if there is food remaining in a container that can be taken home for consumption.

Inputs

- Distance sensor
- 4x4 matrix keypad

Outputs

- LCD
- Buzzer alarm

Constraints

- The distance sensor is used to measure how much food is in the container using the distance in the direction of the bottom of the container to estimate volume.
- A 4x4 matrix keypad is used to configure the current time, closing time, and calibrate full/empty container distances with the LCD providing feedback to the user on what inputs have been detected and interpreted as.
- Upon startup, a user must enter the current time, closing time, and calibrate the full/empty capacity distances.
- The LCD must be used as a terminal to guide the user in configuring this startup data.
- Once the system has started up, the LCD should display a percentage estimate of the currently used capacity of the container.
- The buzzer alarm is used to draw the attention of those nearby at closing time to ensure that any remaining food in the container is taken home before it goes bad.

Bill of Materials

- NUCLEO L4R5ZI
 - <https://www.mouser.com/ProductDetail/511-NUCLEO-L4R5ZI>
- 4x4 Matrix Keypad
 - <https://www.amazon.com/dp/B07THCLGCZ>
- LCD
 - JHD1804 - <https://www.mouser.com/ProductDetail/713-104020111>
- Distance Sensor
 - SainSmart HC-SR04 - <https://www.amazon.com/dp/B004U8TOE6>
- Buzzer Alarm Sound Module
 - <https://www.amazon.com/dp/B07MPYWVGD>
- Breadboard
- Jumper wires
- USB 2.0 A to USB 2.0 Micro B cable
- Container for food
- Food (or substitute objects while testing) for the container