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IMPLEMENTATION OF CLINICAL DECISION SUPPORT SYSTEM FOR THE AYURVEDA MEDICINE

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Abstract- Online diagnosis is becoming famous day by day. In today's world, people hardly get time to visit a doctor so they can use the service of this online diagnosis system and have an idea about the diseases and food recommendations. Clinical decision support system is an important tool used for deriving a clinical decision. Ayurveda is seen as lesser than the western medical system. This practice of Ayurveda emphasizes in the traditional way. In this paper the characteristics of individual patients are matched to the computerized knowledge base and are used to create the patient related information in the form of assessments and based on the assessments the probable diseases and food habits will be displayed. This paper describes our research into the development of clinical decision support system for ayurvedic medicine, which has won a big recognition on these days. Ayurvedic medicine is strongly based on the concept of uniqueness for diagnosis of disease and recommendations of food habits. Clinical decision support system has been developed to recognize human constitution according to ayurvedic medicine. Fuzzy logic is used to fine tune the results obtained from the user. This developed clinical decision support system can also be used as a fuzzy expert system, which models ayurvedic classification of individuals.

Keywords: Ayurveda, Prakriti, Diet, Dosha, Vata, Pitta, Kapha, fuzzy logic

I. INTRODUCTION

It is ethical accountability of a nation to furnish the nice clinical services to their nation men and women on the grounds that healthy humans make a healthy nation. Clinical science discipline is a massive field that consists of a tremendous quantity of talents and information. In this paper, a model of clinical decision support system is proposed and described. This model can be utilized to furnish the prescription for general wellbeing ailments also it works as a human proficient. Clinical decision support system is an information

technology and it is used for obtaining a clinical decision. Clinical decision support system is just a decision support system useful for achieving clinical advice for the patient based on the patient data. Ayurveda is the traditional Indian medicine that remains the most ancient yet living traditions. The present practice of Ayurveda emphasizes in the traditional way. An Expert system is also called as knowledge based system and it is a computer program which uses knowledge base and fuzzy logic inference procedures to solve the problems that are usually solved through human expertise. Fuzzy logic uses the concept of membership degrees and in some domains, fuzzy logic is specially designed to represent uncertainty for dealing with the inbuilt vagueness. Fuzzy logic uses logical values between 0 and 1.

II. METHODOLOGY

Ancient Indian culture has many precious stones. One of these invaluable stones is Ayurveda, which has been serving the people to maintain a healthy and disease free life. In Ayurveda each and every individual is unique. Their size and shape are different, even their anatomical, physiological, psychological characters and behavior are also different this is because they have a different proposition of dosha (Vata, pitta, Kapha). The health of human being totally depends on diet. The human body is made from tri-doshas and is called as Prakriti. In Ayurveda, Prakriti (dosha) is called as the root of the body. Prakriti plays important role in healthy or sick body. When all these doshas are in their normal proportions then person remains healthy but the moment their proportion is disturbed person falls sick. In the human body, these doshas are present with certain proportion. The disorder in human health exists because of disturbance of the combination of this dosha. Seasonal variations affect the human body. Proper diet helps to maintain health. There are various different techniques used to recommending a diet for people having different diseases also for normal users. The Fuzzy technique gives good results in real word problem to recommend personalized diet with different uncertainty.

2.1 About Ayurveda

Ayurveda is one of the oldest logical medical systems in the world, with a long record of clinical experience. However, it is not only a system of medicine. It is also a way of life that teaches us how to maintain and protect health. Ayurvedic medicine has a very strong carriage on the concept of Prakriti, which means nature (natural form) of the build and constitution of the human body. Prakriti is defined as a combination of Vata, Pitta, and Kapha.

2.2 Prakriti Pariksha

Prakriti Pariksha contains questionnaire which assesses the dominance of tri-doshas and each question had three choices for a response that corresponded to the concerned feature's characteristics. The questionnaire consists of 83 questions and it is divided into three sections namely Anatomical, Physiological and Psychological. Questionnaires are user-friendly and based on medical theories of Ayurveda used for finding the constituent type.

- The anatomical section consists of 20 questions which are related to the structure of the human body.
- The physiological section consists of 28 questions which are related to the normal body function.
- The psychological section consists of 35 questions which are related to the mental state of a human being.

2.3 Doshas

The basic of the ayurvedic system is tri-doshas i.e. the three doshas namely Vata, Pitta and Kapha. Each and every individual have a different proportion of dosha (Vata, Pitta, and Kapha) at the time of birth which decides their constitution. Once this constitution is set, it is permanent for that individual. Vata, Pitta, and Kapha are found in every cell, tissue, and organ in different degrees. In the human body, these doshas are present with certain proportion.

The three doshas are:

- Vata dosha
- Pitta dosha
- Kapha dosha

The features of these doshas are mentioned below:

1. Vata dosha: Vata reflects the elements of space and air. Vata is dryness, whenever there is excessive dryness in the body we can say Vata is high. This dryness could manifest externally as dry hair, dry skin or dry eyes. It could also show up internally as constipation. People with Vata type are usually quick thinking, thin and fast moving.

2. Pitta dosha: Pitta reflects the elements of fire and water. Pitta is heat, when pitta is high then it could manifest as fever, inflammation, skin rash and hot temper. People with pitta type are usually fiery personality and oily skin.

3. Kapha dosha: Kapha reflects the elements of water and earth. Kapha is heaviness, when Kapha is high there could be laziness, obesity, edema, and congestion.

The result of Prakriti can be an individual or combination results totally there are seven possibilities including the combinations. The different types of Prakriti is shown below

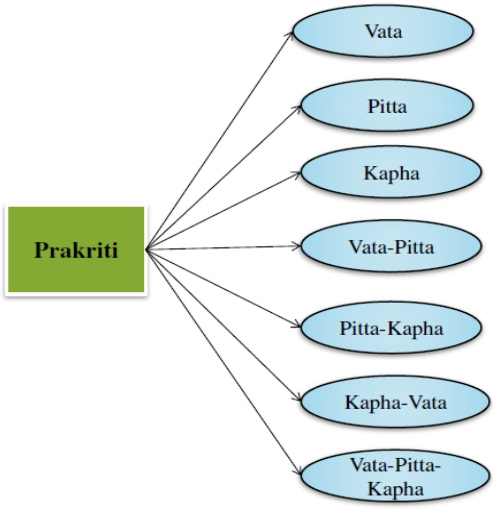

Fig 1 : Types of Prakriti

III. STRUCTURE FOR MODELING KNOWLEDGE

The architecture for modeling knowledge is given below. It is consists of modules such as fuzzy logic Inference engine and knowledge base etc.

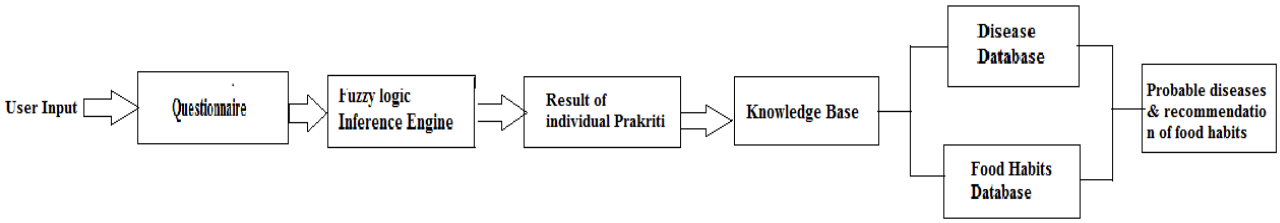

Fig 2: Knowledge modeling architecture

The answers from the users for the uestionnaire will be the input for the fuzzy logic module using the fuzzy rule base the individual prakriti will be determined. The knowledge base contains diseases and food habits database based on the result of prakriti the probable diseases and recommendation of food habits will be displayed as the output. This module has been implemented using visual C# for widening scope of generating membership function. Fuzzy rules have been constructed in the fuzzy logic module.

Fuzzy rule base: In the fuzzy theory, fuzzy set F of universe U is defined by a membership function. It is denoted by μF(x) such that μF(x): F→ [0, 1], 1 if x is totally in F, μF(x) = 0 if x is not in F. For any element x of universe X, membership function μF(x) equals the degree to which x is an element of set F. Degree having a value between 0 and 1 which represents the degree of membership and also called as membership value of element x in set F.

Type-1 Fuzzy logic: The type-1 Fuzzy logic set can operate well under specific operation conditions. The linguistic and numerical uncertainties can make problems in determining the exact and precise antecedents and consequent membership functions during the fuzzy logic set design. As time goes every user behavior and preferences change from one person to another also the domain experts opinions are also vary. Hence, the effectiveness of the type-1-based system will goes down when there are high uncertainty levels that are related with the diet domain.

Type-2 Fuzzy logic: Type-2 fuzzy logic is used to handle the uncertainties in the group-decision-making process as they can model the uncertainties between expert opinions using type-2 fuzzy sets. A type-2 fuzzy set is characterized by a fuzzy Membership function, the membership value for each element of this set is a fuzzy set in 0, 1 and in between 0 and 1, in type-1 fuzzy set, where the membership function value is a crisp number in exactly 0 or 1.The type-2 fuzzy sets can model the requirements of a person specification that is reflective of all the experts' opinions and which can then be used to provide a good recommendation for the diet.

The questionnaire with the weight ages have been stored in the database and it is integrated with the user interface. The output is generated by the fuzzy logic module. The explanations for the output have been processed by fuzzy rule base.

The clinical decision support system takes the answer from the patient for each question(i.e. 83 questions) based on the answers the fuzzy logic finds the human constituents in percentage according to the dominance of the dosha the system exhibits the related diseases and food habits. Fig 3 explains the concept of clinical decision support system.

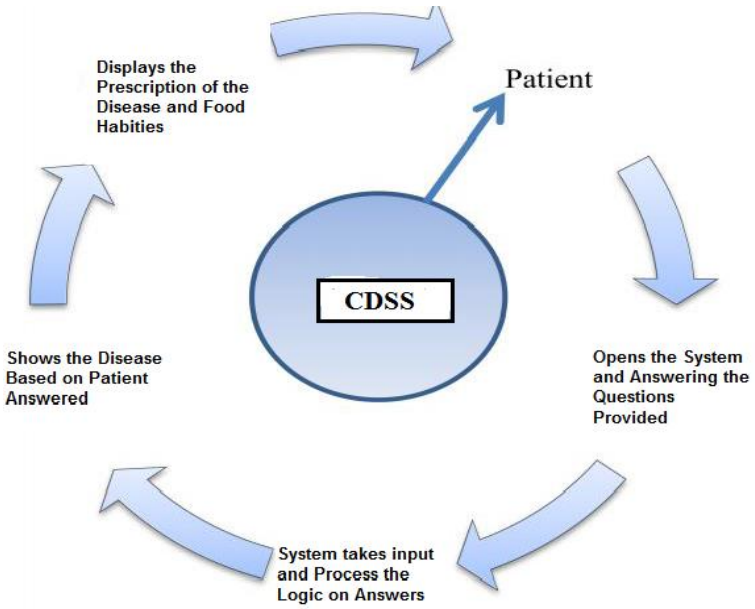

Fig 3: Clinical decision support system

We presented an approach to model clinical decision support system for arriving clinical decision-making in ayurvedic medicine evolved by dosha using fuzzy inference system. Clinical decision support system helps to find:

- Type of dosha (constituent type: Vata, Pitta, Kapha)
- Dominant type of dosha
- Possible diseases based on type of dosha
- Food habits recommendation.

IV. CONCLUSION

The developed tool can be used for supporting ayurvedic medical practitioners for recognition of individual human constituents. We have improved the correctness of the decision-making process by the use of a traditional questionnaire which can eliminate the inconsistencies and repetitiveness of answers and also provides a means for an explanation of reasons for answers. The system can also be used by an ordinary person without consulting an ayurvedic doctor furthermore this can be used by the ayurvedic medical student as a learning system.

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