1. **FPGA based Intelligent Food Spoilage Detection for Commercial Storage**
   (Link: https://ieeexplore.ieee.org/abstract/document/9936415)

Summary

Foods can be spoiled if they are stored in the refrigerator or cold storage. Moreover, when the foods are spoiled in a cold storage, it only only creates fungus or other diseases, but also spreads disease all over the storage foods. Therefore, in this paper, the authors proposed a new approach that can be easily implemented in our refrigerators as a detection method of rotten foods. Using deep machine learning algorithms (YOLOv5), image processing methods and FPGA based food spoilage detection methods can detect early levels of spoiled foods. Thus creating buzzers will alert users to discard that food immediately and this will also maintain the freshness of other foods while preventing food poison.

Methodology

- First of all, here the system uses an FPGA based food detection system where the MQ2 Gas Sensor is used for methane gas emission from spoiled food.
- Also moisture is being detected through sensors and Object Detection Algorithm YOLO version 5 is used here for detecting specific regions of spot or disease on food.
- When the system detects any mold or fungi on the food surface, the buzzer will automatically alert the user to discard the item from the refrigerator.

Findings

When they were observing the entire FPGA system, they observed every single fragmented image for better detection of rotten food.

Novelty

The innovative side of this paper is, they developed a new FPGA based rotten food detection in refrigerators which can be easily implemented in cold storage. Also the updated version of Object Detection Algorithm YOLO is used here.

Algorithm Used

During this experiment, the researchers used Object Detection Algorithm YOLO including machine learning algorithm for image processing.

Analysis

In the analysis phase, the researchers tested several image segments at the time of image processing using RGB recognition and they could detect the spoiled area over food surface.

Research Gap

If the research paper contains a smartphone based checking process of the system, then through smartphone, the user can see the analytics of segmented images color percentage and when the food is about to spoil.

Future Work

The FPGA based rotten food detection systems can also be connected through smartphones for better overview of the shelf of foods stored in refrigerators.