Implementation of Fuzzy Logic in Medical Diagnosis

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Abstract:
In order to build smart decision making system fuzzy logic has evidenced to be incredible tool based upon the expert knowledge and interpretations. For the development of medical knowledge based systems, fuzzy logic and set are the most appropriate and very much suitable approach. These expert systems then helps in the diagnosis of a diseases with more accuracy and also recommends the corresponding prescription a particular can have based upon the identified diseases along with the monitoring of patient in real time environment.
Keywords: Fuzzy Set, Fuzzy Logic, Knowledge Base Systems

I. Introduction

As per needs of faster diagnosis of large quantity of data and expertise in utilizing available resources we have to look forward to Fuzzy Logic and Fuzzy Set Theory. Fuzzy Logic helps us analysing and categorising the patient data.

For handling medical queries and to answer the following questions fuzzy logic and fuzzy set is the most appropriate tool. The questions are:

- How to define logic?
- How to define the fuzziness?
- How we can specify the term "fuzzy logic"?

After getting the answers to these questions we will confer the inspiration of using fuzzy logic in the field of medicine.

- *Logic study the various concepts, their relationships and their consequences.* It also deals with the rules generated by propositions, proposition sets and relationships among then. Based upon the relationship it generates the results.
- *fuzziness is impreciseness in medical*: Propositions generated by fuzziness is true to some extent.
- *Fuzzy logic is a consistent classification* of rules which is responsible for formulating the estimated perceptive.

II. Problem Definition:

Availability of huge amount of data creates lot of problems for medical experts because data contains too much of insecurity and ambiguity. As the data grows these factors also raises. The diagnostic decisions depend upon not only the expertise of the practitioner but also how we are providing information to the expert system. Because the expert system generates the result based upon the data inputted to the system. So as the input data increases it increases the system complexity which will further affect the performance.

III. Scope Of Fuzzy Logic in Helpful Medical Diagnosis:

Fuzzy logic presents dominant reasoning methods that can switch suspicions and vagueness. The Fuzzy Expert Systems (FES) define indefinite knowledge and offers language concept with brilliant estimate to medical writings. Fuzzy logic is a process to condense specific what is indefinite in the world of medicine. FES (Fuzzy Expert System) plays a vital role in terms of pharmacy for symptomatic diagnostic therapies. The technocrats identified potential and possible areas for implementation of FES for medical diagnosis.

IV. Approaches of fuzzy systems:

Various approaches were recommended and proposed by different researchers to pact with the diverse matters related to the medical findings. The fuzzy schemes were planned based upon the knowledge gathered from experts and their

experience. The following is the process which shows the basic process

- Acquisition of medical awareness.
- System development based upon the data given by experts.
- Rule generation based upon the inputted data.
- Handling discrepancies from generated data.
- Identification of methods used to deal with discrepancies.
- Recommendation of various alternatives.
- Regular observation for system validation.
- Identification and specification of various parameters to identify particular disease.
- Implementation of fuzzy approach using genetic algorithm.

V. An example

To assess the instant strength of neonates instantly after the birth, a basic scoring system which was named after the American physician Apgar was used by throughout the world. It worked upon 5 attributes which were as follows:

a) Rate of heart beat.
b) Tone of muscles.
c) Skin colour.
d) response tetchiness
e) respirational effort

The normal score given to these variables varies in the range of 0,1,2 as shown in the table and the abnormal score ranges from 8 and 10. By considering these various under three classes we can see the outcome of
Arbitrary task to one of it two adjacent modules in marginal cases is essentially required.

Table 1: Apgar's score.

VARIABLE/SCORE	0	1	2
heart rate	absent	< 100	>100
respiratory effort	absent	slow, irregular	good, crying
muscle tone	flaccid	tone of extremeties	active motion
reflex irritability	no	grimace	cough or sneeze
colour of skin	pale	body pink, extremeties cynaotic	pink

Note that only the heart rate is observed in quantitative form.

After the fuzzification the Apgar score all the contributions were considered on uninterrupted scale.

The arbitrary class assignment problem was replaced by subjective values rather than objective value in majority of the cases which in turn has less influence on the score outcome.

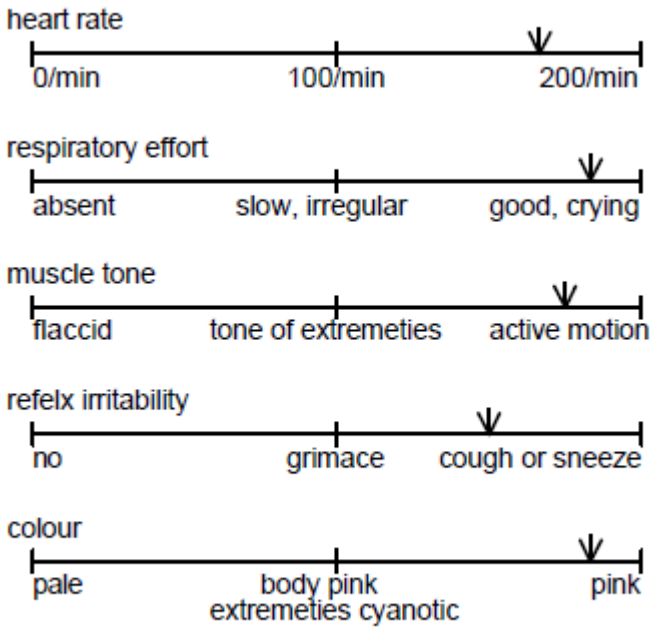

Figure 1: Continuous input to the fuzzy Apgar score

The relationship of the values on the continuous scales for the three classes under which the variables were monitored was identified using fuzzy groups. The correspondence of a grouping of different class projects for a particular evaluation, using fuzzy set was also well-defined using some rules. The overall score generated by fuzzy sets were derived from the results subsequent to the fuzzification / inference/defuzzification approach that is severely engaged in fuzzy control.

The score provided by fuzzy will efficiently stipulates a continuous function from the observations.

The benefit over other possible specifications of this function is its nearness to the original tabular values of Table 1.

VI. Conclusions:

Different medical practioners have different implementation for particular diseases that will result in vague results. Fuzzy systems are those systems that employ fuzzy logic and they are designed in such a way that they can handle uncertainties very well. Now a day's medical systems are intended by using some heuristics means they are designed based on some experiences of different medical practioners. They are known as expert systems because they acquire expertise knowledge of different practioners and they have the capability of thinking like humans. The other advantage of implementing Fuzzy logic in medical diagnosis system is that we can get the more accurate results that we can get from normal medical practioners.

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