Reviewer's report

**Title:** Fuzzy Cognitive Map Technique for Meningitis Diagnosis Support Among Infants and Children

**Version:** 1 **Date:** 1 February 2012

**Reviewer:** Neli R S Ortega

**Reviewer's report:**

**Major Compulsory Revisions:**

The manuscript titled “Fuzzy cognitive map technique for meningitis diagnosis support among infants and children” addresses the application of cognitive maps, which is a tool that has proved very useful in control systems, in medical decision making. The subject is certainly interesting, although not exactly original. The text is reasonably organized, but very redundant. There are figures and tables that can be deleted. The aim of the work costs to get the course. Also, there are laboratory tests reasonably quick, although invasive, to assess the type of meningitis. In this sense, how the system might actually be useful? It is a cost-benefit situation or availability of these tests? These issues must be discussed once the novelty of the paper is the application and not a model or theory used.

In addition, some theoretical and philosophical aspects are relevant:

1) Fuzzy relations between signs and diagnoses in a FCM describe associations between these conditions and not necessarily causality. Causal relationships are complex to establish in health, demanding depth studies about the dynamics of the disease and the use of various epidemiological techniques. Therefore, it is essential to be careful when establishing causal conditions, or even with the use of the word causality.

2) The MCF, as proposed by Kosko and implemented in this study, is useful in control system precisely because, depending on the transformation function and the parameters used, they converge to a fixed point or a cycle. This feature provides robustness to the system allowing it to adapt to changes in initial conditions. However, the use of these systems in the differential diagnosis of disease requires further attention. It is unclear how the system can converge to different values depending on the initial conditions, i.e., for different patients in the case of application in health. You should also discuss what it would mean changing the values of FCM status in relation to patient status.

3) On these maps in general the weight matrix is fixed in time, even as indicated in equations 1 and 2, however, in the text the authors indicate that the system takes as input an “initial matrix”. This matrix changes in time? According to that dynamic? If the weights change it seems very strange from the viewpoint of application of the MCF in health.
4) The lambda value should also be fixed and the model for the diagnosis is completed only when a value of lambda is chosen as the most appropriate.

5) In establishing the weight matrix specialists work with discrete values (linguistic terms defined), why not use a system based on rules with Sugeno type inference? In this case it seems more appropriate.

6) The authors seem to have used the same database to study the values of lambda and to evaluate the accuracy of the system, which would be a mistake. It is also not clear how is the values of the state of the patients. What are the values of the array of states? They are classical or fuzzy measures? What is coding used?

7) The evaluation of the cases was performed by expert consensus? Were those who worked to produce the model?

8) The system was not evaluated using statistical tools. Since there is a gold standard can be used, for example, a ROC curve to evaluate the system performance.

Minor Essential Revisions:

1) Revise the text in order to be more objective and not repetitive.

2) it is necessary to review the notation.

3) The equations of the membership functions are unnecessary since there are graphics. I think the graphics are more interesting than the equations given the profile of the magazine readers.

4) There are errors in the numbering of tables and columns.

5) The algorithm presented on page 13 is unnecessary since the system is quite simple.

6) Tables A and B of the appendix may be deleted. In fact, they seem to be not part of the document.

7) Table 1 is unnecessary, the symptoms may be described in the text.

8) Table 5 is unnecessary, since the values are shown in Figure 7.

9) Figures 3 and 4 must be redone because it is unethical to use graphics directly extracted by Print Screen of the fuzzy toolbox frame of the Matlab. Moreover, they have very bad quality.

10) Figures 5 and 6 are totally unnecessary.

**Level of interest:** An article of importance in its field
Quality of written English: Not suitable for publication unless extensively edited

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.