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Survey on Fuzzy expert system for non invasive method of the liver cirrhosis diagnosis

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ABSTRACT
Decision support through expert systems becomes part of everyday life. The aim of this study is to design a fuzzy expert system for the diagnosis of Cirrhosis which is one of the common diseases of the liver. The designed system is based on the sequential combination of the Bononcini score, which includes AST/ALT ratio, Platelet count and INR. The system has 3 input fields and one output field. Input fields are AST/ALT ratio, Platelet count and INR and the output field refers to the risk of cirrhosis. It is integer valued from 0 to 6. The system uses Mamdani Inference method. The results obtained from the designed system are compared with the actual data of patients in the database and observed results of the designed system are well within the limits set by the domain expert. The system can be used as decision support for the prediction of the cirrhosis and can avoid the need of the liver biopsy. Cirrhosis is a serious disease of the liver which replaces healthy liver tissue with scar tissue. The scar tissue blocks the flow of blood in the liver and slows down the vital functions of liver. To improve the performance and to provide security this paper focuses on the TCP throughput, RTT, receive window, retransmission and RC6 for security.

General Terms
Medical diagnosis is the art of determining a person's pathological status from an available set of findings. Why is it an art? Because it is a problem complicated by many and manifold factors, and its solution involves literally all of a human's abilities including intuition and the subconscious. If it is an art, is it at all susceptible to information processing? Although it appears to be among the most demanding problems ever to be approached by the information processing community, there is strong evidence that it is. It does, however, require an integration of results from most of the many subdisciplines of information processing and, especially, AI.
Keywords: Fuzzy Expert System, Diagnosis of Cirrhosis, Pathological Investigation.

I. INTRODUCTION

Medical diagnosis is the art of determining a person's pathological status from an available set of findings. Why is it an art? Because it is a problem complicated by many and manifold factors, and its solution involves literally all of a human's abilities including intuition and the subconscious. If it is an art, is it at all susceptible to information processing? Although it appears to be among the most demanding problems ever to be approached by the information processing community, there is strong evidence that it is. It does, however, require an integration of results from most of the many subdisciplines of information processing and, especially, AI. **Alcoholic diseases** Alcohol injuries may affect the normal functioning of the liver by blocking the metabolism of fat, proteins and carbohydrates Chronic Infection:- Chronic hepatitis A,B,C and D infection can cause inflation of the liver and can damage the liver which can lead to cirrhosis. Fatty liver :- Fatty liver associated with diabetes and obesity can affect the normal functioning of the liver which may cause cirrhosis. Hemochromatosis :- Diseases such as hemochromatosis

in which excessive absorption and disposition of iron takes place in liver can cause cirrhosis Inherited diseases: - Certain inherited diseases such as Alpha-1 antitrypsin deficiency, Glycogen storage diseases, Wilson disease and cystic fibrosis can cause Cirrhosis. Cirrhosis can cause loss of appetite, weakness, jaundice ,itching and fatigue. Complication of Cirrhosis includes edema and ascites, bleeding from varices, hepatopulmonary syndrome and liver cancer. Patient's history, physical examination of patient and blood test can suggest the diagnosis of Cirrhosis. The conformation can be done by the liver biopsy, but biopsy may cause complications. Several non invasive tests which includes routine laboratory test can predict cirrhosis.The aim of this research is to design a Fuzzy expert system using Bononcini score to predict diagnostic accuracy of cirrhosis. The investigation of cirrhosis involves uncertainty and imprecision, hence fuzzy logic is the most suitable tool for the development of this system.

II. PROPOSED ALGORITHAM

The proposed expert system assist physician in the diagnosis of the diseases the patient might have, in a fuzzy way. Based on the patient complaints, the signs and symptoms are input into the system, according to the selection the fuzzy expert system diagnosis diseases based on its knowledge. The algorithm for the proposed system is adapted from

Step 1: Input signs and symptoms of patient complaint into the system. Where s = number of signs and symptoms.
Step 2: Search the knowledge-base for the disease p whether it matches the signs and symptoms identified.
Step 3: Get the associated degree of intensity (weighing factor) di = 1, 2, and 3. Where 1 = Mild, 2 = Moderate, 3 = Severe.
Step 4: Apply fuzzy rules.
Step 5: Map fuzzy inputs into their respective weighing factors to determine their degree of membership.
Step 6: Determine the rule base evaluating (non-minimum values).
Step 7: Determine the firing strength of the rules R.
Step 8: Calculate the degree of truth R, of each rules by evaluating the nonzero minimum value.
Step 9: Compute the intensity of the disease.
Step 10: Output fuzzy diagnosis.

III. PROPOSED WORK AND BJECTIVES

A fuzzy expert system will be developed for them management/diagnosis of Cirrhosis. The proposed system uses fuzzy logic approach. The system will be designed as a rule based expert system. A rule based expert system is one whose knowledge base contains the domain knowledge coded in the form of rules. The main components of system are:

- Knowledge base.
- Fuzzification.
- Fuzzy Inference.
- Defuzzification.

3.1 KNOWLEDGE BASE

This is the component of the expert system that contains the system's knowledge. It contains concise representation of domain expert.

3.2 FUZZIFICATION

Fuzzification is a process that determines the degree of membership to the fuzzy set based on fuzzy membership function. The first step is to

3.2.1 Create a fuzzy set of the parameters. The parameters will be described with three linguistic variables (mild, moderate and severe).

3.2.2 The degree of membership for a fuzzy system is of the range [0 1]. A range of the fuzzy value using the linguistic variables will be determined by the expert e.g. mild $0.1 \leq x \leq 0.3$.

3.2.3 The fuzzy rule will be developed with the assistance of the domain expert.

3.3 FUZZY INFERENCE

The inference engine controls how the rules are applied towards facts. This is the part of rule-based expert system that makes inferences. It decides which rules are satisfied by facts and controls overall execution. Also, it matches the facts against the rules to see what rules are applicable. The system will make use of forward chaining reasoning; it would make use of the facts given by the patient to diagnose the problem. Fuzzy inference is the process of mapping from a given input to an output using the theory of fuzzy sets .Rules are used in the knowledge-base by the fuzzy inference engine to derive conclusion based on the rules.

3.4 DEFUZZIFICATION

This involves changing fuzzy output back into numerical values for system action. The output from the inference engine is translated into crisp output which is more precise than the fuzzy output.

IV. CONCLUSION

This paper describes design of fuzzy expert system for the pathological investigation and diagnosis of Cirrhosis, which can be used by the doctors for the liver treatment. The system design is based on membership functions, input, output variables and the rule base.

In this system fuzzy logic enhance the reasoning in dealing with fuzzy data and the expert system uses the rules designed by the domain expert to diagnose patient"s illness based on the pathological tests. Combination of expert system and fuzzy logic could increase the performance. In future this system can be applied for the other liver diseases.

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