Food Detection and Recognition System

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Abstract: Obesity rates are increasing at an alarming speed due to the improvement in people's standards of living and this is reflective to the risks in people's health. To avoid obesity, everybody needs to observe their daily nutrition intake by eating healthier foods, which is the most basic method. Due to a wide variety of dishes, making decisions about what to eat is a major problem in our everyday lives. Also, worldwide obesity has nearly tripled since 1975 according to the WHO. We consider nutrition tracking should be as fast as taking a picture. So, we have built an app to calculate nutritional value of food named Healthify Me scanner. Our system also scans the barcode to read the information about food product. Thus, we propose an Android application that tracks the user's food intake by pictures using OCR. OCR works just like a human. It compares all the scanned elements with the database which simplify the work.

Keywords — food, health, obesity, nutrition, android, OCR, barcode, scanner, picture.

I. INTRODUCTION

A lot of easy to use applications were made for the purpose of dieting guidance, because of the raise of diet related diseases. Thus, we propose an integration of an OCR model with a barcode. The proposed model extracts interested ingredients from the set of recipes of user's favorite dishes that is given before using the system. The system achieves automatic food detection and recognition that tracks the user's food intake by pictures. The system can estimate the calorific and nutrition content of food by recognize it. The user simply takes a photo of the food dish upload it on the application. The system uses OCR to detect the food by crop the image into segments. Then we can scale and classify these segments into different kinds of foods by extracting the features at diff erent position. However, it's still not very convenient for people to reference nutrition (and calorie) labels comes with food packaging.

Thus, to help people determine the caloric value in the food they eat developer started to use different algorithms in computer vision. Food image detection and recognition are very important steps for dietary assessment. While using our application one need to register to prove that they are trustable user. After registration you can use our application to detect the nutrient value of any food package. The features are extracted from the analysis of favorite ingredients using a model of optical character recognition (OCR) then a user profile is evaluated. The camera is used in an OCR system which work like a human eye. It reads the character in the form of light and then evaluations are done on the processor of OCR which works like a human brain. A barcode reader is used to extract the information about product. Once you detect any food product it will be saved in your account for future reference. The system also collects history of selected dishes along with user profile in a database.

II. LITERATURE REVIEW

Research has been done to provide an understanding of the traditional models of detection and recognition of food items. The papers of previous models help us understand the old model and the limitation. By this research we will improve our models and remove all the limitations of the traditional models.

A. Survey Existing System

The model recommends food with 80 percent of precision based on the user's profile. However, some of the user has low hit ratio, this may be the result of randomly selected dishes while collecting user feedback. [1] The model uses Chinese food dataset. Chinese food is contained in a circular plate or a meal box, the food detector locates a container via circular or rectangular detection using Hough transformation. So, if food is not in specified shaped container then the food region will not be detected [2].

The model checks users twitter tweets to recommend food. This project is only for people who use twitter and talk about food in their tweets. Based on your tweets it decides your situation. Then based on your situation it recommends food. Drawback in this paper is that understanding the situation based on tweets in difficult and has very less accuracy. [3]. Full dietary chart for an

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individual cannot be perceived by this model, it will provide an individual a guideline to meet his/her nutritional needs This work can be improved by adding learning capability. Also, with income other parameters are needed to be taken under consideration [4]. In the current OCR system, you can edit the characters recognized [6]. In [7] they tried to find information about multiple food items on the screen.

B. Limitation Existing System or Research Gap

To make user aware of their eating habit problems such as junk food, unhealthy diets which are useful for disease prevention and dieting, eating habit recording services plays an important role. It is very tiring and time consuming to select food items from huge menus. Selecting from manual menus can be inconvenient to the diner. When there are more than one food items on the plate then identifying can be a struggle. Big drawback is that the application requires the food to be clicked with a static background which seems very infeasible.

Recognition and recommendation systems are not in one single app. There is no app where food is recognized by image and also recommends food based on remaining calories. The current OCR systems can be improved by re-defining line ends and text alignments, maintaining the font type and font size [6]. Increasing the accuracy by using multi-tasking learning [7].

Table 1: Literature review

No	Paper	Authors	Pros	Cons
1	Personalized Food Recommendation Using Deep Neural Network	Tossawat Mokdara, Priyakorn Pusawiro, Jaturon Harnsomburana	Model recommends dishes from user preference and eating history	Some of the user has low hit ratio, this may be the result of randomly selected dishes while collecting user feedback
2	NutriTrack: Android-based Food Recognition App for Nutrition Awareness	Arnel B. Ocay, Jane M. Fernandez, Thelma D. Palaoag	Application implements food recognition and nutrition estimation	The study shows that respondents' level of food nutritional awareness is remarkably low as to the status of cognizance about food intake
3	Situation-based Food Recommendation For Yielding Good Results	Takuya Kadowaki, Yoko Yamakata, Katsumi Tanaka	The system successfully escaped recommending such foods that yield bad results, and as a consequence, bring good results to the user on the similar situation	The system is not able to recommend wide categories of food items. Understanding the situation based on tweets is difficult and has very less accuracy.
4	Income Based Food List Recommendation for Rural People Using Fuzzy Logic	Muhammad Abrar Hussain, Sadia Yeasmin, Sadia Chowdhury, Farhan Rahman Wasee, Sadia Afrin, Sarkar Md Tanzim, Rashedur M. Rahman	Model provides an individual a guideline to meet his/her nutritional needs.It will help people in managing their nutritional needs with their income level.	Full dietary chart for an individual cannot be perceived by this model. Also with income other parameters are needed to be taken under consideration.

III. IMPLEMENTATION

We have built an android app for finding the nutritional and caloric values of a food item. The name of the app is Healthify Me Scanner. The two technologies used are optical character recognition and barcode reader. The app is built on the android studios. Various permissions and libraries are used to make the android app. It is created keeping in mind the people who are health conscious and also those who have to monitor their nutrition intake. This app is time saving and efficient.

A. Optical Character Recognition

Optical character recognition or optical character reader (OCR) is used to convert images electronically into text format l. It is a well-known technology that detects texts in the image and basically converts it into documents. OCR technology is used to convert these scanned documents into machine-readable text data. OCR systems have multiple steps which are used to find loops or problems in the current method in the character recognition. [6] The system can provide some great results if the errors are rectified and the system is trained well. OCR technology is used in an Android app. It is made possible by providing camera permission and google OCR libraries.

B. Barcode

A barcode or bar code is a technology that is used to store information about various objects in the visual format. The machine-readable format is a collection of varying widths of parallel lines. Barcodes are linear or one-dimensional. They can be scanned by special optical scanners, called barcode readers. Two-dimensional (2D) variants of barcodes were developed, using various geometrical patterns like rectangles, dots, hexagons . Such barcodes were called *matrix codes* or *2D barcodes*. 2D barcodes can be read using application software on mobile devices. For real time implementation with proper hardware and software requirements fulfilled, barcode systems are effective. [8] Barcode readers can be integrated in an android app. Camera permission is required and google libraries.

C. The Android App

Android is a mobile operating system designed primarily for touchscreen mobile devices such as smartphones and tablets. The GUI of the android is very attractive compared to other systems [9]. Android based systems are one of the fastest and cheapest methods to keep a track on your nutritional and caloric intake. Before you can scan the food, you have to sign up and then login with your email id. The food in front of you should be scanned. Using the camera permission and OCR library, the characters on the packaged food will be identified. You have to click on the word and you can also edit it. Once the food object is identified, then the nutritional and caloric values are shown. If the object is

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not identified then you can use the barcode reader and scan the barcode on the package. The scanning will finally give details of the food item. All the scanned food objects go in the history section. You can see all the details of the object later too in the history page. The most frequently needed object can be favorited and you will see it in the favorite page.

Finally, you log out. But if you want to login but you have forgotten your password you can change it. You can also change the password if you think the password is too weak or complicated to remember.

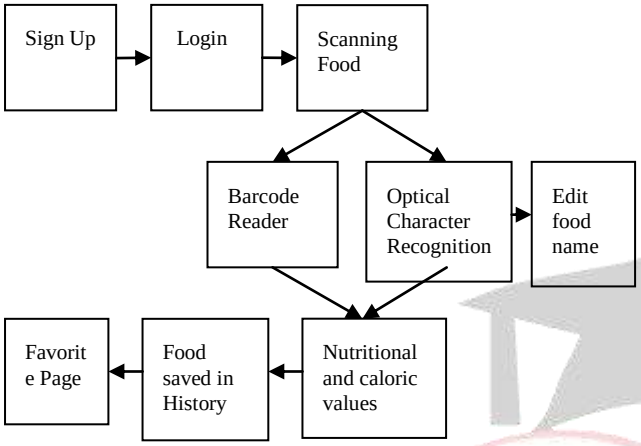

Fig 1: Implementation flow

IV. RESULT AND DISCUSSION

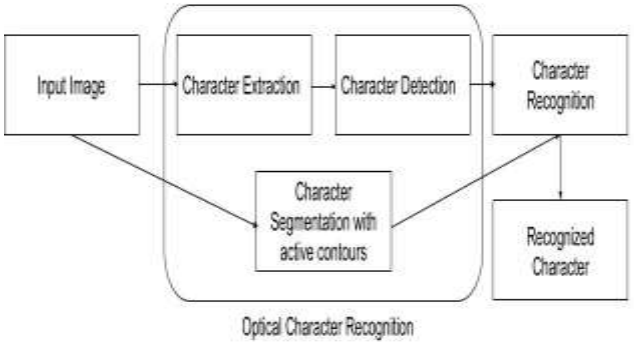

Fig 2: Optical Character Recognition

The image undergoes the OCR process as shown in Fig 2, implementing the various subpart processes for character recognition. The food package is detected using the camera permission and OCR in the Android Studio. This results into recognition of food item which then searches the world wide web for producing the nutritional content of the detected food item. If sometimes due to any external damage to the food package the OCR model could not detect the food package another alternative is used.

The alternative used is barcode reading. The Barcode reading undergoes the process as shown in Fig. 3. The Barcode lines are scanned using the camera permissions in the Android App studio. Later, the content stored in the barcode is decoded to provide the information of the food package present in it. The information is filtered in order to retrieve the nutritional content of the food package and this results in detection of the food package using barcode methodology.

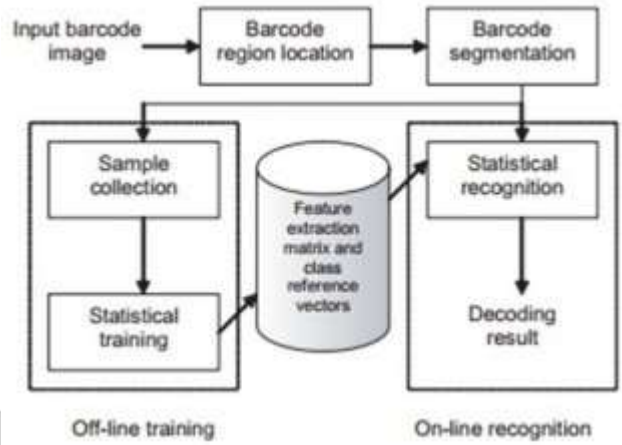

Fig 3: Barcode Processing

In most cases, character level is the parameter to judge an OCR technology. How many times a character is examined correctly versus how many times a character is examined incorrectly defines an accuracy rate of an OCR software. According to studies, an achieved accuracy is 99%. Means that 1 out of 100 characters is uncertain. Obviously, the accuracy rate of the conversion plays an important role. Most of the OCR software provides 98 to 99 percent accuracy. This level of accuracy is acceptable in most cases. OCR results depends on the quality of the source image. If the quality is good then it will give you a very good result. If the source image is not clear then it will include errors. You can easily distinguish the characters from the image if the quality is good and it will give you a more accuracy. Low contrast may lead to poor OCR. By increasing contrast and density of the image, OCR process can be done in the scanning software to increase the accuracy. Or this can be done in any other image processing software.

V. CONCLUSION

In this paper we have directed the effectiveness of using the Optical character Recognition model along with the barcode methodology for the detection of food items. Firstly, a fully functional user profile is created allowing user access to the basic features like favorite the food item, view history, etc. Secondly, the user snaps the food item using a camera. OCR and barcode methods are applied on the image and the data from the web is retrieved in order to detect the food item along with its nutritional content present in the food item. We have worked on matching the characters using OCR and barcode and retrieving the data about the food item from the web. We have tested the app

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for different images and the OCR and barcode-based method provided impressive results.

The processing speed in the traditional method for food recognition and its content is slow, less attractive and not automated. Thus, the Android based systems are cheap and give an automated solution for detection and recognition of the food items and its content. The system also provides customer satisfaction by detecting the nutrient content of the food item and ensuring better health of the customer. This system provides really commendable results but there are certain things that can be improved and added. The OCR and Barcode methods are not efficient in detecting food dishes. Thus, the future research can be directed towards using Machine Learning and Artificial Intelligence techniques like RCNN and Deep learning. It would improve the efficiency and accuracy of the system.

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