

Research Article

IoT Based Smart Refrigerator for Commercial User and Retail User using Machine Learning

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Abstract

making lines for refrigerator take benefit of automated inspection apparatus that relies on cameras. As arising problem, refrigerator classification based on images from its front view is potentially priceless for industrial automation of refrigerator. However, it remains an extremely challenging task because refrigerator is commonly view against dense clutter in a conditions. In this paper, we suggest an automatic refrigerator image classification method which is based on a new planning of Convolutional Neural Network (CNN). It decide the hardships in refrigerator image classification by leveraging a data-driven mechanism and together optimizing both classification and similarity constraint. To our best knowledge, this is perhaps the first time that the deep-learning architecture is practical to the field of household appliance of the refrigerator. Due to the experiments conventional out using 31,247 images of 30 categories of refrigerators, our CNN architecture create an extremely imposing accuracy of 99.96%.

Keywords: Smart Device, Smart Refrigerator, Camera, Android Application.

Introduction

Refrigerator is the most often used domiciliary/kitchen electrical machine all over the world for food sarduiotorage. Principally this machine is used for various tenacities like store vegetables, fruits etc. Smart refrigeration module is designed to transform any existing refrigerator into a smart cost effective machine using Raspberry-Pi. Smart refrigerator compare the status of the food for e.g. expiry date, weight, quantity etc. meaning of this work will be detachable of food spoilage, reduce illness and make healthier lifestyle of modern age human being. Smart application with hypermedia abilityare being used in today's life, all the main credit goes to digitalization of technology and wide practice of internet. In this modern era, human being is used to contract with technology or we can say it as internet of things (IoT). Automation is the most essential part of our life in the there time. Automation accommodated home enables us to manage IoT devices such as Light, entryway, fan, AC, fridge, and so on. A refrigerator is the most often used electrical appliance in the kitchen all over the world for food storage space and keeping it fresh. Aeasy refrigerator can be upgraded into aelegant cost-effective engine using a smart refrigerator module which consist of sensors like load cell, gas sensor, camera module, etc. Smart refrigerator look at the status of the sustenance of food.

Literature survey

Aurel-Dorian Floarea et.al proposed a nextgeneration refrigerator connected to the IoT, a fridge that is revealed as an IoT object and connects with the things kept inside gathers data about the process this data into significant information that is later gone on through an IoT stage to its users [1].

ShoumingQiao et.al proposed a refrigerator based on the technology of RFID. A refrigerator will gather information about food items in a refrigerator and according to the food inside the refrigerator, it can provide recipes [2].

Suhuai Luo et.al proposed a system used for better nourishment and health of human life. It is planned for managing things kept in the refrigerator and inciting its users with cooking techniques depending upon what kind of item is available [3].

Kebande et.al proposed a refrigerator system that indicates how vulnerabilities can be abused and recognized possible countermeasures as a course that can secure touchy and basic data in an IoT-based condition [4].

Deepti Singh et.al proposed work on refrigerator system with intelligence, which can sense the weight of the food items placed in the refrigerator and sends a

notification to the user's mobile through a mobile app when the weight goes below the threshold value [5].

Emily Moin proposed a system that uses the barcode scanning method of getting information about the packing of the food item and communicates with the system through RFID [6].

FolasadeOsisanwo et.al gives a brief idea about a system uses RFID tagging. The refrigerator is provided with a Wi-Fi system to transmit data to the user [7].

Propose Methodology

The proposed aim aims to apply a smart refrigerator system, which is simple to use and economical for the user. It is able of notifying the possessor about their activities going on in it via wireless system on the mobile phone. The Internet of things basedsystem where they will be intelligent to see the condition of the number of milk packet kept inside the refrigerator. The whole system is govern by the raspberry PI , camera and Wi-Fi transmits all in sequence to the wireless sensors by IoT.

A. Architecture

The proposed occupation is to set up an intelligent refrigerator system, which is absolutely not hard to use and ecologist for the customer. It is ready for illuminating its owner about the behavior going on inside it by the INTERNET on the phone. The android application made here is used as a GUI (Graphical User Interface) for the customer where they will be clever to watch the state of the food item reserved inside the refrigerator. The whole scheme is manage by Raspberry Pi having Broadcom BCM2835 SoC filled high definition compact disk processors with 512mb SDRAM memory and it mechanism on the Linux operating system. It also has a built-in Wi-Fi which we will employ as a communication entry for the android application. As the weight of the foodstuff item goes below a threshold value which will be given by the consumer, the system gives a notification and ask for a refill. Similarly, if the foodstuff item starts to decompose it will ask the user to take away it from the refrigerator.

The foundation of the intelligent investigate of refrigerator is to clarify the foodstuff inside the refrigerator. Therefore, the center of this paper is how to efficiently and accurately identify the food inside the refrigerator, so that user can know the type, quantity and freshness of the foodstuff in the refrigerator without gap the refrigerator.

The Proposed word is below: -

- 1) Check freshness of the foodstuff item.

- 2) Take the image of the foodstuff item for the records.
- 3) Trace all the data in the database.
- 4) If the food id decomposing, notify the user.
- 5) Send all this data and the user will access it on mobile through the web request.

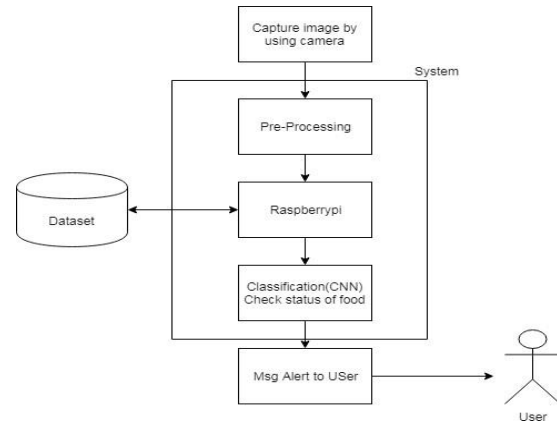


Fig. System Architecture

B. Algorithm

The Propose system uses following Algorithms:

- 1) CNN Algorithm

A Convolutional Neural Networks Introduction so to speak.

Step 1: Convolution Operation

The first building block in our plan of attack is convolution operation. In this step, we will touch on feature detectors, which basically serve as the neural network's filters. We will also discuss feature maps, learning the parameters of such maps, how patterns are detected, the layers of detection, and how the findings are mapped out.

- Step 1(b): ReLU Layer

The second part of this step will involve the Rectified Linear Unit or ReLU. We will cover ReLU layers and explore how linearity functions in the context of Convolutional Neural Networks. Not necessary for understanding CNN's, but there's no harm in a quick lesson to improve your skills.

- Step 2: Pooling

In this part, we'll cover pooling and will get to understand exactly how it generally works. Our nexus here, however, will be a specific type of pooling; max pooling. We'll cover various approaches, though, including mean (or sum) pooling. This part will end with a demonstration made using a visual interactive tool that will definitely sort the whole concept out for you.

- Step 3: Flattening

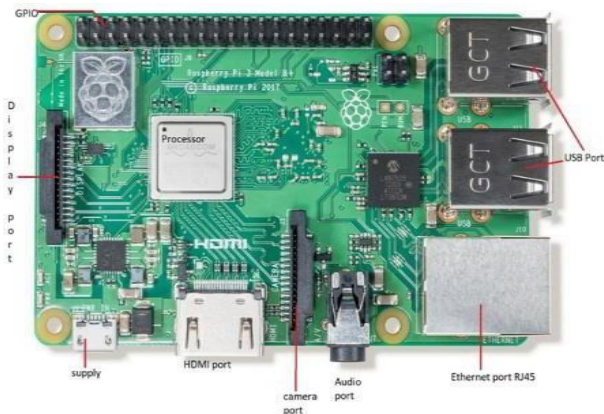
This will be a brief breakdown of the flattening process and how we move from pooled to flattened layers when working with Convolutional Neural Networks.

- Step 4: Full Connection

In this part, everything that we covered throughout the section will be merged together. By learning this, you'll get to envision a fuller picture of how Convolutional Neural Networks operate and how the "neurons" that are finally produced learn the classification of images.

Results and Discussion

Now a day's peoples are becoming an excessive amount of busy in their work in order that they don't have time to recollect what proportion daily required ingredients are there in refrigerator. Our system provides facility that if one piece of vegetable like tomatoes gets rotten then it will cause others to be rotten and if user dont notice this n ate such food it'll be harmful for his health. So we will check whether the vegetable is healthy or not. When rotten vegetable is detected that indication will be given to user. In the previous system they need done data exchange through gsm and was supported SMS. Now a day's peoples are using internet widely so we've used IOT. We are checking the vegetables quality so that human's health can be preserved. When vegetable gets rotten we'll give notification on mobile app through internet.



Conclusion

We have given a smart refrigerator application. The proposed smart refrigerator can enable prosperity. It is planned for regulating things set away in it. What's more, besides, through the intelligent refrigerator people can save some money with less effort. We are certain that such kind of smart refrigerator will be a basic part in future smart homes. The possibility of the insightful fridge is obviously more coming to than educating the customer about the substance of the fridge. The smart refrigerator is conservative and easy to use.

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