

About the Operating Principles of System DDFAO “(Dépistage et Diagnostique Fonctionnel Assisté Par Ordinateur)”

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Abstract— At present, one of advanced noninvasive techniques for medical diagnostics is the system electrosonatograph (ESG- DDFAO), which is estimated playing equivalent role of whole polyclinic. The paper treats the basics of this technique and define operating principles and structures for typical system ESG - DDFAO - Pro MEDISCAN M3D now firstly used in Vietnam.

Keywords— electrosonatograph, expert-like system, algorithm, bio-electroimpedance. Identify.

I. INTRODUCTION TO SYSTEM DDFAO [2]

A. What Is DDFAO ?

DDFAO has been invented in France and is an French acronym for **Dépistage et Diagnostique Fonctionnel Assisté par Ordinateur** to designate the first “Computer-Aided Screening and Functional Diagnosis” non-invasive investigation tool for the entire human body.

DDFAO is an imaging medical device but, unlike conventional scanners or MRI, which are expensive imaging devices looking for any possible lesion in the body and therefore require extensive computer power in order not to miss any detail, DDFAO is looking for the functional state of the different organs and systems of the human body.

B. The Applications of DDFAO

Screening and early detection

By pinpointing any discrepancy between the expected values measured in the different areas of the body which are linked together through the different body’s regulation systems modeled into DDFAO, all disorders in the organs and systems are highlighted, suggesting sensitivity to possible future pathologies and actions to be taken even before external symptoms have yet appeared. The operator-independent simple and quick procedure allows a high throughput for quick screening of large batches of population under scrutiny.

Functional diagnosis

DDFAO expert-like system analyzes the possible risks related to the current alkalosis or acidosis state of the organs and tissues of the patient, suggesting conventional examinations to assert the patient’s condition. DDFAO allows the doctor to look for the origin of a problem, not just treat the external symptoms.

It is to be noted that, like in a normal medical practice, knowing the clinical context of a patient is of a particular importance, since DDFAO is not looking for lesions. If the body is used to function with a particular lesion with no harm, DDFAO will not show a disorder. Similarly, if a treatment is appropriate and suppress the initial disorder, DDFAO will only show that, as a result of the good treatment, the body returned in an homeostatic (i.e. well balanced) state.

Treatment follow-up

Dynamic comparisons between the patient’s functional states, as recorded during two different visits. The values are instantly compared and DDFAO will pinpoint all the areas which have come closer to the homeostatic state, also highlighting the areas where the disorders have increased, allowing the doctor to take immediate corrective actions, before new external symptoms even appeared. Ultimately, DDFAO will allow to assert the return to the homeostatic state of a patient, thus indicating if the treatment must be continued even when the external symptoms have disappeared.

C. The Feature of DDFAO Technology

DDFAO is not representing these data on a hard-to-read list of numbers or hard-to-interpret graphics, but in a similar way that the data collected by mean of ultrasounds are displayed after calculations in an echography, DDFAO generates several reconstituted color graphic images in its unique easy-to-read yet comprehensive way.

DDFAO’s embedded expert-like system instantaneously proposes to the doctor its own analysis of the risks related to the current condition of the patient, suggesting possible complementary conventional examinations and actions related to several possible therapies.

II. SCIENTIFIC BASE AND OPERATING PRINCIPLES [2]

A. Scientific Base [1]

DDFAO is based on next sciences:

- a. The quantum theory
- b. Measurements of resistances of human body systems and organs
- c. Colloidal Properties of a material
- d. Perturbing foci and fields
- e. Measurement of biological microcurrents
- f. Somaesthesia
- g. Use of the principle of nuclear magnetic resonance in biology
- h. Information theory

B. Operating Principles [2]

DDFAO is a true medical device which reliably measures bio-electroimpedances by mean of 6 convenient large flat pods and determines accurately body parameters like pH and blood pressures, thanks to its highly integrated electronic circuitry.

DDFAO's integrated expert-like patented technology is also able to interpret these data by applying the neurophysiology principles and to propose automatically its own analysis of the patient's risks in less than 3 minutes (measuring time included), instead of simply printing out the measurements results as a set of raw data which require significant time of a trained person for the analysis !

DDFAO expert-like system is able to deliver a full analytical report on the detailed functioning of the complete body with organs and systems (down to the hormones), along with quantifying the risks for pathologies, giving recommendations for conventional examinations, and suggestions for therapies.

DDFAO is measuring the human body's electrical activity, actually using the same principles which are behind the well-known EEG and ECG, but instead of focusing on brain or heart activities, DDFAO applies the technique to the entire body, to record an ElectroSomatoGram (ESG).

DDFAO is simply sending a harmless low DC-voltage (1.28V) to the patient's body, by the mean of 6 electrodes in contact with his skin : two on his feet, two on his hands and two on his foreheads. By sequentially applying the positive polarity on each one of these electrodes while every other one is sequentially receiving the negative polarity, DDFAO initiates a migration of H⁺ and HC03⁻ ions in the different tissues traversed, thus creating a very low DC-current which is measured on each of the 22 branches under analysis.

The bio-electroimpedance of each branch is then simply calculated by the application of Ohm's Law and recorded as

the ESG. Of course, each branch is composed of many organs and tissues but DDFAO's patented cross-analysis algorithms allow to calculate the bio-electroimpedance of more than 69 different volumes (organs and surrounding tissues) in the human body and ultimately to determine the pH of each one of these volumes, whose pH is representative of their alkalosis or acidosis state, which is significative of trends or pathologies, according to the importance of this pH value.

The correlation between an organ's bio-electroimpedance and its pH or blood pressure is not new : it was actually proved by numerous electro-physiological research that started as early as the middle of the 19th century (E. Du Bois Reymond, 1857). But at that time, this experimental work had no applicable usage in common practice because it would take way too long to manually make all the measurements and calculations needed to make a proper diagnosis : only the modern understanding of the neuro-physiology principles and the affordable and extensive power of today's computers allowed fast calculations and the neurophysiology systems to be modeled into DDFAO.

III. THE DDFAO'S ALGORITHMS USED TO IDENTIFY DISEASES [5]

Analysing above described scientific base and operating principles of DDFAO enables to propose it's the algorithms used to identify the functional state of the different organs and systems of the human body (diseases) in figure 1. In this figure:

- The block “Preliminary processing” receives the signals from 6 electrodes and patient's medical file (the data about patient's age, sex and BMI). Then, this block prepares data to calculate the parameters named as parameter set to norms (N) and parameter of permeability called automatic (A).

- The block “Calculating parameters” estimates two parameters

1-Norm Na: this parameter depends on the body's water content and, after taking into account the above factors of variation, corresponds to functional norms of optimal concentration of the interstitium;

-Automatic Aa : The 0 point for this parameter is calculated relative to the mean electrical resistance of cell membranes or their permeability (electrochemical gradient of diffusion and activity). This will demonstrate the relationship between electrical membrane conductivity and ionic concentration of the interstitium;

- The blocks “Identifying ... diseases “ compare estimated parameters Aa and Na with standard parameters corresponding to diseases of the different organs and systems of the human body, and propose the diagnosis.

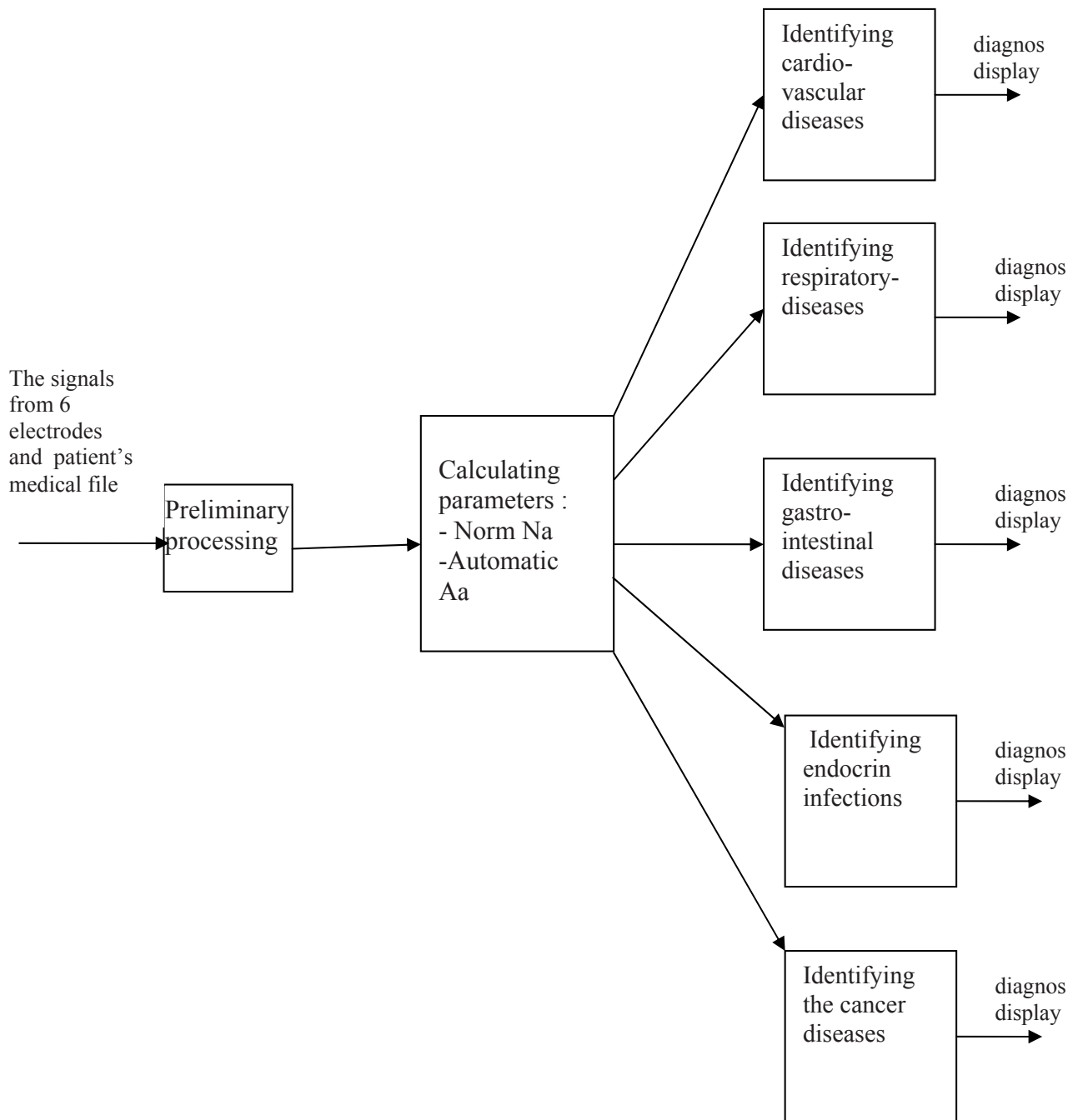


Fig. 1 Structure Scheme of diseases identifying algorithms used in DDFAO-PROMEDISCAN-M3D

IV. CONCLUSIONS

At the time of testing the DDFAO system's ability to detect the pathologies recorded is defined at 79.7%. Of the 1163 pathologies recorded, there were noted: False positives: 63 , False negatives: 112.

Sensitivity was 89% with a confidence interval of 9% for a remarkable specificity of 84% with a confidence interval of 11% (calculated at 95%).

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