IoT as a Health Guide Tool

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Abstract. Now-a-days, food is very important in order to feed to the live people or animals. It is required to know the statistics about the food in terms of proteins, fat, and factors that increase immunity power. Hence, the proposed methodology called food IoT is developed that will scan the food and displays the statistics that guide details to the customer or client. The details describe about calories that are helpful, the details that will increase fat, the details like food is poisoned, and from the provided statistics, any one could judge the food is useful to feed. This proposed application guarantees the good health because health depends on feeding of food. This is more proactive because it guides which items to be added in case there is less kind of positive minerals and less proteins identified. Hence, a sensor to be required that display the statistics about the food and is more helpful to the people in order to know category of factors involved in the food. The timed out and mineral less food is identified and could come to be known in this proposed approach. Also, this proposed approach helpful in terms of alerting as a guide based on past experience and reports future predictions about the health as like future weather predictions.

1. Introduction
Nowadays, food affects the livestock life span. Food is very important while consuming because it directs parts of the body which in turn is directed by the nervous and blood system. In day to day, most people are not worried about the check-up of the food that they will consume. Because of this negligence, many people may get disorder in their body, also may don’t know the kind of diseases that might attack, and many other factors that cause damage to leading a healthy life. To take this concern seriously into consideration, an efficient sensor device to be required that determines the components share involved in the food prepared or naturally available food. To overcome the damage to be going to occur over the livestock, a novel device with a built-in statistics sensor is to be developed. The proposed gadget work as scanning the food, display the statistics about the food as well as suggests the supplements be added in case of less calorie food. This introduction follows the proposed approach where the architecture of the novel sensor is to be discussed, a pseudo procedure that describes the working flow of the designed sensor, also specifies the modules that play a vital role in the proposed approach. Generally, health is affected by food that people to consume. To know what factors are involved in maintaining the healthy body, such factors to be ideal or checked up as normal. This eagerness leads to design novel approach where one sensor to be used at food other to be used for future health for a person. This
proposed approach follows the results along with example scenarios and that results follow the conclusion where the outline of this novel sensor built to be represented along with performance details are specified.

2. Literature Review
In this, the basic content analyzed is usage of food and its affect on the health. According to [1],[2],[3],[4] sources, the obesity will be increased if there is no proper diet in food. The components of the food that cause obesity is fat components are listed in the sources mentioned. According to [5], the kind of food that supply nutrition to the body and makes good health. According to [6], the food that makes happy mental health is listed and also the components that develop good mental ability are also listed in the source provided. According to [7], the kind of food that makes connection with mood are also discussed and the components that makes mood happy or sad also discussed in the source. In [8],[9] that describe about What are the eatables that help the health to improve and What things will affect Blood Pressure respectively. In sources [10],[11] describe about guidelines to be healthy and also What eatables make healthy. In [12],[13] describe weight also influence health and what routines cause heart diseases and how to overcome respectively. In [14],[15],[16],[17],[18] describe various guidelines that make food as a medicine, mood, and other perceptions for the human health. In [19],[20],[21] describe about frameworks for health, visually impaired, and breast abnormality respectively. In [22],[23],[24],[25] describes on heart rate and diseases using data mining and machine learning techniques. In [22],[26], One represent multi mode emotions, and other coronary illness. In [27],[28],[29],[30], there is no study on prediction of future health statuses but those studies are oral and text guidelines for human to follow. Whatever remaining sources listed and not listed are used to describe about the food that determines the fitness and healthiness of the body. In [31] and [32], the studies represent about Hybrid context aware for pervasive smart environment and its consequences is discussed is as one, other is about on smart emergency responsive environment for fire hazards using IoT and its consequences are discussed. In [33],[34] studies states that first study is on IoT based decision making in agriculture using THAM index and the second study is on specific nano-tube arrays for sensing acetone room temperature and their implications. These are although different w.r.to application, the terminology IoT is useful in our proposed application. After all these, there is no source discussed about guide the human about the future based on past experiences. These sources are helpful knowledge about the kind of food that possess the nutrition so that manually prepare the food for the health. The most drawback of this is more nutrition component or more fat oriented components or less nutrition component will not balance the fit of the health. Hence, a kind of automatic guide to be required so that it will alert the kind of components to take for the preparation of food to make health fit. The alerting of components to pick from various food sources is done based on past health daily checkup and food that feed on those days. Here, the reinforcement learning is used that will predict the health in future according to past food habits. From the guide that is developed in the proposed approach, the fitness of health is controlled. Also, sensors used will also guide diseases that will be come in the near future for that person.

3. Proposed Approach
In this proposed strategy, the features of the novel sensor for displaying statistics of the food to be used to be discussed, architecture of the novel sensor in order to identify the components to be depicted, and the pseudo code working of the novel sensor to be defined.

The features of the novel sensor for displaying food statistics are defined as follows:

a) Input: It reads the food through the scanner. The scanner sends this information to the processing step.
b) **Processing:** It takes information from the input step. It also identifies components involved in the food. Here, the percentage of components used is calculated based on training the sensor through reinforcement learning. This processing step is now segregates what components are belongs to protein and healthy type, what are belongs to fat related type, what are related neutral type, what components made the food more poisonous and etc. The customer came to know the details of the food in terms of good or bad. In addition to guidance, it also instructs which supplements are lacking for balance diet and what proportion to be required to add in order to maintain diet. There is huge difference between manual health guide and device health guide.

c) **Output:** The Customer’s satisfaction is achieved. The society and environment will be healthy because of balance food that reduces fat and other instant diseases.

The architecture of this IoT as a health guide is as follows where modules along with their use cases are represented:

![Figure 1. Architecture of IoT as a Health Guide](image)

From the architecture, the modules identified are Food Sensor, Health Guide Sensor, and Communication Gadget. In which, First module is the Food Sensor whose responsibilities are reporting the percentage of components involved. From this knowledge, it also determines freshness of food and poisonous nature of it, and gives a report on what supplementary to be added to make balanced food. Second is health guide sensor in which it is already trained from past food habits, it will have health guide in terms of components such as BP, Cardiac rate, body nature, and diabetic nature of the customer, also it will assess the future heath instances from the past health reports and also gives cautions to have fit in health. The third module is communication device such as mobile or PC is used to show reports of the food sensor and health guide sensor.
The pseudo procedure for this proposed title is IoT as a health guide will work as follows:

Pseudo Procedure HealthGuide_IoT(food, output):

3.1 **Food Sensor (Food):** It will scan the food, will generate a report on components involved. Also guides the supplementary items to turn that into balanced diet. Also, reports freshness of the food in terms of outdated or poisonous.

Pseudo Procedure Food_Sensor(Food):

Input: Food

Output: guiding report that consists of % of components, food is fresh or poisonous or outdated, supplementary items to add

Step1: Convert that into data frame which consists of percentage of components.

Step2: Analyze the percentage of components, decide food is fresh or outdated based on strength of food. Also, decide food is poisonous food or not.

Step3: Suggests supplementary items that suppose be added that turns status to balanced diet. This is -1 in case of lack of supplementary and 0 in case of supplementary is provided.

3.2 **HealthGuide(dailyfoodplan):** It trains on the daily food plan and stores the daily reports. From those past dataset, it will generate future health prediction instances. If the future instance is not as you like expected, need to go through the precautionary steps to have the health fit.

Pseudo Procedure HealthGuide(dailyPastfoodplan):

Step1: Analyze the food plans and build graphs from day1 to last Day trained

Step2: From those plans, predict the report for the next day or day wise manner report for next week as options provided.

Step3: Will provide the information in terms of precautions whenever health is degrading in the future is identified.

3.3 **Communication Gadget (reports):** It stores the reports and outputs and alerts the customer about the food habits as well as about the health. The communication depends on internet.

Pseudo Procedure Communication_Gadget(data):

Step1: Based on the data received from previous modules, it will generate a report consisting of important parameters indicating good health.

Step2: Based on parameters that indicate remark on specific day or specific duration of a future week, that could be notified in advance according to feelings of the customer.

Step3: For easy understanding, graphs (visual representations) are drawn from the reports.

The simplified flowchart that resembles interaction of modules involved in IoT as a health guide is as follows:
4. Results

The output of food scanner as well as output of health guide sensor is discussed and demonstrated in this section. The reports generated give the information about the instances involved. These reports will become guide for analysis and prepare the future reports. The format of the report that is generated in excel so that analysis became easy and helps to generate graphical tools like bar charts, pie charts, and other easy ways.

The first module Food Sensor extracts energy and non-energy components. The energy components fall into categories such as lipids, proteins, and carbohydrates. The components such as water, minerals, vitamins, and fiber-oriented content are considered as non-energy components.

The following diagram shows functionality, sources of food that possess nutrient components. This information is also helpful in consuming nutria oriented food.
Figure 4. Sources of food that possess the nutrients

The following shows the consequences of usage of food components. It not only tells about food component but also the affect as a result of consuming it.

Figure 5. The effect of usage of food components

The default values are supplied by expert doctor and these are vary in narrowly depending on the personalities.

The following is one report that guides about the consumed food:

Report Generated by Food Sensor:

% of Energy Components (Default 60): 70
% of Non Energy Components (Default 30): 40
% of freshness (Default 70): 90
% of poisonous (Default 0-10): 10

Figure 6. Simple report generated by Food Sensor

The weekly report is on the past food habits are as follows. This format may vary according to
user perception.

Week Report:

| Day  | Day1  | Day2  | Day3  | Day4  | Day5  | Day6  | Day7  |
|------|-------|-------|-------|-------|-------|-------|-------|
|      | Balanced | Balanced | Over Diet | Under Diet | Under Diet | Balanced | Balanced |

Figure 7. Past Week report generated by Food sensor

This output will be given as input health guide sensor and this module will generate the statistics about the health:

Health Week Report:

| Day  | Day1  | Day2  | Day3  | Day4  | Day5  | Day6  | Day7  |
|------|-------|-------|-------|-------|-------|-------|-------|
|      | Status of Diet | Balanced | Balanced | Over Diet | Under Diet | Under Diet | Balanced |
| Health Based on feeding parameters | Health | Good | Good | More exercise required | Take supplementary drinks or food items | Take supplementary drinks or food items | Good |
| Precautions | Precautions | Nil | Nil | Reduce the diet by 20% | Increase diet by 15% | Increase diet by 25% | Nil |

Figure 8. Simple report generated by Health Guide Sensor

The other report will also to be generated by the request of the customer where future predictions of the health status are alerted.

Health Guide:

| Day  | Day1  | Day2  | Day3  | Day4  | Day5  | Day6  | Day7  |
|------|-------|-------|-------|-------|-------|-------|-------|
|      | Status of Health | Normal | Uncomfortable | Normal | OverComfortable | Normal | Uncomfortable | Normal |
| Reason | Reason | Diet Followed | Under Diet | Diet Followed | Over Diet | Diet Followed | Under Diet | Diet Followed |
| Component of Health that cause noted feeling | Component of Health that cause noted feeling | Body | Muscles | Body | Breathing | Body | Brain | Body |

Figure 9. Future instances of Health by Health Guide
In the above, Day-wise over a week is reported about the future instances of health. In which, the component of the body status, the reason for status of the health, and the status of the health are specified in a table as a report.

5. Conclusion

In this work, the food scanner will be taken place first in the operation of IoT as a health Guide. The output of this will be a report describing the percentage of components involved as well as a help report (supplementary components) to make that food balanced. The next module health guide will train from past food feedings and will generate future health status instances. From the future health instances, it also guides food diet plans to the customer so that the fitness of the health also to be maintained. In this, the available methods are outdated and are not efficient in expecting future health samples. The proposed system where the user will be guided at top priority and that will help to maintain the health fitness. This is not only for knowing statistics but also for reducing the health issues by giving prescriptions.

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