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Knowledge-Based Diet and Physical Exercise Advisory System

Ezeuko Charles E[1], Diala Stanley O[2], Ejem Agbaeze[3]

[1, 2, 3]Department of Computer Science, School of Physical Science, Federal University of Technology, P.M.B. 1526, Owerri, Imo State, Nigeria

Abstract: ***With healthy diet and exercise, one can live a healthy, longer live with less illness due to the acquired stronger immuned system. In many developing countries, many people have suffered from preventable health problems due to insufficient number of medicalexpert offering advisory solutions on the proper diets and exercises. Improper diet and exercise scheme imposes some health impairments to mankind such as diabetes, obesity, hypertensions, etc.The two main reasons are traced to be poverty(which makes it difficult to receive medical advice or partakeassisted exercise using machines) and inadequate enlightenment media system. Developing anadvisory system that provides solutions for proper dietary and exercise is a challenge and thus a problem to be solved. This work aims at developing a web based solution for diet and exercise advisory system. The expert system design paradigm was adopted and employed. This system having and embedded withinthe solutionalstrategies,will capture among others users' demographical data: biodata, religion, culture, health conditions; analyzing these data and generates the list of appropriate diets and exercise for the user.The system has been tested with sample records and thus is an assistingtool usedwhere medical experts are not readily available.***

Keywords: Diet, Exercise, Knowledge Based System, Domain Expert, Advice

1. Introduction

Proper diet and exercise is the mainstay of healthy lifestyle. In nutrition, diet is the quantity and quality of food consumed by a person or other organisms. Dietary habits are the habitual decisions an individual or culture makes when choosing what foods to eat.Despite humansomnivorous nature, each person's culture holds some food preferences, or some forbiddentype due to social custom or emotional aversion.

Physical exercise is any bodily activity that enhances or maintains physical fitness and overall health and wellness (http://goodhealthandbeauty.com/?page_id=331; retrieved 12/02/2015) . WHO (World Health Organization) also defined physical exercise as any bodily movement produced by skeletal muscles that requires energy expenditure. It is performed for many reasons including strengthening muscles and the cardiovascular system, honing athletic skills, weight loss or maintenance, as well as for the purpose of enjoyment.

With healthy diet and exercise, one can live a healthier, longer live with less illness due to stronger acquired immune system as a result of being properly guided on the process. In most cases, people need to be advised on the right type of diet and exercise for them to maintain a healthy lifestyle. Hence, there are number of trained persons or specialists who can be consulted for appropriate advice.

Many rural communities in Nigeria have extremely limited access to medical advice (Heber,2005). People travel long distances to hospitals or clinics for medication.The challenges that Patients do face are much. The habit of slow services, and patients end up waiting long hours without receiving any attention, excusses as a result of tiredness or stress, difficulties on the road, etc are conditions patient experienced that demands solutions. Hence Diet and Exercise Advice System can play a significant role in such cases where medical experts are not readily available.Improper diet and physical exercise scheme imposes somehealth impairments to mankind, such as obesity, hypertensions, diabetes, etc. and should be avoided (Ness and Powles,1999).This paper aimed at development of an advisory system for the appropriate diet and exercise ranging from infants to the very-aged people. And thus is an assisting tool used where medical experts are not readily available.

The outline of the paper is as follows. Section 2.0 discusses the related works of researchers in dietary and exercise. In section 3.0, we dealt with the DEAS Architecture, Knowledge Based Design, Entity Relational Diagram and the flowchart that shows how the system works. Following is the implementation and section 5.0 handles areas of application. Finally, section 6.0 deals with the conclusion and direction for future work. In this publication, explanations, descriptions of classes/type of diet and that of exercises were neglected to avoided complexity.

2. Review of Related Works

Many researchhave been done on field of health pertaining effects of dietary and exercise in the life of humans. The work of (Ganesh, 2009; *Carol, 2010*) revealed that unhealthy diets and along with physical inactivity are two of the main risk factors of many chronic diseases.Lack of physical exercises and unhealthy dietary habit may increase the blood pressure.

The economic burden of poor diet, physical inactivity, and obesity is substantial. All are significant risk factors for developing coronary heart disease, certain types of cancer, stroke, and diabetes, conditions that involve considerable medical expense as well as lost work time, disability, and premature death. Poor diet and physical inactivity cause 310,000 to 580,000 deaths per year and are major contributors to disabilities that result from diabetes,

osteoporosis, obesity, and stroke (*Carol, 2010).*Ganesh, (2009) considers the relationship between behavioral factors and blood pressure among hypertensive patients with aged 45 years and above. But measures or means towards prevention of hypertension is not of special concern and therefore needs attention.Malkawi, (2012) carried asystematic review to evaluate the effectiveness of well-structured interventions which promote physical activity in high risk individuals with type 2 diabetes. The review found strong evidence regarding the effectiveness of well-structured physical activity interventions in reducing the incidence of type 2 diabetes. Moreover, well-structured interventions were also found to be effective in restoring glucose measures including fasting plasma glucose and 2h plasma glucose. However, there was weak evidence regarding the effectiveness of well-structured interventions in increasing the level of physical activity. The review suggests using well-structured lifestyle interventions which include both physical activity and dietary advice. More research regarding the effectiveness of single physical activity interventions in preventing type 2 diabetes is recommended.

In one study, the direct medical cost for diet-related manifestations was estimated at $33.6 billion (in 1995 dollars) and the total cost, including lost productivity because of illness and premature death, was estimated to be $70.9 billion (Thompson, 1999). One dimension of quality targeted for improvement is preventive care which our research is concerned about. Several studies suggest that Americans do not receive preventive care and preventive counseling services at optimum rates Kelsey, (2012). According to the American College of Physicians, many health plans typically cover immunizations and screening tests, but do not cover preventive services like education and counseling (Jennifer,1998).

So far, the revealed papers pay little or no attention to prevention and awareness creation to support the saying that "prevention is better than cure." It was predicted that perceived healthy eating, exercise and sleep would predict subjective well-being SWB (Bianca, 2005). The importance of proper nutrition and physical activity in reducing rates of disease and death from chronic diseases has been well established but suffers from media outreach to the populace.Information Technological tools offering solutions of electronic information through various media and devices nowadays have made communication to reach to the populace despite distance (barrier). Efficient health communication efforts should have the three main goals (Thompson, 1999):

1. to educate the public about the importance of diet and exercise and motivate them to eat healthier and engage in more physical activity,
2. to motivate relevant groups and policy makers to create policies and environments that support healthy eating and increased physical activity, and
3. to eventually change social norms related to eating and activity.

With our system, a dietary and exercise system,will contribute to route information concerning diet and exercise through web media to people over the network in order to change their habit towards living a good and productive life.

3. Methodology/Procedure

This represents an approach that is used to show the system framework that is used to structure, plan and control the system. To avoid more complexity, the methodology details were omitted. Thus, the general knowledge acquisition process are summarized in rough chronological order below:

1. The knowledge engineers do elicite knowledge from the domain expert for solving the real-life problem.
2. Through discussions, identify the kinds of data, knowledge and procedures required to solve the problem.
3. Build scenarios with the expert that can be associated with different problem types.
4. Have the expert solve a series of problems verbally and ask the rationale behind each step.
5. Develop rules based on the interviews and solve the problems with them.
6. Have the expert review the rules and the general problem solving procedure.
7. Compare the responses of outside experts to a set of scenarios obtained from the project's expert.

Note that most of these procedures require a close working relationship between the knowledge engineer and the domain expert.

3.1 System Architecture

The system has a user friendly interface and need to provide consistently reliable advice to users by incorporating a lot of features like pregnancy status, associated diseases, body stature, etc. The system can be able to use inexact or incomplete information (user medical data) to provide complete advice. The figure 3.1 below represents the architectural structure of the knowledge-based system required for the implemented.

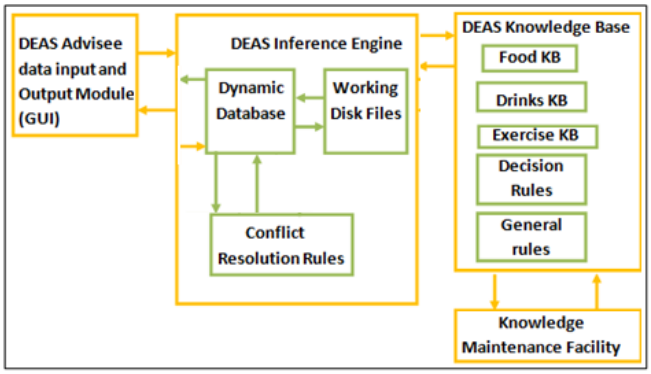

Figure 3.1: The Architecture of Diet and Exercise Advice System.

3.1.1 Components Explanations

We thus explain the components of the architecture above.

(a) User Interface

Diet and Exercise Advice System (DEAS) User Interface is a module in the system through which the users communicates with the system. User information needed by the system are being collected through this module and recommended diet and exercise is also proffered by the system through this same module.

(b) Inference Engine Design

The inference engine is the main control module of a knowledge-based system comprising within the mechanisms used to interpret the content of the knowledge base in the context of user input to arrive at a decision or solution. There are two types of inferencing mechanism thus, forward chaining (data driven) and backward-driven mechanism. Thus, our system uses goal-driven (backward chaining) mechanism/reasoning since it does not require any mathematical formula to compute the solutions. The system selects the best solutions from the set of enumerated solutions based on the users input and will keep track of current state of the problem solution and look for rules which will move that state closer to the final solution.

(c) DEAS Knowledge Base

The knowledge/informationobtained from the domain expert is stored in the knowledge base ofDiet and Exercise Advice System. The function of any representation scheme is to capture essential features of a problem domain and make that information available to a problem solving procedure. Since our problem is a diagnostic problem; involves a lot of rules in solving the problem, thus, the new system is a Rule-based knowledge representation scheme.

Diet and Exercise Advice System (DEAS) contains information repository (such as foods type, exercise type, drink types) that provides a means for information to be collected, organized, shared, searched and utilized. It also contains formal representations of reasoning and problem-solving strategies.

(d) Knowledge Maintenance Facility

This serves as the medium through which the knowledge base is being updated. It contains the following:

I. **Database File Structure:** The database design is based on the standard food menu and exercise system. The tables file structure of Drink.dbf, Exercise.dbf, Diet.dbf, AdviseeInput.dbf, AdviceRpt.dbf etc. have the same schema (Fieldno, Fieldname, Data Type, Data Type, Unit of Measurement**).**These form part of the dynamic and declarative databases and also provides the features needed in the design format of the DEASGraphical User Interface (GUI).

II. **Drink.dbf**will contain the features of various drinks to be recommended for the advisees. **Diet.dbf**is a database file structure which will contain enumerated set of possible diets and their features from which the best will be chosen for the advisee by the system. **Exercise.dbf**is a database file structure which comprises of enumerated set of exercise from which the system will use to select the best possible choice for the advisee. **AdviseeData.dbf**is a database file structure that will contain the data of the input which is a major factor that will determine the nature of the advice to be proffered by the system. **AdviceRpt.dbf** is a database file structure that will contain the data of the input alongside the recommendation made by the system.

The figure 3.1.1(a) below represents the entity relational diagram for the workability of DEAS.

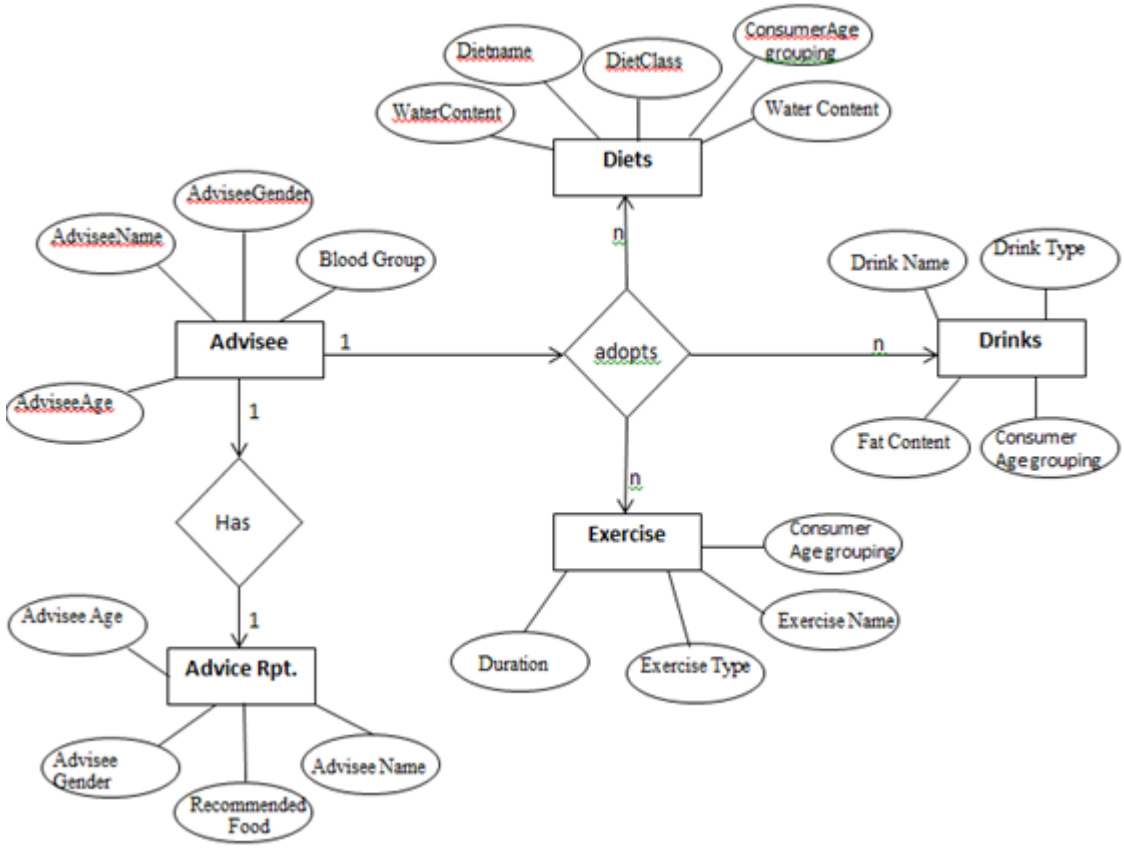

Figure 3.1.1(a): Entity Relational Diagram (ERD) for DEAS.

(e) User Interface Design

The user interface is the point of interaction between the user and the system. It comprises of two terminal: **Input Template and Output Template and Reports Format**.

I. **Input Template:** The figure 3.1.1(b)belowsshows a conceptual view of the input template through which the system collects information from the user.

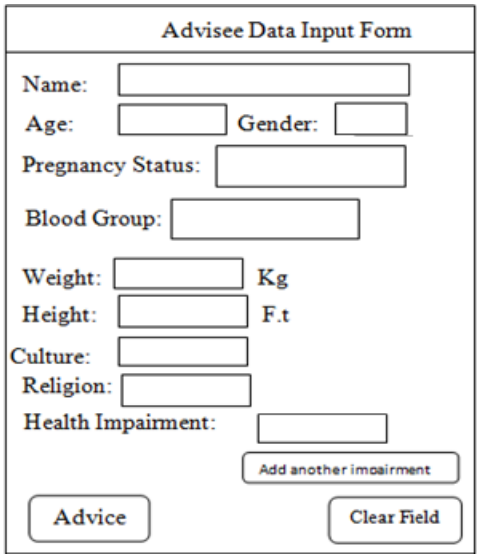

Figure 3.1.1(b): Data Input Format for DEAS

II. Output Template and Reports Format

The system uses the output template to show the necessary reports and recommended advices to the user.The design of the output is critical to the successful implementation of the system because it is the output that provides the information the user required, and thus shown in figure 3.1.1(c) below.

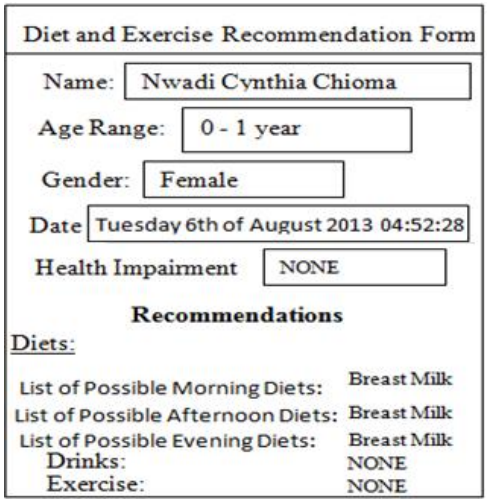

Figure 3.1.1(c): DEASOutput Template and Reports Format

(f) DEAS Knowledge Base Design

The knowledge base contains formal representations of reasoning and problem solving strategies. The knowledge base contains the declarative database (containing the knowledge about the domain), the Meta rules (for solving conflict resolution where necessary) and the Inference rules. Below shows some sample of the declarative databases.

Deductive Database for Diets

This comprises of the list of possible diets to be recommended by the system.
FDR denotes food Deductive database rules.
The rule follows this pattern.
$FDR_{N.}$: (food name, food type, carbohydrate content, protein content, fat content, Taurine content, Calcium content, Magnesium Content, Phosphorus Content, Zinc Content, Selenium Content, Potassium Content , VitaminA Content, VitaminB1 Content, VitaminB2 Content, VitaminB3 Content, VitaminB5 Content, VitaminB6 Content, VitaminC Content, VitaminD Content, VitaminB12 Content, VitaminK Content, SaturatedFattyacid Content, Monosaccharide Content, Polynsaturatedfattyacid Content, Water Content, Alcohol Content, Consumer Age-Grouping, HealthImpairment1,HealthImpairment2, HealthImpairment3, HealthImpairment4, HealthImpairment5, HealthImpairment6, HealthImpairment7).
Where N denotes the numbering. Thus sample is shown below.

The age grouping follows a particular pattern hence:
0-1 years is denoted with “01”; 1 - 2 years is denoted with “12”; 3 - 13 years is denoted with “313”; 14- 17 years is denoted with “1417”; 18-35 years is denoted with “1835”; 36-64 years is denoted with “3664”; 65 years and above is denoted with “65A”.
These nutrient component are expressed in different units such as in percentage (%), in milligram (mg), in grams (g), iu etc.
Thus, samples of these are expressed below.

FDR1:(GoldenMorn,Cereals,65.5mg,13g,6.6g,0.2mg,455g,0.2mg,0.23mg,0.9mg,1.0mg,9.0mg,116.6IU,0.20mg,0.01mg,0.0,0.0,0.0mg,0.0mg,0.0mg,0.0mg,0.0mg,0.10mg,6.6mg,0.9mg,77mg,o.0,0.0,580mg, 1835, Ulcer, Hypertension, Diabetes, Pneumonia , Obesity, Asthma, none)

$FDR_{2.}$(milletpap+soyabean milk,74mg,19 mg, 1.8 mg, .2mg,455g,0.2mg,0.23mg,0.9mg,1.0mg,9.0mg,116.6IU,0.20mg,0.01mg,8.0,5.0,3.0mg,0.0mg,0.0mg,0.0mg,0.0mg,0.10mg,6.6mg,0.9mg,77mg,0.9mg,8.0mg,580mg,1417, Ulcer, Hypertension, Diabetes, Pneumonia , Obesity, Asthma, Bruises)

FDR_3:(BangaSoup,Soup,0.48%,4.03%,5.0%,0.0%,0.0%,0.0%,14.2%,0.35%,0.0%,0.0%,0.0%,0.0%, 0.0%,0.0%,0.0%,0.0%,18.5%,0.0%,0.0%,0.0%,0.0%,,0.0%, 0.0%,0.0%,76.7%,12.77%,0.44%, 313, Diabetes, Ulcer, Hypertension, Diabetes, Pneumonia, Obesity, Asthma)

FDR_4:(Melonsoup,2.07%,5.00%,9.41%,0.0%,0.65%,0.0mg, 14.2%,0.3%,0.06%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%, 29.28%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,54.12%,24.08%,0.0%,65A, Diabetes, Ulcer, Hypertension,Obesity, Asthma,none,none)

FDR_5:(WhiteSoup,Soup,1.58%,5.38%,7.00%,0.00%,0.00%, 0.00%,15.7%,0.23%,0.001%,0.00%,0.00%,0.00%,0.00%,0.00%,0.00%,0.00%,16.32%,0.00%,0.00%,0.00%,0.00%,0.00

%,0.00%,0.00%,56.25%,24.54%, 0.0%, 1835, Pneumonia, Obesity, Asthma,Hypertension, none, none)

FDR$_6$:(SavoryVegetableSoup,Soup,8.98g,1.22,0.41g,0.008g ,16.0mg,0.0mg,0.50mg,0.08mg,0.09mg,1.99mg,**1633iu,0.8 mg,0.882mg,0.010mg,0.0mg,2.00mg,0.0mg,0.00mg,0.00g, 0.00mg,0.9mg,0.204g,**
0.00mg, 0.00mg, 88.20g,0.00mg,314mg,313, Pneumonia, Obesity, Asthma, Hypertension,none,none)

FDR$_7$:(Boiled-African-Bread-Fruit-with-Potash,food,0.24%,12.56%,3.05%,
%,0.6%,0.0%,14.8%,0.2%,
0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,16.22%,,0.0%,0.0% ,0.0%,0.0%,0.0%,0.0%,0.0%52.42%, 30.06%, 0.0%,313, Asthma, Hypertension, Pneumonia, Obesity, none, none, none).

FDR$_8$:(African-Yambean+Fermented-il,food,0.14%,7.99%,5.0%,0.0%,0.0%,0.0%,13.6%,0.20%,0.0%,
1.71%,0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,18.4%,0.0%,0.0%, 0.0%,0.0%,0.0%,0.0%,0.0%,52.7%,
0.0%,1417,Ulcer,Pneumonia, Obesity,Asthma, Hypertension,none,none,none)

FDR$_9$:(Unripe-and-ripe-Plantain-pudding, Food, 0.26%, 2.05%,3.42%,0.00%,0.00%,0.01%,14.0%,
0.14%,0.00%,0.00%,0.00%,0.00%,0.00%,0.00%,0.00%,0.00 %,0.00%,9.12%,0.00%,0.00%,0.00%,0.00%,
0.00%,0.00%, 0.00%, 54.38%, 38.1%,0.0%,1417, Asthma, Hypertension, Pneumonia, Obesity,none,none,none)

FDR$_{10}$:(Cassava-trips+Blackcowpea,food,0.5%,3.4%,4.5%,0.0%,0.11%,0.0% ,14.0%,0.3%,0.0%,0.0%,
0.0%,0.0%,0.0%,0.0%,0.0%,0.0%,21.4%,0.0%,0.0%,0.0%,0 .0%,0.0%,0.0%,0.0%,50.14%,39.73%, 0.0%, 1417, Asthma, Hypertension, Pneumonia, Obesity,Ulcer,none,none)

Deductive Database for Drinks

This comprises of the list of possible drinks to be recommended by the system.
DDR denotes Drink Declarative Database Rules.
DDR$_N$: (Drink name, Drink type, carbohydrate content, protein content, fat content, Taurine content, Calcium content, Magnesium Content, Phosphorus Content, Zinc Content, Selenium Content, Potassium Content , VitaminA Content, VitaminB1 Content, VitaminB2 Content, VitaminB3 Content, VitaminB5 Content, VitaminB6 Content, VitaminC Content, VitaminD Content, VitaminB12 Content, VitaminK Content, SaturatedFattyacid Content, Monosaccharide Content, Polynsaturatedfattyacid Content, Water Content, Alcohol Content, Consumer Age-Grouping, HealthImpairment1 ,HealthImpairment2, HealthImpairment3, HealthImpairment4, HealthImpairment5, HealthImpairment6, HealthImpairment7).
The age grouping and unit of other nutrient is the same to that of food above. Thus, the sample is shown below.
DDR1: (Berry Créme Smoothie, Beverage wine, 0.22mg, 15.0g, 1.0g , 0.1mg, 20% , 0.11 mg, 0.0mg, 0.1mg,0.5mg,220mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8 mg,8.0mg,0.0mg,0.9mg,0.0mg, 0.8mg,0.8mg, 40%,7.0g, 65A, Diabetes ,Ulcer, Obesity ,none ,none, none, none)
DDR2: (Mocha Pudding Shake, Beverage wine, 0.22mg, 15.0g, 1.0g , 0.1mg, 20% , 0.11 mg, 0.0mg, 0.1 mg, 0.5mg,220mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8mg,8.0 mg,0.0mg,0.9mg,0.0mg,0.8mg,0.8mg, 40%, 7.0g, 1417, Diabetes, Ulcer, Hypertension, Diabetes, Pneumonia, Obesity, Asthma)
DDR$_3$: (Chocolate Beverage,Beverage wine, 0.22mg, 27.0g, 1.0g , 0.1mg, 20% , 0.11 mg, 0.0mg, 0.1 mg,0.5mg,850mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8mg, 8.0mg,0.0mg,0.9mg,0.0mg,0.8mg,0.8mg,40%, 660.0g, 1417, Diabetes, Ulcer, Obesity, none, none, none, none)
DDR$_4$:(MiksiMilk,Milk,38.0g,20g,30g,4.0g,750mg,71mg,60 0mg,4.5ug,960mg,2500iu,0.1mg,0.9mg,0.8mg,
1.9mg,0.3mg9.0mg,350iu,0.9mg,1.5ug,0.8mg,0.8mg,0.00m g,0.00mg,40%,0.00mg,210mg,1835,Diabetes, Ulcer, Pneumonia, Obesity, none, none, none)
DDR$_5$:(Mocharano, Red wine, 0.22mg, 15.0g, 1.0g , 0.1mg, 20% , 0.11 mg, 0.0mg, 0.1 mg, 0.5mg,220mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8mg,8.0 mg,0.0mg,0.9mg,0.0mg,0.8mg,0.8mg,40%, 7.0g, 1835, Diabetes, Ulcer, Pneumonia, Obesity, none, none, none)
DDR$_6$:(Chocolate Mint Pudding Shake, Beverage wine, 0.32mg, 22.0g, 1.0g , 0.1mg, 20% , 0.11 mg, 0.0mg, 0.1mg, 0.1mg,220mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8mg,8.0 mg,0.0mg,0.9mg,0.0mg,0.8mg,0.8mg, 40%, 7.0g, 313, Diabetes, Ulcer, Obesity, Hypertension, Pneumonia, Asthma, none)
DDR$_7$: (BariCare Vanilla Beverage**,**Beverage wine, 0.22mg, 27.0g, 1.0g, 0.1mg, 20%, 0.11 mg, 0.0mg, 0.1mg,0.5mg,850mg,0.01%,0.9mg,0.0mg,0.4mg,2.0mg,0.8 mg,8.0mg,0.0mg,0.9mg,0.0mg,0.8mg, 0.8mg, 40%, 660.0g, 313, Diabetes, Ulcer, Obesity,Asthma, none, none, none)

DDR$_8$:(CranberryWine,FruitWine,12.2g,0.39g,0.13g,0.01g,8 .0g,6.0mg,13.0mg,0.1mg,0.05mg,85.0mg,3.0ug,0.012mg,0.0 2mg,0.101mg,0.295mg,0.057mg,13.3mg,0.007mg,1.2mg,4.5 ug,5.1ug,0.008mg,
7.8mg,87.13g,0.006,2.0mg,1417,Diabetes,Ulcer, Obesity, Asthma, Hypertension, Pneumonia,none)
DDR$_9$:(Grape-Fruit,Fruit Wine,1.42g,0.39g,0.13g,0.01g,8.0g,,6.0mg,13.0mg,0.1mg,0. 05mg,177.0mg,1186.56iu,
0.052mg,0.02mg,0.101mg,0.295mg,0.057mg,13.3mg,44.56 mg,1.2mg,4.5ug,5.1ug,0.008mg,
7.8mg,87.13g,0.006,2.0mg,1417,Diabetes, Hypertension, Pneumonia,none,none,none,none)
DDR$_{10}$:(Choko Milk,Milk,89.0g,20g,20g,4.0g,650mg,75mg,600mg,4.5ug,9 60mg,2500iu,0.1mg,0.9mg, 0.8mg,
1.9mg,0.3mg9.0mg,350iu,0.9mg,1.5ug,0.8mg,0.8mg,0.00m g,
0.00mg,40%,0.00mg,210mg,1417, diabetes, Ulcer, Obesity, Asthma, Hypertension, Pneumonia).

Deductive Database for Exercise

This comprises of the list of possible exercises to be recommended by the system, below shows a sample of such exercise and how they are being arranged.
EDR denotes Exercise deductive database rules

EDR_N: (Exercise name, ExerciseType, Duration ,Age Range, Impairment1 ,Impairment2 , Impairment3 , Impairment4 , Impairment5 , Impairment6 , Impairment7). The age grouping and unit of other nutrient is the same to that of food above. Thus, the sample is shown below.

EDR_1:(Brisk walking,Aerobic,10minutes per day; 150 minutes (2 hours and 30 minutes) per week,1417, none, none, none, none, none, none, none)

EDR_2: (Jogging, Aerobic, 10 minutes per day; 1 hour and 15 minutes (75 minutes) per week, 65A, Hypertension, Fracture, none, none, none, none, none)

EDR_3:(Running,Aerobic, 10 minutes per day; 1 hour and 15 minutes (75 minutes) per week, 65A,
Hypertension, Asthma, none, none, none, none, none)

EDR_4:(Brisk walk, Aerobic, 10-minute; 3 times a day; 5 days a week, 1835, Hypertension, none, none, none, none, none,none)

EDR_5:(Muscle strength,Flexibility,60 minutes per day (3 days per week),1417, Hypertension, Joint-Wounds/fracture,none, none, none, none, none)

EDR_6:(Running,Aerobic, 60 minutes per day (3 days per week),1417, hypertension, Asthma, Ulcer, none,none, none, none)

EDR_6:(Brisk walking, Aerobic, 60 minutes per day (3 days per week),313, none, none, none, none, none,none, none)

EDR_7:(Gymnastics, Aerobic, 60 minutes per day (3 days per week),313, none, none, none, none, none, none, none)

EDR_8:(Jumpingrope, Aerobic, 60 minutes per day (3 days per week),313,Asthma, Hypertension, Joint-Wounds/fracture none, none, none, none)

EDR_9:(Running, Aerobic, 10-minute; 3 times a day; 5 days a week, 1835, Hypertension, Asthma, none, none, none, none, none)

EDR_{10}: (Swimming, Aerobic, 5-minute at a time; 3 times a day; 5 days a week, 1835, Hypertension, Asthma, none, none, none, none, none).

1.2 The Flowchart of DEAS

The figure below depicts the flowchart for the workability of DEAS.

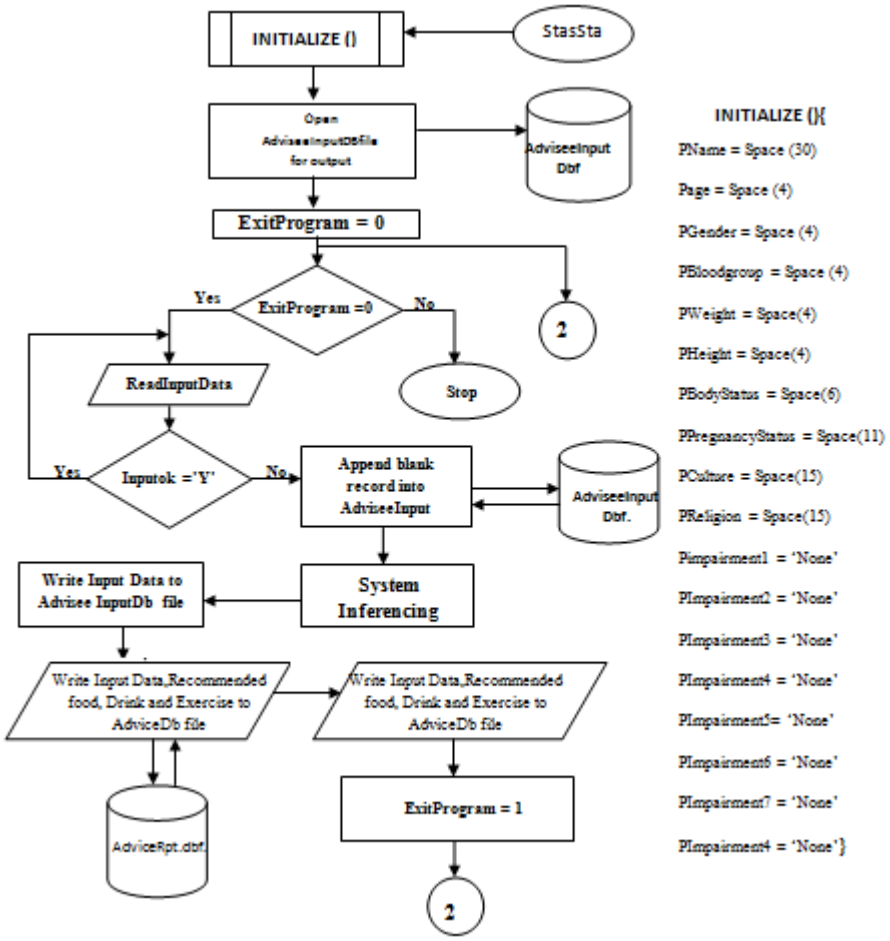

Figure 3.2: Flowchart of DEAS Depicting its Workability.

Implementation and Sample Results

Following the system architecture and knowledge based design, the system coding was done thereby achieving the implementation. The system was tested and we obtain the following sample output (screen shots).

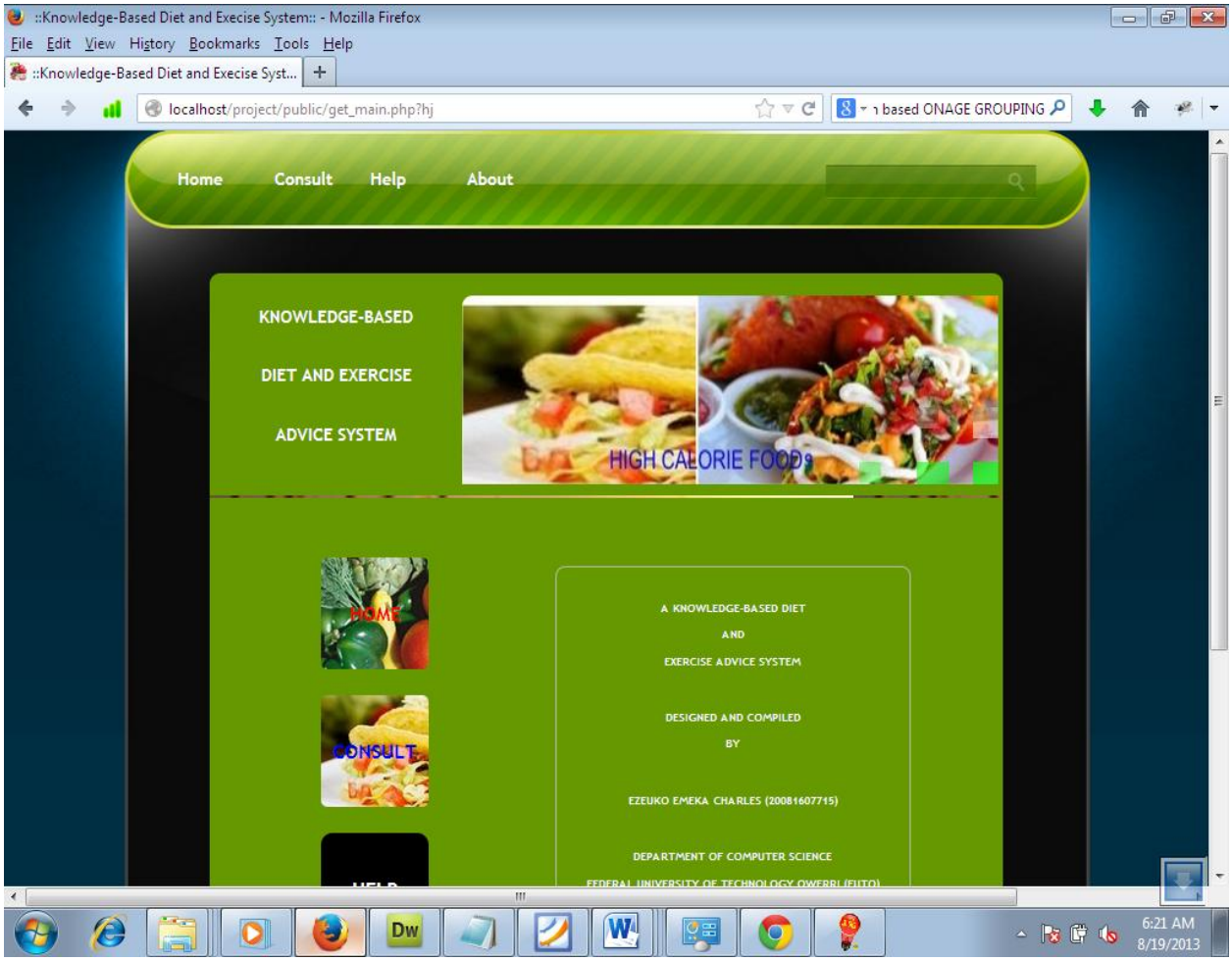

Figure 4(a): Home Page of DEAS.

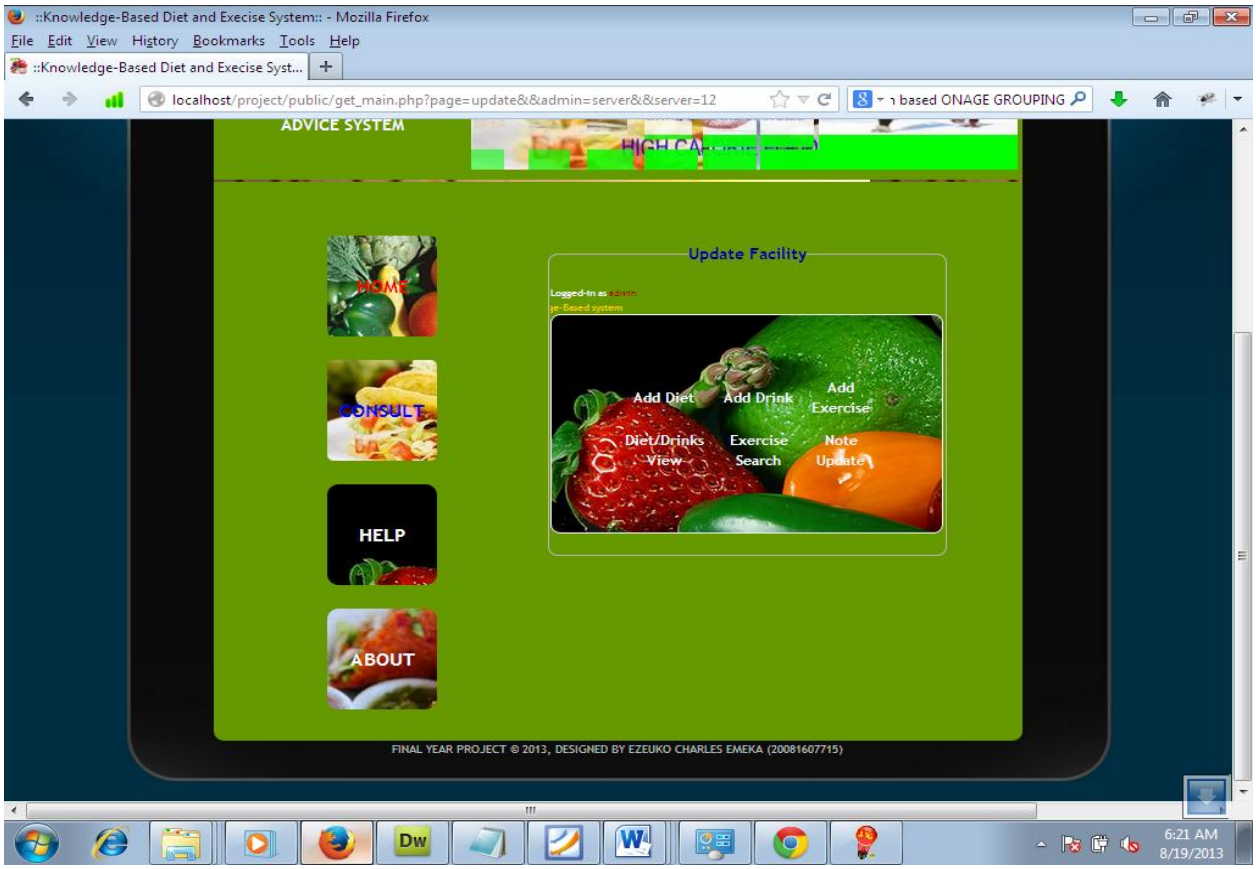

Figure 4(b): DEAS Update Facility

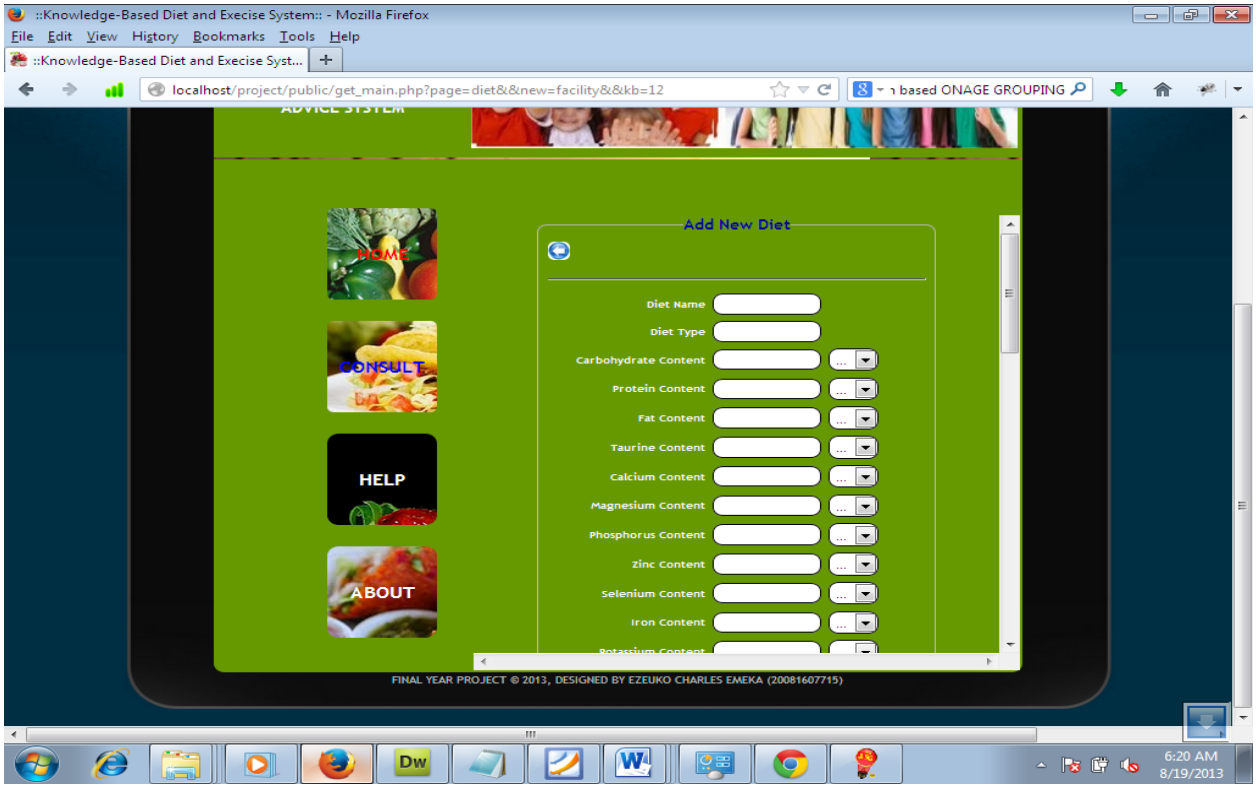

Figure 4(c): DEAS Update Facility- Add New Diet .

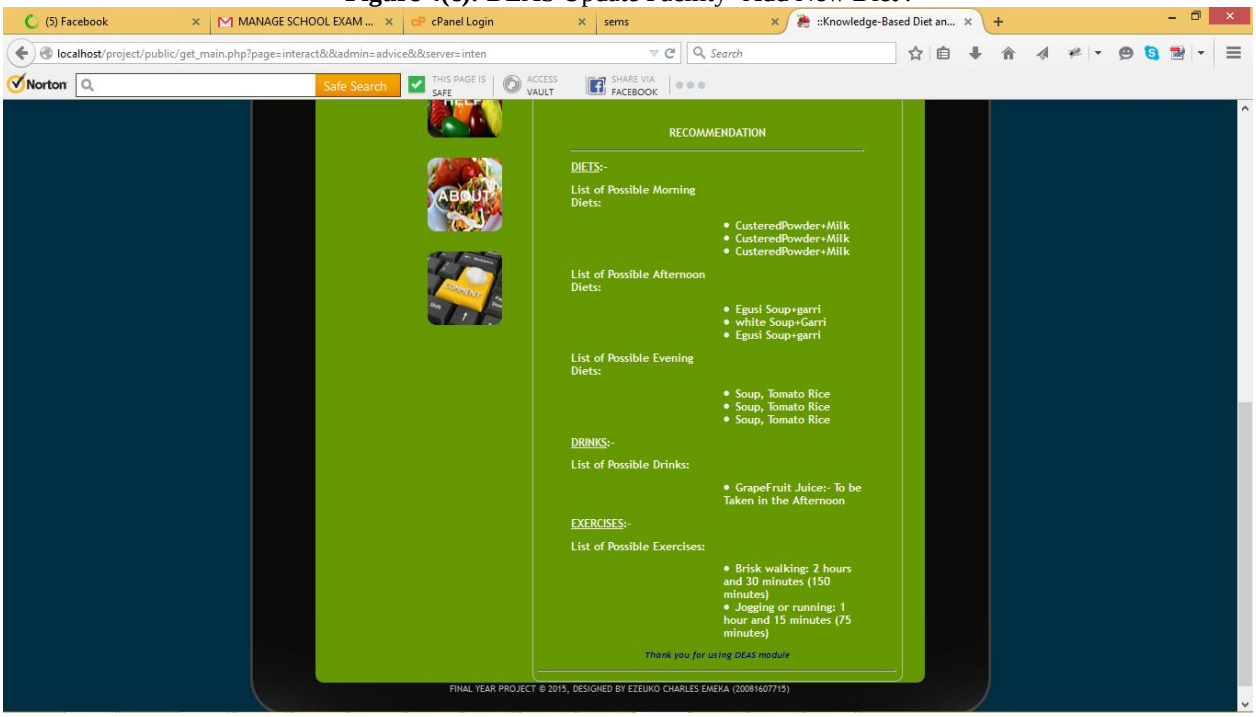

Figure 4 (d): Sample Output Template.

4. Areas of Application

There are several diverse area where the use of this work can be needed thus: individuals, families, hospitals and establishments offering diet and exercise solutions to the populace.

5. Conclusion

Proper diet and exercise are the mainstays for a healthy lifestyle. With healthy diet and exercise, one can live a healthy, longer live with less illness and be more productive. In most cases, people need to be advised on the right type of diet and exercise for them to maintain a healthy lifestyle. The challenges has been insufficient number of trained personnel (Nutritionist, Dieticians) who can be consulted for appropriate advice. The reviewed papers within concentrate on works done on diet and exercise but pay little or no attention to educating, prevention and awareness through media outreach to the populace. This research seeks to automate the functions of the medical domain experts using expert system approach into the system (DEAS). This will enable people to acquire necessary information concerning

proper diet and exercises to be taken instead of witnessing undeserved experience from the inadiquatemedical staff. In the future work, culture should be considered specifically to reflect on the feeding habit. This will enable DEAS system to capture cultural background of different ethnic groups as its affect the feeding habit. Also, the system should be evaluated to determine the usabilitygoals using user centric approach.**(Juha, 2014)**pointed out that developing recommender systems that truly serve their users, user-centric testing is a must.

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