Integrated intelligent system for functional diagnosis

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1. Introduction

Correct medical diagnosis is an important step and condition to ensure an effective monitoring and prophylactic medical attendance. It is more and more difficult to imagine a performance diagnosis without the support of computer. Therefore, a challenging step is to pass directly to the intelligent system support, neglecting any intermediate stages. Information processing means an assisted support in which medical staff is less (or not at all) involved.

Current outcome in fault detection and isolation (FDI) systems applied in technical environments (Isoc 2004) encourages the monitoring and control of the fault state by means of quantitative and qualitative ways. At the same time, it encourages the integration of objective information together with other information provided from other sources, inclusively those which refer to human knowledge. On the other hand, the medical diagnosis, by example the diagnosis of lung diseases (Zamora *et al.* 2003) is mainly oriented to identify the knowledge.

2. Materials and methods

The functional diagnosis can be predicted as a consequence of all conditions which are consistent in characterizing the health state of a person as a member (e.g. member of a group with similar diseases). The functional diagnosis is developed by collecting information (data) and integrated into possible known and reproducible disease states. Part of this information flow is collected by numerous members of medical staff during their activity and another part is collected by use of specialized apparatus and methods. Firstly, the measured data are concentrated and synthesized, in order to be manipulated by such an intelligent system. The integration of general information and measured data, together with procedures able to develop

information processing like a human being (e.g. expert system), is done by an intelligent system.

3. Results and discussion

As a concrete result of the analysis of functional diagnosis in medical field, a system was specified in figure 1. The *integrated intelligent system* (IInS) involves a background expert system having some specialized information basis and subsystems. The knowledge base (KB) hosts all the information necessary to be inferred in order to obtain alternative decisions as possible diseases for the given patient. The further knowledge to be included in KB is collected from experience by a knowledge gathering system (KGS) and from measurements by a data gathering system (DGS). The relation between the patient and the integrated intelligent system is mediated by an *assistive doctor*.

As an application of this intelligent system, an evaluation of the respiratory function was performed and information gathered (Ionescu and De Keyser 2005). This noninvasive evaluation of the lungs suggests if the patient needs a more careful examination or if its vital respiratory capacity is within normal conditions. This could result also in a screening method of the patients, reducing considerably the time and efforts the medical staff invests during the diagnosis.

In its initial stage, the system integrated only heuristic knowledge. Some further patterns and procedures to transfer specific medical knowledge into effective

Figure 1. Structure of the integrated intelligent system (IInS).

information are introduced and exemplified. This effective information will be further manipulated by IInS.

4. Conclusion

The suggested IInS structure proved to be appropriate and allows processing specific information, assisting the medical staff, and at the same time updating the above information with measured data collected by the staff by means of medical apparatus and methods.

References

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