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MODERN SOLUTIONS FOR SELECTING THE CORRESPONDING MACHINERY DEDICATED TO TECHNOLOGICAL APPLICATIONS

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Abstract: *This article presents a software application that wants to reach out to all the specialists from the industry, to make the right choice of technological equipment according to certain characteristics (the parameters of work) required, which they have to accomplish, with maximum reliability and high quality, in optimal conditions of technical risk and security (employment, environment and health) and, of course, last but not least, in terms of value for money, all strength on the historical operation and exploitation of those terms in similar operating conditions.*

Keywords: *modern solutions, technological applications, technological equipment, software, neural networks.*

1. INTRODUCTION

Following the trend of making the specialists' work from different fields of industry easier, it is increasingly appealed to the introduction, in the decision processes, of modern computer technology in general and of the artificial intelligence in particular.

This article presents an application based on neural network technique, which uses the history of equipment running for the relief of decision in determining the optimal type of technological equipment for a known application.

To achieve this application we considered dig performances obtained from experimental programs, performed in different locations of the country, in the exploitation process, under similar working conditions.

2. GENERAL CONSIDERATIONS

Artificial neural networks, presented in figure 1, are relatively crude electronic networks of "neurons" based on the neural structure of the brain.

They process records one at a time, and "learn" by comparing their prediction of the record (which, at the outset, is largely arbitrary) with the known actual record. The errors from the initial prediction of the first record is fed back into the network, and used to modify the networks algorithm the second time around, and so on for many iterations [2,5,4].

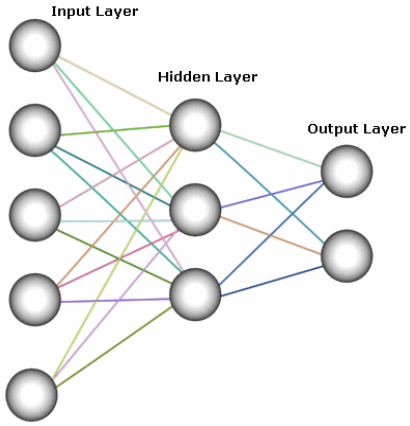

Figure 1. Artificial neural networks

The main advantage of neural networks is that it is possible to train a neural network to perform a

particular function by adjusting the values of connections (weights) between elements. For example, if we want to train a neuron model to approximate a specific function, the weights that multiply each input signal will be updated until the output from the neuron is similar to the function /5/.

Taking into account the influence of using time of the studied drilling bits found out to their extraction from the drilling process, it will be presented a special software (with logical sequences presented in figure 2) based on neural networks conceived for the reliability study of the industrial equipments (systems) [2,5,4].

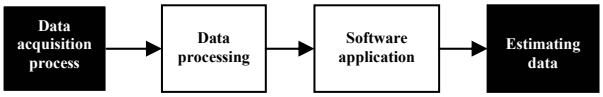

Figure 2. Logical sequences)

3. SOFTWARE APPLICATION USING ARTIFICIAL NEURAL NETWORKS

The modern solution, proposed by the authors for choosing the appropriate equipment, to specifically technological operations, consists of an application, "Appointing the technological equipment type" (figure 3), using the neural networks algorithm (shown above), using data from specially formatted text files (tab delimited, figure 4).

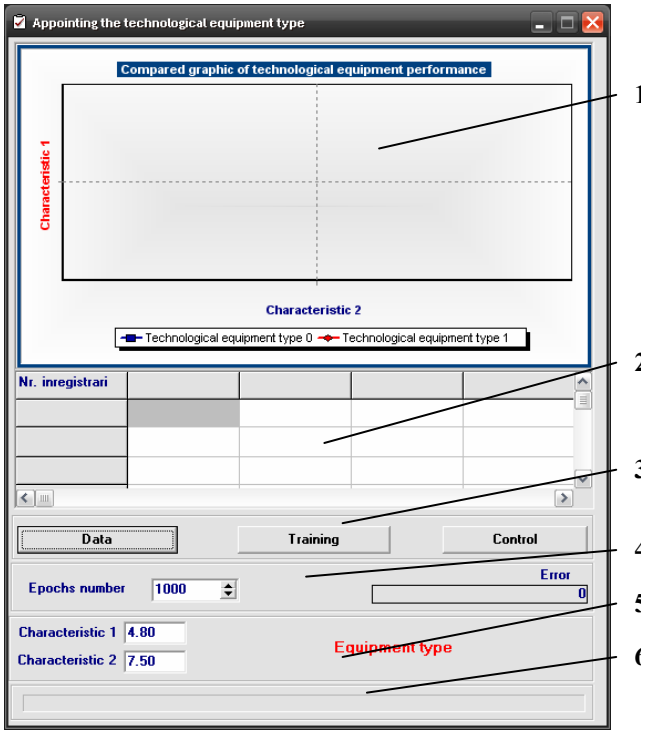

Figure 3.

It is considered the value sets, introduced as pairs (drilling depth, function time) adequate to the characteristics corresponding to the right choice of the equipment, each pair has a serial number 0 or 1 depending on the drilling bit type (0 for the first type of equipment and 1 for type two). It uses a probabilistic network type (which is part of the radial neural networks category). The system responds with the value 0 to all data corresponding to the first equipment type and 1 at type two, recognizing the category of technological equipment studied (three cone drilling bit), so the error is zero.

The usefulness of such selection consists in the elimination of some values from a dataset, which have not the same characteristics with the group; you can also make a sorting by group, useful for the reliability analysis and the choice of an optimal technology equipment for a given application.

The models of this type can learn from a dataset with a random distribution, which suggests the estimating parameters of reliability. The method gives an advantage even when the distributions of failure/repair times are not close to the known ones.

In order to understand the software's functionality we will present it briefly.

The first step is to create files of *.txt type, drawn up in Wordpad, Notepad or Microsoft Word save it in the "Resources" folder placed in the path, where the software application is installed - "Appointing the technological equipment type", shown in the model from figure 4, which are necessary for loading data in the application.

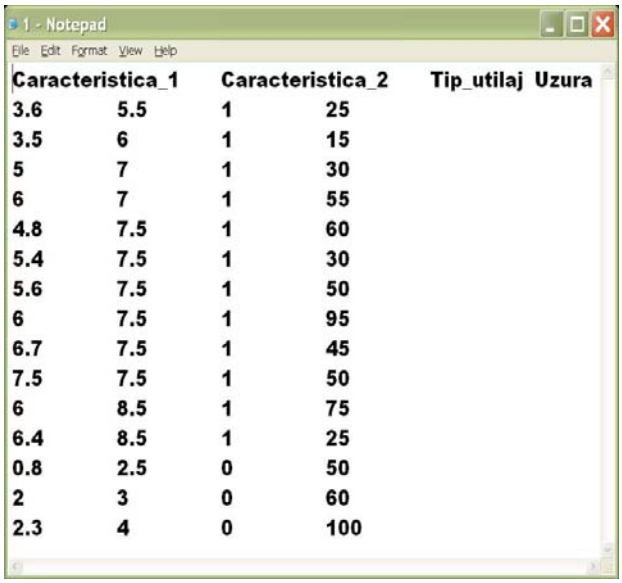

Figure 4. *.txt file type for dataset entry used in "Appointing the technological equipment type" application

In these files, as you can see, it will be recorded in separated columns, by tab or space delimited, the adequate datas of exploitation characteristics (drilling depth and time-on steam - exploitation characteristics obtained using technological applications and similar working conditions) through which will be selected the technology

equipment, the equipment type (equipment 1 or 0) and wear result.

The application interface named "Appointing the technological equipment type" is using the neural networks specific algorithm presented above, it has six working areas (the order of those areas is from left to right and from top to bottom) namely:

➢ First area (1) – "Compared graphic of technological equipment performance" is adequate to the representation of dataset pairs corresponding to the exploitation characteristics of technological equipment analyses from this application, described in a graphic representation.

➢ The second area (2) - presents under a table form the recorded data in the *. txt files type, created after the procedure described above and then loaded in the application;

➢ The third area (3) – the application control area:

- Data – by pressing this button we activate the browsing window for selection of *.txt file earlier created;
- Training – by pressing this button the neural networks trains with preliminary data obtained from the exploitation of the same equipment type studied;
- Control – by pressing this button it is shown, in fifth area, the application result in the same line with Equipment type label having 0 or 1 values corresponding to the studied equipments depending on the optimal characteristics studied in this application.

➢ The fourth area (4) – where we set the training epochs number and the error which is obtained according to the optimal characteristics used at the application running with this equipment type; if the error is near 0, the choice of the operation was successful.

➢ The fifth area (5) – where we can set the characteristics value which we want to obtain when the technological equipment runs with the wanted equipment type. The result must be 0 or 1 and appears in the right zone Equipment type (0 – if we use MTA-8 3/8 J drilling bit type and 1 – if we use SM-8 3/8 KGJ drilling bit type).

➢ The sixth area (6) – represents a progress-bar object used for showing us the remaining time until the training process ends.

As we detailed in a previous paragraph about the "Appointing the technological equipment type" software, in fig. 5 it is shown a final window with the input data of drilling bit with three cones (a regulars drilling bit series by MTA-8 3/8 J type and some of those with technological modifications by MTA-8 3/8 KGJ type realized to increase the reliability), according to which we make the right choice. The assessment application characteristics, according to the exploitation wanted by the user, are drilling depth (4.8 meters) and running travel (7.50 hours).

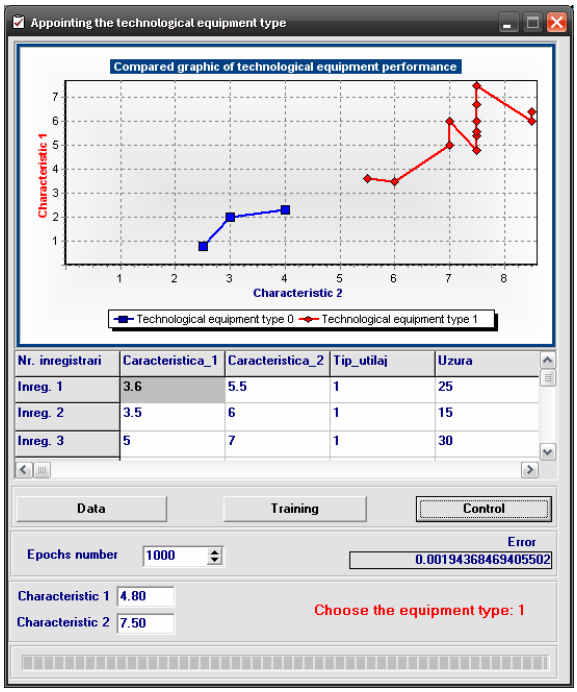

Figure 5.

The software that we conceived, different from other software programs, that runs under various environments (like MathLAB, MathCAD, C++, Delphi, …), is a standalone application. This one has as back-up a mathematic algorithm specific to neural networks, it runs under any Microsoft® Windows version and doesn't need any additional software, having a regular installation. This software can be used by any user, with no special knowledge in IT domain and it has as a purpose choosing the optimal equipment for achieving a technological application based on the results with the same equipment type, in the same environment and regular working conditions. Also, it must be specified the fact that the only impediment for using this software is the creating and the maintaining of a database which contains trace data of equipment type studied during the exploitation process.

4. CONCLUSION

In conclusion, we can say that this application is a modern method, easy to use by all industry specialists and gives support for making the right choice of technological equipment, depending on certain commanded characteristics (working parameters), which has to be accomplished with maximal reliability and high quality, in optimal conditions according to the technical risk and

security (employment, environment and health) and, of course, but not last, in terms of value for money, all strength on the historical operation and exploitation of those terms in similar operating conditions.

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