ARTIFICIAL INTELLIGENCE: DEVELOPING SOFTWARE-BASED APPLICATION TO LEVERAGE GENETIC ALGORITHM TO ENHANCE ITS APPLICABILITY IN BUSINESS AND MEDICAL AREAS

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ABSTRACT

A method for systems identification using artificial intelligence is presented in this paper. To prove its usefulness applicability, it was verified in the health sector in the clarification of electrophoresis tests, but this application can be implemented in different areas of interest e.g. in business, management, advertising, etc. A wide examination has been done developing the hearty assets of genetic algorithms and proving their abilities across a large range of glitches. We can use this application in many events areas (medical, business, etc.) The resulting references may constitute the basis of future work in the use of genetic algorithms in the business area.

Keywords **-** *artificial intelligence; medical tests; genetic algorithm; systems identification*

I. INTRODUCTION

In my research, I developed a software-based application on artificial intelligence principles, more exactly, using genetic algorithms for the identification of specified parameters of a specific curve. The initial segment of paper incorporates a hypothetical introduction of the technique and the second part the representation of trial results in the medicinal field. Albeit these days numerous applications for frameworks recognizable proof are accessible, our change comprises in utilizing hereditary calculations. Broad research has been performed by misusing the powerful properties of hereditary calculations and exhibiting their abilities over an extensive scope of issues. These strategies have picked up acknowledgment as general critical thinking procedures in numerous applications.

II. THE STRUCTURE OF THE CHOSEN GENETIC ALGORITHM

The structure of the chosen genetic algorithm is presented below [1]:

P1: The initial population is created P(t).

P2: The assessment work is connected to every chromosome of the P(t) populace, deciding their wellness esteem.

P3: The population's chromosomes are arranged in light of their wellness esteem given in the past advance.

P4: The best chromosomes are selected, and these will be placed unconditionally in the next population P(t+1).

P5: The chromosomes that are the question the hybrid administrator is then chosen. Their number is indicated by the p_combine esteem, which is, really, the hybrid rate.

P6: The relatives from the past advance are liable to the transformation administrator, coming about new individuals for the P(t+1) populace.

P7: The population P(t+1) is finished with people chosen arbitrarily from the P(t) population.

The steps P3 – P7 are repeated until the specified number of generations is reached.

The chromosome represents the real coding, as rows of real numbers, each gene signifying the output of a coefficient in the specific function. This purpose can be of the polynomial type, or of the type given by the second order system response. For the polynomial function, the value of the first gene will correspond to the highest ranked coefficient and the last to the free term. For the second type, the function's format is as follows [1]:

The chromosome has parameters as well to the value of the reference step used to present the system's response.

This is one of the most important elements of the genetic algorithm because contributes decisively to the convergence of the algorithm. For the given application, the input data are pairs (xi,yi), where i=1...n. These pairs are the coordinates of the points from the given graphical representation, the number of these points were also at the user's choice.

Let dim_pop be the population's dimension and nr_gene be the number of genes a chromosome has.

Compute the fitness value:

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III. THE APPLICATION DESCRIPTION

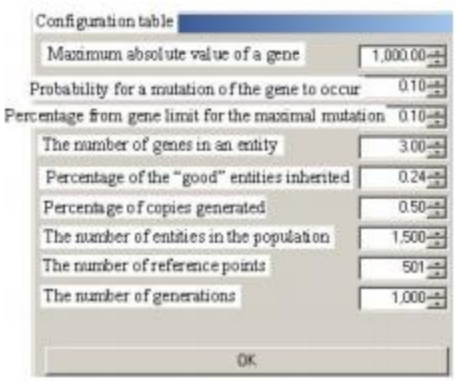
A. The configuration of the genetic algorithm

In the graphical interfaces, the user may set the genetic algorithms configuration, visualize the way the original curve overlaps the computed curve. The computed test parameters are also presented in the graphical interface.

The purpose of these experiments is to detect the application performance in achieving the identification, but also to analyze the influence of different elements of the genetic algorithm on the process of obtaining these results [1].

We configured the genetic algorithm using the values presented in figure 1.

Figure 1. The values of parameters

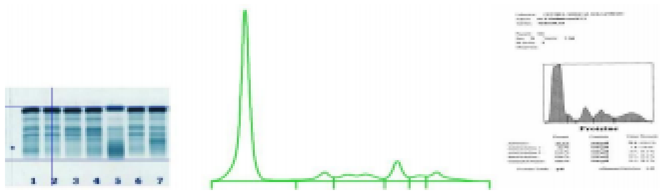


The strong point of our experiment is the identification of the curve parameters followed by the drawing of the curve using the computed parameters. we observe that the computed response (in red) is very close to the original response (in blue). The computed error is under 10%.

B. The application of the genetic algorithm for electrophoresis tests

Usually, an electrophoresis test involves these way [2]:

Figure 2. An example of test’s interpretations (the usual case)



The classical results of an electrophoresis test are like five curves. Therefore, in this case, the physician’s experience is very important for the good interpretation of results. [2] The main goal of our application is to replace the specialist interpretation when an experienced physician is not available.

In the next, we present the result obtained using the application for this situation.

Figure 3. An example of the test’s interpretations using our application.

The curve extracted from electrophoresis gel represents the input data for the genetic algorithm. After the algorithm configuration, in the main window of the application, the computed curves are displayed approximating the original ones. The purpose of our method is the automatic drawing of the five curves. If the curve is drawn exactly, the final step of the test is the computing of maximum values. These values are the values for albumin, gamma globulin, alpha globulin, etc.

The original curve is the representation of normal parameters. Figure 4 presents the superposition of the original curve and computed curves in different moments of the application running.

Figure 4. The preliminary results

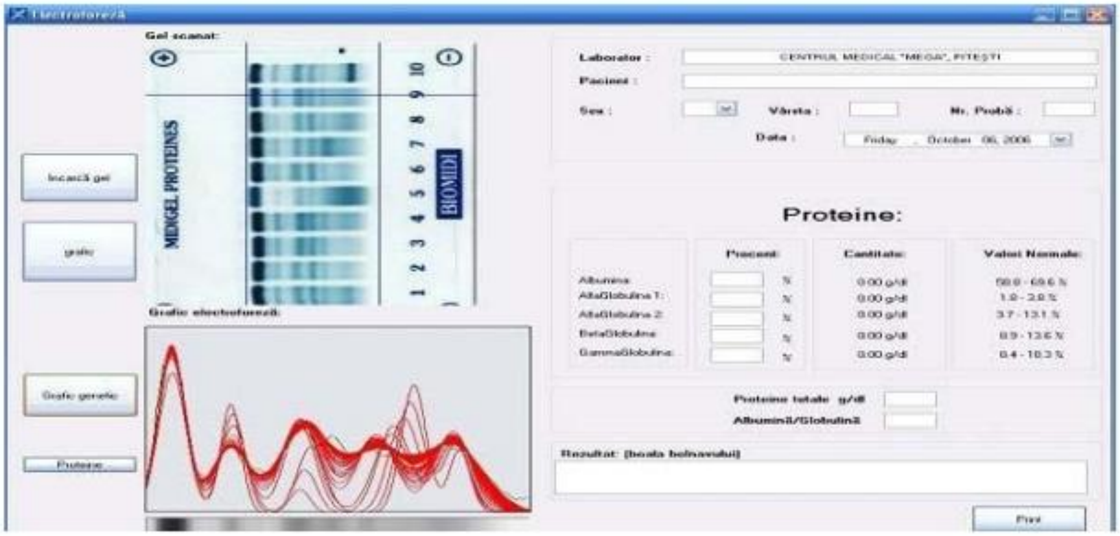
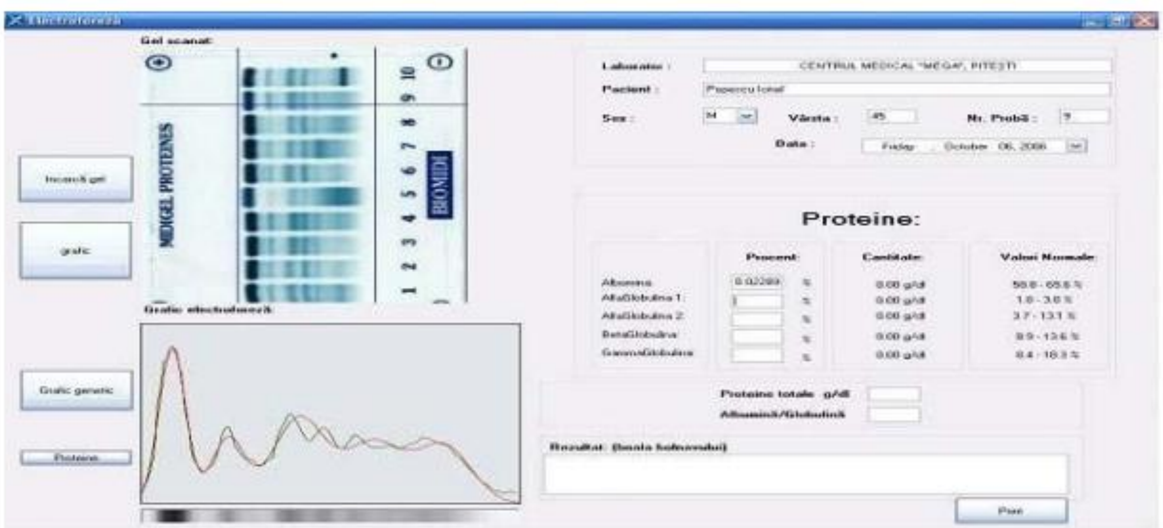


Figure 5. The final results



In figure 5, the computed parameters: albumin, alpha globulin, etc are presented.

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IV. FUTURE WORK

Based on our research, genetic algorithms can be implemented in any field besides the medical one, e.g business, logistics, and management. This is possible as long as you can convert it as an optimization problem with a model represented by a list of parameters, which is enabled with genetic operations like mutation, crossover, and selection.

When you have a model, which is ready for optimization using a genetic algorithm, but your design or business intuition is more accurate than the result given by simulation. [4]. Today, genetic algorithms have become the most valuable asset in advertising. Currently, websites are gathering data about their users. Not only that users read but what they read and also verify if they read it in their entirety and how long it took them. On this basis, you can appropriate whether they were interested. After that, all users can be grouped and drawn conclusions. Thanks to genetic algorithms, it is possible to find twins. If 100 of the people who have used the service 40 have common characteristics, it means that when other people with these characteristics are found in the network, the probability of using the service is higher [5].

Another interesting area of research concerning the use of genetic algorithms is scheduling and planning a business process. Scheduling issues where you have to allocate resources to tasks collection are usually difficult to solve due to the presence of multiple constraints [6].

V. CONCLUSIONS

Our study indicates that the genetic algorithms can be successfully used and are more robust than other methods of controlled search; they use performance functions obtained through simple transformations of the function under evaluation. Also, genetic algorithms are easy to use and can find optimal solutions very easily.

This application is an elective strategy for assessment of the lab tests (in exceptional electrophoresis tests), utilizing a piece of artificial reasoning. The primary favorable position of this technique is the requirement for negligible information in the restorative field. Consequently, the execution of this methodology gives an instrument simple to utilize, which offers the tests results rapidly and plainly.

Although the results of research and tests have demonstrated the effectiveness of the use of genetic algorithms, they could be further developed in a number of ways by testing them in many other fields such as business, management, logistics etc.

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