Personalized Smart Diet Assistance System in Health Care Prosperity with AI and AR

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ABSTRACT

Health care prosperity is the most challenging task for human being in the present dangerous COVID scenario and the discovery proposes an augmented reality based personalized smart diet assistance system which provides diet recommendations, appropriate time, type, quantity and method of consumption of a food item diet based on user health parameters based on location and event activities. The augmented reality based system comprises a user data input, an image processing, food consumption assistance, transmissible disease information retrieval and diet planning modules. The system incorporates an AI based camera to scan a food item before or after cooking and utilizes augmented reality to indicate the nutritional information. The proposed system provides personalized diet recommendations to the user based on personal data such as height, weight, existing medical conditions and thereof of a user. The system retrieves existing transmissible diseases data from world health organizations and data from news articles about any viral infections or diseases to suggest immunity boosting foods to the user to thereby safeguard the user against such diseases or infections.

1. INTRODUCTION

The present disclosure generally relates to the technical field of computer-aided reality systems, and in specific relates to an augmented reality based personalized smart diet assistance system that provides diet recommendations, appropriate time, type, quantity, and method of consumption of a food item in connection with image processing based on user health parameters [1-5].

1.1 Background

In search of success and financial settlement individuals often neglect details about the food they consume such as eating healthy food, maintaining a certain diet, and the amount of calories consumed thereof. Such negligence results in many long term and short term diseases related to malnutrition or over-nutrition. There is scientific evidence showing a direct relationship between the alarming global increase in the prevalence of human chronic diseases and malnutrition, insufficient physical activities, and other unhealthy lifestyle habits.

Some of the chronic diseases include diabetes, hypertension, dyslipidemia, congestive heart failure, obesity, some types of cancer, and others. The inability to change these unhealthy dietary and lifestyle habits can lead to prolonged periods of undetected and unmanaged health problems that in turn, increase the financial burdens on patients and the global healthcare systems. Research has found that certain diets are better for health and have a smaller impact on the environment.

However, people struggle to make food and diet choices that are beneficial for their health and the environment. This can occur due to many reasons such as lack of knowledge or awareness, and lack of access to affordable, nutritious, and environmentally sustainable food.

Further, people have little knowledge on contents of foods such as proteins, fats, carbohydrates and thereof. Therefore, people are unable to choose foods that have good effect on health, whenever a person is diagnosed with certain medical condition. Due to the lack of this knowledge on food, people are inclined towards taking medications rather than preventing the medical conditions by choosing a healthier lifestyle [5-7].

In existing technology, a personal nutrition and wellness advisor system comprises of at least one computing platform, medical and nutrition knowledge databases, and food nutrient databases. The system receives and analyses each user's initial personal and health- related information to intelligently estimate the initial energy & nutrient budgets and physical activity needs. The system interactively constructs and presents personalized energy and nutrient content-based, location-based, activity-based, and event-based ranked available food item lists to the user and recipes to encourage the user to be physically active and consume food items containing the most needed nutrients. The system tracks the user food consumption, physical activity, updates to energy and nutrient budget balances, any physiological parameter measurements, any taken medication types, doses, and times, and automatically varies the types, rankings, and/or portions of the food items in the recommended available food item list based on the results of tracked activities. However, during

climate change there are some foods that are to be included in the diet according to seasonal changes. There is a need for a system that varies the diet based on the seasonal changes [5-7].

1.2 Augmented reality

In updated technology, an augmented reality application that aids to interpret the nutritional information about carbohydrates in real packaged foods with the shape of boxes or cans. The application tracks the full object and guides the user in finding the surface or area of the real package where the information about carbohydrates is located using augmented reality and helps the user to interpret this information. The portions of carbohydrates (also called carb choices or carb servings) that correspond to the visualized food are shown to the user. The augmented reality application is used to effectively learn how to interpret the nutritional information on the labels of real packaged foods and thus help users acquire healthy life habits. However, there is a need for an augmented reality based system that suggests diet recommendations to the user based on user health parameters.

Therefore, there exists a need for an augmented reality based diet suggestive system that suggests diet recommendations, appropriate time, quantity and method of consumption of a food item. There is a need for a personalized diet recommendations to each user based on personal data. A system that retrieves food recommendations from world health organizations, extracts data from news articles about any viral infections or diseases to suggest immunity boosting foods to the user to thereby safeguard the user against such diseases or infections is the need of the hour. There is a need for a system that aids the user to scan foods before eating and before cooking to suggest recommended amount and method of eating. There is a need to reduce side effects to the user by suggesting counter foods in cases of a heavy meal, foods to be avoided while on a medication, foods based on climatic and environmental changes [8].

2. OBJECTIVES OF THE RESEARCH WORK

The primary objective of the invention is to provide an augmented reality based personalized smart diet assistance system that provides diet recommendations, appropriate time, type, quantity and method of consumption of a food item diet based on user health parameters.

Further objective of the invention is to incorporate an AI based camera to scan a food item before or after cooking and utilize augmented reality to indicate the nutritional information.

Another objective of the invention is to provide personalized diet recommendations to the user based on personal data such as height, weight, existing medical conditions and thereof of a user. The other objective of the invention is to indicate excess portion of scanned food by highlighting in the real-time image using augmented reality animations based on the nutritional requirement of the user.

The other objective of the invention is to retrieve existing transmissible diseases data from world health organizations, extract data from news articles about any viral 5 infections or diseases to suggest immunity boosting foods to the user to thereby safeguard the user against such diseases or infections.

Yet another objective of the invention is to incorporate the proposed augmented reality based personalized smart diet assistance system in a portable device such as a smartphone, wristband, ring, and locket thereof to enable the user to carry it to different locations easily.

Another objective of the invention is to reduce side effects to the user by suggesting counter foods in cases of a heavy meal, foods to be avoided while on a medication, and foods based on climatic and environmental changes.

Yet another objective of the invention is to integrate the system with user's day planner or reminders while travelling to different places to adjust the diet plan accordingly.

Further objective of the invention is to analyse user's food habits and warn the user about future circumstances of maintaining the same food habits and aids the user to change to a healthier diet plan [9, 10].

2.1 Summary

This summary is not an extensive overview. It is not intended to identify key/critical elements or to delineate the scope of the claimed subject matter. Its sole purpose is to present some concepts in a simplified form as a prelude to the more detailed description that is presented later. In order to overcome the above deficiencies of the prior art, the present disclosure is to solve the technical problem to provide an augmented reality based personalized smart diet assistance system that provides diet recommendations, appropriate time, type, quantity and method of consumption of a food item in connection with image processing based on user health parameters. According to an aspect, the invention provides an augmented reality based system for personalized smart diet assistance. The augmented reality based system is incorporated either in a portable or wearable device such as a mobile device or a smartphone or a wristband or a ring and thereof configured with the artificial intelligence camera and a display interface with augmented reality technology. In specific, the display interface suggests the quantity or portion of food to intake and highlights excess portion of food with its calories by showing an AR animation on the food depending on the user's health condition. Further, the system aids to suggest food item based on the changes in user's location to adapt to the climatic and geographical conditions.

2.2 Module descriptions

The user data input module is configured to enable the user to input personal data and health data. In specific, the personal data includes age, height, weight, food habits, gender, location the detailed representation you can see in Table 3., thereof and the health data includes any existing or previous medical conditions of the user, inheritable diseases, medical prescriptions and thereof. The image processing module is configured to process a scanned food item in coordination with an artificial intelligence camera with augmented reality technology and identify food type, quantity, calories, and proteins and thereof to thereby provide suggestions to the user about food consumption.

The food consumption assistance module is configured to suggest correct way to prepare; best time to eat and AR animated display of recommended quantity as represented in Table 4 with its nutritional data of the scanned food item based on the user health data. In specific, the nutritional data of the scanned food item includes amount of calories, proteins, carbohydrates and other nutrition present in said scanned food

item. The food consumption assistance module suggests correct way to prepare the scanned food item such as either to cook or boil or bake or fry and thereof and the best time to eat the scanned food item includes either to eat at breakfast or at lunch or at dinner or the like [11-15]. The transmissible disease information retrieval module is configured to extract updated transmissible diseases data from world health organizations and news articles and alert the user on safety precautions to be followed. The safety precautions suggested by the transmissible disease information retrieval module include wearing a mask, taking immunity boosting foods, wearing gloves or the like. The diet planning module is configured to plan a diet to the user based on the updated transmissible diseases data, the user health data and climatic conditions. In specific, diet planning module predicts the future climatic conditions such as change in seasons and accordingly suggests the diet to maintain the health of the user.

Further, objects and advantages of the present invention will be apparent from a study of the following portion of the specification, the claims, and the attached drawings (Figure 1).
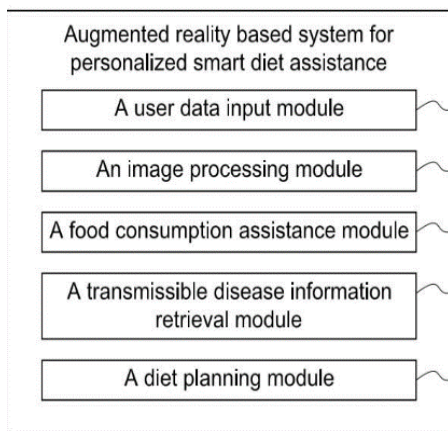

Figure 1. Augmented reality system

Illustrates an exemplary block diagram of an augmented reality based system for personalized smart diet assistance in accordance to an exemplary embodiment of the invention [15].

2.3 Detailed invention explanation

Various embodiments of the present invention will be described in reference to the accompanying drawings. Wherever possible, same or similar reference numerals are used in the drawings and the description to refer to the same or like parts or steps.

According to an exemplary embodiment of the invention, Figure 1 refers to an exemplary block diagram of an augmented reality based system for personalized smart diet assistance. The augmented reality based system comprises a user data input module, an image processing module, a food consumption assistance module, a transmissible disease information retrieval module, and a diet planning module. The proposed system constantly stores and learns the food habits of the user and further warns about long term effects of maintaining the same diet.
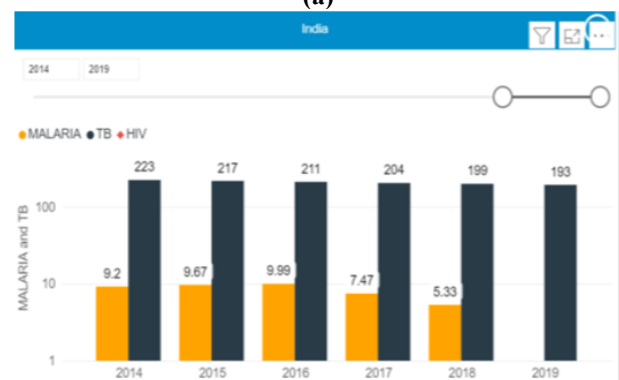
1. The user data input module is configured to enable the user to input personal data and health data. In specific, the personal data includes age, height, weight, food habits, gender, location, thereof and the health data includes any existing or previous medical conditions of the user, inheritable diseases,

medical prescriptions and thereof. Some medical conditions include abnormal blood pressure, diabetes, gastritis, and asthma, specific allergies towards some foods and thereof as shown in Figure 2.

(a)

(b)

Figure 2. WHO data base

2. The image processing module is configured to process a scanned food item in coordination with an artificial intelligence camera with augmented reality technology and identify food type, quantity, calories, and proteins and thereof to thereby provide suggestions to the user about food consumption. The image processing module also identifies the freshness of the scanned food item using artificial intelligence to thereby avoid consumption of spoiled food by the user. In specific, the scanned food item is either packed or unpacked, while the packed food item may or may not have a bar code or a related QR code with encrypted information. The food consumption assistance module 103 is configured to suggest correct way to prepare; best time to eat and AR animated display of recommended quantity with its nutritional data of the scanned food item based on the user health data. In specific, the nutritional data of the scanned food item includes amount of calories, proteins, carbohydrates and other nutrition present in the scanned food item.

3. The food consumption assistance module suggests correct way to prepare the scanned food item such as either to cook or boil or bake or fry and thereof and the best time to eat the scanned food item includes either to eat at breakfast or at lunch or at dinner or the like. For instance, if the user consumes heavy foods such as meat in the afternoon, the food consumption assistance module suggests the user to consume a light food for dinner to avoid uneasiness to the user. The food consumption assistance module also suggests counter foods to ease the digestion of the user.

4. The transmissible disease information retrieval module is configured to extract updated transmissible diseases data from world health organizations and news articles and alert the user on safety precautions to be followed. In specific, the safety precautions suggested by the transmissible disease information retrieval module include taking immunity boosting foods, wearing masks, gloves and thereof.

5. The diet planning module is configured to plan a diet to the user based on the updated transmissible diseases data, the user health data and climatic conditions. In specific, diet planning module predicts the future climatic conditions such as change in seasons and accordingly suggests the diet to maintain the health of the user.

For instance if the user is diabetic, the diet planning module suggests diet containing very less amounts of sugar and avoids sweets. Further, the diet [16, 17].

Planning module considers the effect of medications of the diabetic user and avoids food that may have an effect on the user when taken alongside with those specific food items. The diet planning module also suggests appropriate time gap after consuming food when the user can take medication. Numerous advantages of the present disclosure may be apparent from the discussion above. In accordance with the present disclosure, an augmented reality based personalized smart diet assistance system provides diet recommendations, appropriate time, type, quantity and method of consumption of a food item diet based on user health Parameters.

2.4 Wearable device

The system incorporates an AI based camera to scan a food item before or after cooking and utilizes augmented reality to indicate the nutritional information. The proposed system provides personalized diet recommendations to the user based on personal data such as height, weight, existing medical conditions and thereof of a user. The diet assistance system indicates excess portion of scanned food by highlighting in the real-time image using augmented reality animations based on the nutritional requirement of the user. The system retrieves existing transmissible diseases data from world health organizations and data from news articles about any viral infections or diseases to suggest immunity boosting foods to the user to thereby safeguard the user against such diseases or infections.

Further, the system is incorporated in a portable or wearable device such as a smartphone, wristband, ring, and locket thereof to enable the user to carry it to different locations easily. The system aids to reduce side effects to the user by suggesting counter foods in cases of a heavy meal, foods to be avoided while on a medication, and foods based on climatic and environmental changes. The system aids to adjust the diet plan while the user travels to different places by integrating with user's day planner or reminders. The proposed system analyses user's food habits and warns the user about future circumstances of maintaining the same food habits and aids the user to change to a healthier diet plan.

It will readily be apparent that numerous modifications and alterations can be made to the processes described in the foregoing examples without departing from the principles underlying the invention, and all such modifications and alterations are intended to be embraced by this application. An augmented reality based system for personalized smart diet assistance, comprising: a user data input module configured to enable the user to input personal data and health data; an image processing module configured to process a scanned food item in coordination with an artificial intelligence camera with augmented reality technology and identify food type, quantity, calories, proteins and thereof to thereby provide suggestions to the user about food consumption; a food consumption assistance module configured to suggest correct way to prepare and best time to eat based on various user activity parameters tracked using artificial intelligence and provide AR animated display of recommended quantity with its nutritional data of said scanned food item based on said user health data and said tracked user activity parameters; a transmissible disease information retrieval module configured to extract updated transmissible diseases data from world health organizations and news articles and alert the user on safety precautions to be followed, and a diet planning module configured to plan a diet to the user based on said updated transmissible diseases data, said user health data, said tracked user activity parameters and climatic conditions; Whereby said augmented reality based system is customized, comprehensive and considers infinitesimal decimal information of an individual and suggests accurate diet information. The augmented reality based system for personalized smart diet assistance as claimed in claim, wherein said various user activity parameters tracked using artificial intelligence include parameters of the user such as regular general activities, every minute work status, previously consumed foods, intermittent foods, previous or present health records, number of burn calories, vital parameters, food habits etc. The augmented reality based system for personalized smart diet assistance as, wherein said augmented reality based system is incorporated either in a portable or wearable device such as a mobile device or a smartphone or a wristband or a ring and thereof configured with the artificial intelligence camera and a display interface with augmented reality technology [18, 19].

The augmented reality based system for personalized smart diet assistance as claimed, wherein said system aids to suggest food item based on the changes in user's location to adapt to the climatic and geographical conditions. The augmented reality based system for personalized smart diet assistance as claimed in claim, wherein said display interface suggests the quantity or portion of food to intake and highlights excess portion of food with its calories by showing an AR animation on the food depending on the user's health condition. The augmented reality based system for personalized smart diet assistance as claimed, wherein said personal data includes age, height, weight, food habits, gender, location, thereof and said health data includes any existing or previous medical conditions of the user, inheritable diseases, medical prescriptions and thereof. The augmented reality based system for personalized smart diet assistance as claimed, wherein said nutritional data of said scanned food item includes amount of calories, proteins, carbohydrates and other nutrition present in said scanned food item. The augmented reality based system for personalized smart diet assistance as claimed, wherein said safety precautions suggested by said transmissible disease information retrieval module include wearing a mask, taking immunity boosting foods, wearing gloves or the like [18]. The augmented reality based system for personalized smart diet assistance as claimed, wherein said diet planning module predicts the future climatic conditions such as change in seasons and accordingly suggests the diet to maintain the health of the user. The augmented reality based system for personalized smart diet assistance as claimed wherein said food consumption assistance module suggests correct [18].

3. SCOPE OF THE INVENTION

Researcher is in the process of development of the system, outlines of the background data.

Collection/processing tables are given below to show case the path the development process of the system. The user details can have the details as in Table 1.

Table 1. User details

User Details	
Date of Birth	
Age	
Gender	
Present Location	
Height	
Weight	
Waist	
Body Type	

User health data details can be seen in Table 2.

Table 2. User health data details

User Health Data	
Diabetes	
Cholesterol	
BP	
Symptoms of Acidity	
Digestive Captivity	
Any Heart Complaint	
Health Ailments in last 3 Months	
Health Ailments in last 2 weeks	
Medications	

Table 3. User routine schedule

User Routine / Schedule		
Activity	Time	
	Daily/Regular	Intermittent/ Irregular
Wake up	6.00AM	
Exercise	6.30AM	
Exception to routine	6.00AM to 6.30AM	
Breakfast	8.00AM	
Activity	8.00AM to 9.30AM	
Work Timings	9.30AM to 1.00PM	
Activity Lunch Activity	1.15PM	
Snacks Activity	5.00PM	
Walking	7.00PM to 7.30PM	
Dinner Activity	8.30PM	
Sleep	10.00PM	

The details that are collected from WHO Data base. As in Figure 2.

Tables 5, 6 are indicating the details of the food, type of the food, properties.

Digestion Time does depend on the person and their Age, Health, Metabolism and many other factors all are seen in the Table 7.

Table 4. Food calorific data

Form	Chicken			Egg				Ground Nut		Potato	
	Calories (Per 2.5 lb.)	Fat grm	Calories (Per 100gr.)	Fat (Per 100gr)	Sugar (Par 100gr)	Protein (per 100 gr)	Calories (per 0.5 cup)	Protein Per 0.5 Cup	Calories (Per 136gr.)	Protein (per 136 gr)
Boiled	700	50	155 Kcal	3.3	1.1	12.6	286	12	118	2.5
Fried	1000	60	196 Kcal	4.3	0.4	13.6	237	9.7	365	4

Table 5. Food type calorific data

From	Rice	
	Calories (per 100gms)	Carbs (per 100gms)
Steamed	151	33.88gms
Boiled	130	28.17gms

Table 6. Food properties calorific data

Properties	Brown Rice (per 1/3 cup)	White Rice (per 1/3 cup)
Calories	82	68
Protein	1.83 gms	1.42 gms
Total Lipid (Fat)	0.65 gms	0.15 gms
Carbs	17.05 gms	14.85 gms
Fiber	1.1 gms	0.2 gms
Sugar	0.16 gms	0.03 gms
Calcium	2 mg	5 mg
Iron	0.37 mg	0.63 mg
Cholesterol	0	0

Table 7. Digestion time

Time Taken for the Food to Digest		
Digestion Time does depend on the person and their Age, Health, Metabolism and many other factors		
Category	Product	Time taken to Digest
Fruits	Juices or Broths	15-20 Min
	Smoothies	20-30 Min
	Watermelons	20 Min
	Other Melons	30 Min
	Orange	30 Min
	Grapes	30 Min
	Bananas	30 Min
	Apple	40 Min
	Pear	40 Min
	Cherries	40 Min
	Plums	40 Min
	Kiwi	40 Min
Raw High Water Salad Vegetables	Lettuce	30 Min
	Cucumber	30 Min

	Peppers	30 Min
	Tomatoes	30 Min
	Radish	30 Min
Leafy Green and Cruciferous Vegetables (Cooked)	Kale	40 Min
	Broccoli	40 Min
	Cauliflower	40 Min
	Bok choy	40 Min
Root Vegetables	Beetroot	50 Min
	Carrot	50 Min
	Parsnip	50 Min
Starchy Vegetables	Butter Nut	60 Min
	Corn	60 Min
	Sweet Potatoes	60 Min
	Potatoes	60 Min
	Chestnuts	60 Min
Grains	Brown Rice	90 Min
	Buckwheat	90 Min
	Oats	90 Min
	Cornmeal	90 Min
	Pulses and Beans	120 Min
High-Fat Seeds	Sun Flower	120 Min
	Pumpkin	120 Min
	Sesame	120 Min
Nuts	Legume Peanut	3 Hrs
	Almonds	3 Hrs
	Cashews	3 Hrs
	Walnuts	3 Hrs
	Pecans	3 Hrs
	Brazils	3 Hrs
Dairy	Skimmed Milk	90 Min
	Low-Fat Cheese	90 Min
Meat	Egg Yolk	30 Min
	Egg (Whole)	45 Min
	Non-oily Fish	30 Min
	Oily Fish	50 Min
	Chicken	2 Hrs
	Turkey	2 Hrs
	Beef	4 Hrs
	Lamb	4 Hrs
	Pork	5 Hrs

Way to prepare said scanned food item such as either to cook or boil or bake or fry and thereof and wherein said best time to eat said scanned food item includes either to eat at breakfast or at lunch or at dinner or the like (Figure 3).
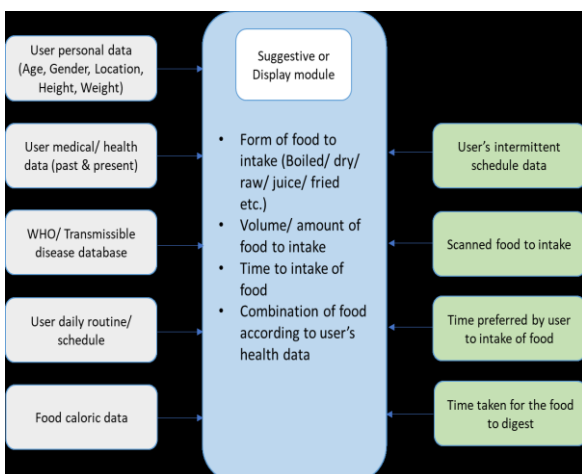

Figure 3. AI and AR based smart diet system

Figures 4-5 explain about food form raw, boiled, light Fried, Deep Fried and usage of the bowl.

Figure 6 explain user module analysis of the scanned food, suggestions to take food, how much quantity of the food can be taken at what time it is.

Figure 4. Food and forms

Figure 5. Usage of the bowl

Figure 6. Quantity of the food to consume

Figure 7. Food in the liquid or other form

Figure 8. Food in the other form

The figures (Figure 7, 8) explain the after scanning the food what are the suggestions to take the food in the liquid or other form.

4. CONCLUSION

An augmented reality based system for personalized smart diet assistance, comprising: a user data input , image processing food consumption assistance ,transmissible disease information retrieval module, diet planning module configured to plan a diet to the user based on said updated transmissible diseases data, said user health data, said tracked user activity parameters which includes past, present and assumptions of future user activity, climatic conditions, future climatic conditions such as change in seasons and changes in user's location to adapt to the climatic and geographical conditions, Whereby said system incorporated either in a portable or a wearable device suggests accurate diet information. The augmented reality based system for personalized smart diet assistance as claimed, wherein said food consumption assistance module suggests the correct way to prepare said scanned food item such as either cook or boil or bake or fry and thereof, and suggests the best time to eat said scanned food item such as either to eat at breakfast or at lunch or at dinner or the like based on said various user activity parameters such as regular general activities, every minute work status, previously consumed foods, intermittent foods, previous or present health records, number of burn calories vital parameters, food habits etc.

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