EasyChair Preprint

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What's inside my fridge

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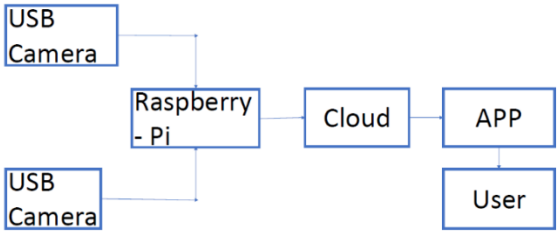
Abstract: **Buying extra groceries, don't remember what you want to buy because you don't remember what's inside your fridge is an everyday hassle. This device lets you check what's inside your fridge while you are at grocery or wherever you are and plan, you're shopping accordingly. Raspberry-pi works as a central processing unit for our project. A pi camera is mounted on the door of the fridge at a certain angle to get the whole inside picture. As soon as the door is opened, the LDR is triggered and the camera starts taking pictures. The python script takes those pictures as input using pi camera, performs image isolation using OpenCV, and then image recognition is performed using neural networks. A list of all the items is acquired and then stored on a cloud platform. The list can be accessed anytime from the respective cloud service application.**

I. Introduction

This device "What's inside my fridge" is very useful for providing an instant view of what's inside your fridge. It works anytime, anywhere whether you are at grocery store thinking what to buy, or at work planning what to make for dinner with available items in fridge. For fitness enthusiast this device is a gold, this smart fridge will keep a track of items stored inside fridge for 30 days and the user can access the history to have a glance of his/her food habits.

This easy to use simple and innovative concept can also be applied for commercial proposes. For example, in normal case scenario the restaurant owner has to maintain a daily log of grocery items which is kind of a lot of manual work, this unnecessary labor work can be easily avoided with this one simple "What inside my fridge" device.

II. Block Diagram



Block Diagram of System.

As shown in the block diagram, the input section consists of Raspberry Pi, USB Camera, WIFI Module and cloud.

III. Components Used

1. **Raspberry Pi**: It is the most important component as it will form the central control system of the project. It will also be responsible to carry out the most important job i.e. image processing. It will also control the trigger mechanism and the USB cameras along with the Wi-Fi module. It will be performing object isolation and image recognition and creating the list of items and sending images onto the cloud using Wi-Fi module.

2. **USB Camera**: USB camera mounted on the door will be responsible for taking pictures and sending them to the Pi every time the trigger mechanism is triggered.

3. **Trigger Mechanism:** An LDR will form the trigger mechanism so that every time the fridge is opened, because of the light the LDR will send a signal to the Pi for USB cameras to start taking pictures.

4. **Wi-Fi Module:** The only function of the Wi-Fi module will be to connect the Pi to the

internet and upload the list of items and images on to the cloud

5. **Cloud:** We'll be using Amazon Cloud Services which will form the online storage and make the list of items available anytime and anywhere.

6. **Python:** This will be software base for our project. All the programs for image recognition will be written in python.

7. **Application:** The application can be used to access the list of items and the images. Also, it will also have various features to make it more useful and informative.

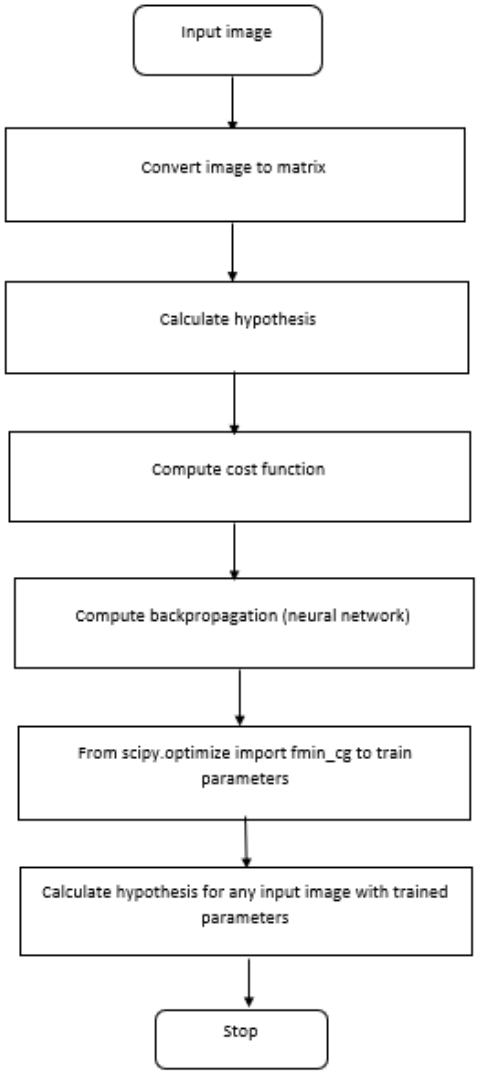
IV. Dataset

We have trained our parameters on 80000 fruit samples
Dataset source. Kaggle.com

IV. Experimental Analysis

- The original image has been reduced in size and converted to grayscale so that the computation becomes faster and efficient and due to this we get an distorted image at the output.
- After testing our algorithm on unseen dataset we got an accuracy of 90 percent

VI .Flowchart



VII. Algorithm

- **We are using neural network and using backpropagation algorithm to minimize our cost function.**
- **Backpropagation algorithm**
  - **We have used two layers with 25 units in each.**
  - **Using feed forward propagation method each layer's hypothesis is calculated.**
  - **In reverse the gradient for respective layer is calculated and updated with every iteration.**
  - **The gradient is updated until we reach a global optima.**

V. Advantages

- It can be used to manage logistics operation to control the cargo movement and product management.
- The technology can be used by suppliers. They can directly restock the commodities required by the retailer
- Image processing can be used in many places like self-driving cars to perceive the surroundings, this forms an important part of the entire system
- Image Processing has certain military applications as well which can be used in surveillance systems

VI. Conclusion

We have successfully performed and implemented image recognition algorithm and have achieved 90 % accuracy in doing so.
Further we would like to work on object isolation problem followed by the rest of the project and also work to increase the percentage of the accuracy of image recognition.
We'd also try to overcome and solve the limitations of this project as we progress further with our project.

VII. Future Scope

- The basic project principle can be in future used in any logistics operation dealing with cargo handling and product management at an unprecedented scale. This remains the case even for humongous companies like Amazon and Flipkart where the complexity of logistics operation is unimaginable.

- The idea is not only limited to large operations but also small-scale businesses where the demand and supply chain between the retailer and the supplier can be made quite efficient and seamless.

- The most important part of our project is image processing which on its own has unlimited and untapped potential for the future applications like computer vision and surveillance and self-driving cars.

- There are many companies already working with the concept of an open shopping store where you can just buy stuff, pay using digital wallets and leave without the hassle of waiting in the long queues. Cameras will track all of the products you picked and upload the list of items for the same onto the cloud and to the phone.

VIII. References
Journal Papers

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- https://www.researchgate.net/publication/311668047_Image_Processing_Using_Artificial_Neural_Networks/link/5cae5bfa92851c8d22e2fe8b/download

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