

A PROTOTYPE FUZZY LOGIC BASED DIAGNOSTIC EXPERT SYSTEM FOR COMMON RESPIRATORY DISEASES NEEDING INTENSIVE CARE

S.R.LIYANAGE,¹ K.S.WALGAMA,² C.D.A.GOONASEKARA,³
I.P.M.WICKRAMASINGHE² AND T.M.A.S.PERERA³

¹*Department of Computer Engineering, Faculty of Engineering, University of Peradeniya.*

²*Department of Engineering Mathematics, Faculty of Engineering,
University of Peradeniya*

³*Department of Anaesthesiology, Faculty of Medicine, University of Peradeniya*

Precise relationships between clinical features and diseases are difficult to define yet it is essential that the physician establishes a diagnosis to institute appropriate therapy. The physician generally gathers knowledge about the patient from the presenting clinical features, past history, physical examination, laboratory test results, and other investigative procedures. The knowledge provided by each of these sources carries with it a varying degree of vagueness. Fuzzy set theory with its capability of defining inexact medical entities as fuzzy subsets, with its linguistic approach provides an excellent approximation to medical texts. Its power of approximate reasoning seems to be perfect for designing and developing computer-assisted diagnostic, prognostic and treatment recommendation systems.

In this paper a decision support mechanism is attempted utilizing five respiratory related diseases with similar clinical features, which are hard to distinguish from one another for the non expert. The medical knowledge in the system is stored in the form of fuzzy logical relationships between clinical features and diseases representing the above scenario. The fuzzy inference is performed using the min-max compositional rule to calculate indication relations expressing occurrence and confirmability. These lead to confirmed and excluded diagnoses as well as diagnostic hypotheses. The diagnostic hypotheses are ranked according to their respective products of occurrence and confirmability relation values.

A sensitivity analysis of the system was carried out to measure the robustness and to identify the sensitive clinical features for each disease. A clinical validation of the prototype is currently underway and has shown constructive results and weaknesses. For example, Pneumothorax and Inhaled foreign body cannot be distinguished by the current system. These diseases can be differentiated only by an X-ray examination. Medical history of patients and age also help to determine these two diseases. It is intended to consider such clinical features in further developments of the system.

Financial assistance by the National Science Foundation is acknowledged.