



Calorie and Nutrition Measurement Based on Food Image Processing

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Abstract: Now a day, people across the universe are becoming more sensitive to their diet. Unbalanced diet can cause many problems like weight gain, obesity, sugar, etc. So different systems were developed so as to analyze food images to calculate calorie, nutrition level etc. This paper gives a brief review of these systems and proposes a effective way to measure and manage daily food intake of patients and dietitians. The system will take the images of food and using image processing and segmentation, it calculates the nutrition and calorie content in the food. The proposed system will certainly improve and facilitate the current calorie measurement techniques.

Keyword: Calorie estimation; nutrition measurement; segmentation, support vector machine;

I. INTRODUCTION

Body Mass Index (BMI) is a person's weight in kilograms divided by the square of their height in meters. It is one of the most commonly used ways of estimating whether a person is overweight or not [1]. A person is considered obese when his / her BMI is higher than or equal to 30 kg/m² [2]. The rate of obese person is increasing in alarming rate from last few years [3]. Also studies have shown that there are many chances for obese people to prone to serious health problems like hypertension, heart attack, diabetes, etc [4]. So the main cause for obesity is imbalance of the amount of food intake and energy consumed by the individual [5]. So it is necessary to have healthy meal.

Therefore, different systems were developed which would measure the nutrition level of the diet and helps the patients and dietitians to control their obesity. This paper reviews the different systems which had taken the food images to measure the calorie and nutritional level in the food sample [6-13].

Section 1 has given the brief introduction which included the necessity of the system, a brief idea about the system. In the next section, review of different systems is presented. The review will tell individual about the current status in the food measurement field. The III section includes the details of proposed system. It is followed by the conclusion and references.

II. DIFFERENT NUTRITION MEASUREMENT SYSTEMS

People have started to give preference to their health, type of meal, workout in order to keep them away from the health problems. Different researchers have also contributed to reduce the health problem of people by developing various systems that would assist patients to keep them fit. Here in this paper, few contributions based on measurement of nutrition level from food images are considered.

A Diaware system was proposed which was content aware wearable food and activity recognition system. It monitored and assisted diabetic patients with regard to their calorie intake after running food image recognition algorithm on the food image taken from user's plate. The algorithm also uses the user preferences and environmental context information for the greater effect. Wearable were used to monitor patients calorie burnt during the day. The performance of system was accurate for special type of meal and therefore there is large scope for the improvement [6].

Kitamura et. Al. developed web based personal food logging system for dietary control. This web based dietary management support system analyzes image achieves of the user to identify image of meal. It determines the nutritional composition of these meals and stores the data to form a foodlog. There is facility for user to view data in different formats and can edit the data to correct any mistake that might occur during image analysis. With the help of pre classification and personalization, accuracy of food balance estimation is significantly improved [7].

Different systems that were developed for nutritional measurement from food image involved image classification for which different recognition algorithms were developed. Pouladzadeh et. At. Also had developed a new recognition algorithm which considered the shape, size, color and texture characteristics of food image. Using various combinations of these features a better classification is achieved. Thus based on results about 92.6% is the accuracy of new developed algorithm for food recognition [8].

A semi automatic system was proposed which measure the caloric from the food intake. System utilizes nutrition table for better results. System used camera to record images of food before and after eating it for accurate measurement of calorie value. After taking the food image, shape, size, color and texture features are extracted and given to support vector machine for recognition of food and then using nutrition table, calorie value is measured. Disadvantage with the system is that it didn't considered mixed or even liquid food [9].

A mobile Diet Data Recorder System (DDRS) was developed to address important hypothesis related to diet and health. The DDRS consists of (1) a mobile device integrates a Smartphone and an integrated laser package, (2) software on the Smartphone for data collection and laser control, (3) an algorithm to process acquired data for food volume estimation, which is generally the largest source of error in calculating dietary intake, and (4) database and interface for data storage and management. The estimated food volume, together with direct entries of food questionnaires and voice recordings, could provide dietitians and nutritional epidemiologists with more complete food description and more accurate food portion sizes [10].

The major problem that many other systems were facing is the identification of meal. So a IMG 2 calorie system was an innovation which uses the combination of image recognition and comparative analysis to identify meals, fruits from average definition photos. The system determined the depth of each pixel in an image, matches the results in the database of nutritional information, and then took in to account portions by gauging the size of the food relative to the plate its own. In one test IMG 2 calories was able to calculate the accurate caloric total of two eggs, two pancakes, three strips of bacon, and accompanying condiments but much of the work is gone in vain [11].

This system was developed to identify if the food image is good or rotten. If it is found to be good then it is taken for calorie measurement analysis and classified based on standard calorific tables using Self- Adaptive Resource Allocation Network [SARAN]. Then, based on the BMI of a person, the result alarms about whether the food under analysis is suitable to the person or not. The results show that the accuracy of the system is acceptable and it will greatly improve and facilitate current manual calorie measurement techniques [12].

A food image recognition system for measuring the calorie and nutrition values was developed. In this system the food area, size and volume is used to calculate the calorie and nutrition in accurate way. The user need to take the pictures of the food image, this system will classify the image to detect the type of food and portion size and the recognition information will estimate the number of calories in the food [13].

All of the above developed systems are not so accurate to rely on them. Some were good in measuring the calorie and nutrition level of some specific food type with predefined size. Some uses the high definition cameras to take pictures of sample food. So keeping these disadvantages in mind there is scope for an efficient, low cost, simple system to assist the patients to control their calorie value and nutrition level.

III. PROPOSED SYSTEM

Reviewing the different systems, it is possible to develop another low cost simple system so as to accurately measure the calorie and nutritional level in the food. The block diagram of proposed system is as shown in the fig1. User need to take the image of the food before and after the meal for the accurate measurement of calories. The next step of system is segmentation, each image will be analyzed to extract various segments of the food image portion. Out of various tools available for segmentation, color and texture segmentation tools are used for the effective measurement. Various food features including size, shape, color and texture will be extracted and sent to classification step where, using the Support Vector Machine. Thus using the above steps, portion of food is recognised. Finally, by estimating the area of the food portion and using some nutritional tables, the calorie value of the food will be extracted.

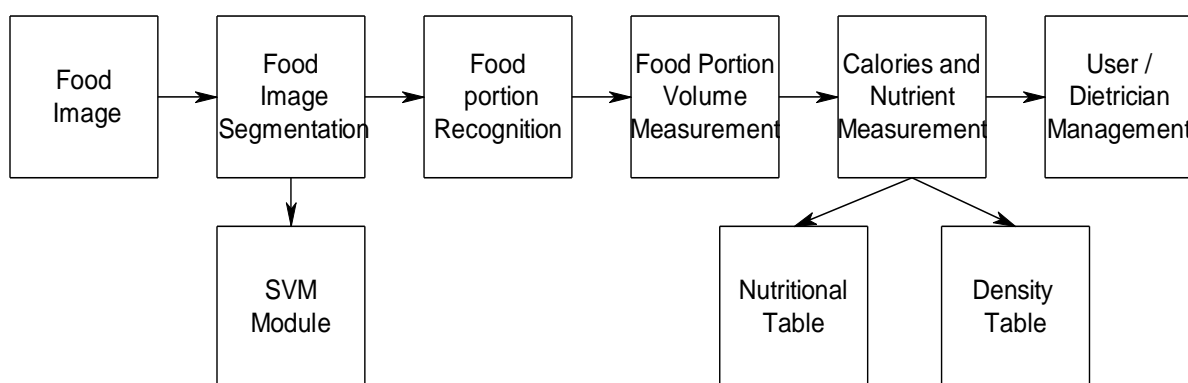


Fig. 1: Block diagram of proposed system

Conclusion: People across the universe are becoming more attentive towards their health. They are adopting various ways to keep themselves fit. One the way is to measure the calorie and nutrition level in the meal. This paper has given a brief review of different calorie and nutrition measurement system. After discussing various systems, it is found that there is scope for another system that can develop in order to help the patients and dieticians. A system is proposed which uses segmentation and classification using Support Vector Machine to measure the calorie and nutrition level in the meal. System is cost effective and simple. Practical results of the system might boast the research in the field of food processing.

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