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TEXPRO – THE EDUCATIONAL COMPUTER PROGRAM FOR THE MODELING OF TEXTILES PROPERTIES

The new worked-out computer program, named TEXPRO, for modeling of textiles properties is presented. The program is written in C++ language and built in form of handbook divided into particular exercises. It is designed for students doing the laboratories from subject “Structure of Yarns and Textile Fabrics”.

Keywords: teaching, laboratory, textiles, yarns, fabrics, properties, modeling, software.

1. INTRODUCTION

The subject “ Structure of Yarns and Textile Fabrics “ [1-3] is lectured on IIIrd (the first part) and on IVth (the second part) year in size 14 hours lectures and 14 hours laboratories each year. The first laboratory consists of 5 exercises and the second – of 4. The collection of hypothesis and solutions being the base of the materials engineering applied for modeling of the textiles properties is presented during the lectures and chosen solutions are tested in practice on laboratories. The yarns properties are predicted on the base of experimentally determined fibers parameters and data for yarns using specific computational procedures. Next the same values of yarns parameters are experimentally determined and compared with calculated values. The fabrics properties are calculated on the base of experimentally determined specific yarns parameters and data for fabrics and the comparison is done between these and values of the same parameters of fabrics obtained from tests. The detailed treatments

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of modeling of textile properties are presented in published handbook [3] in the form of 16 individually numbered exercises, 9 of which are realized on laboratories. Therefore it was decided to keep the same numbers of exercises in the program. Until now the analysis of the influence of fibers, yarns and fabrics parameters on specified textiles properties was carried out using calculators and was very time-consuming, because of the number of variants and complexity of calculations. Taking this and the absence of such a technical software on market into consideration it was decided to create a computer program for modeling of textile properties.

2. PROGRAMME DESCRIPTION

2.1. STRUCTURE OF PROGRAMME

The TEXPRO program is written in C++ language and built in form of handbook divided into particular exercises that enable modeling of the following textiles properties: *the changes of traverse dimensions of yarns during extension (Exercise 2); the coefficient of contraction of single (Exercise 3) and folded yarns (Exercise 4); the tensile strength of the bundle of fibers and/or threads (Exercise 5); the influence the sample length on breaking force of yarns (Exercise 6); the tensile strength and elongation of multifilaments (Exercise 7); the tensile strength of short segments of blended yarns (Exercise 11); the crimp of threads and mass per square metre of woven fabrics (Exercise 12); the thickness of woven fabrics (Exercise 13).*

After starting the program the title page appears (Fig.1) from which we can move to page “Main Menu” (Fig.2) to choose specified exercise.

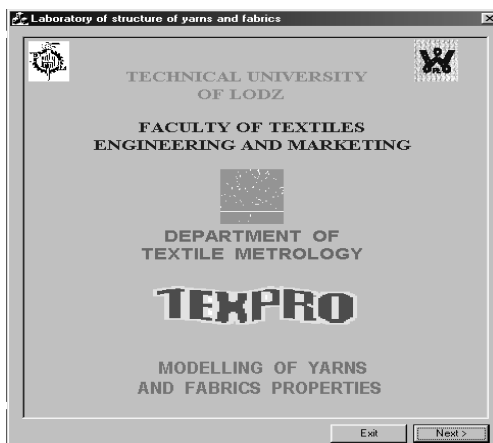


Fig. 1. The title page of TEXPRO

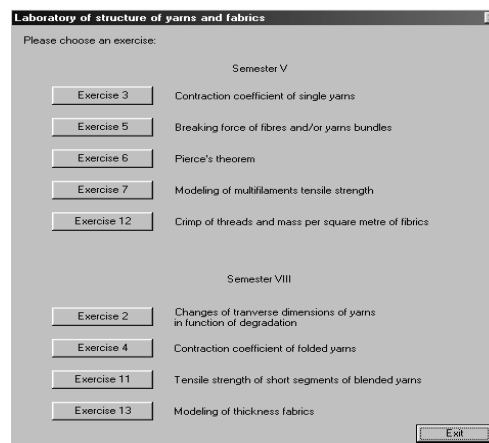


Fig. 2. The page “Main Menu”

Generally each exercise is composed of main page “**Aim of exercise**” (Fig.3) and number of steps depending on a procedure of modeling. In some exercises (2 and 13) the examples of the practical application of modeling textiles are presented. They are available under the option “**Modeling**”.

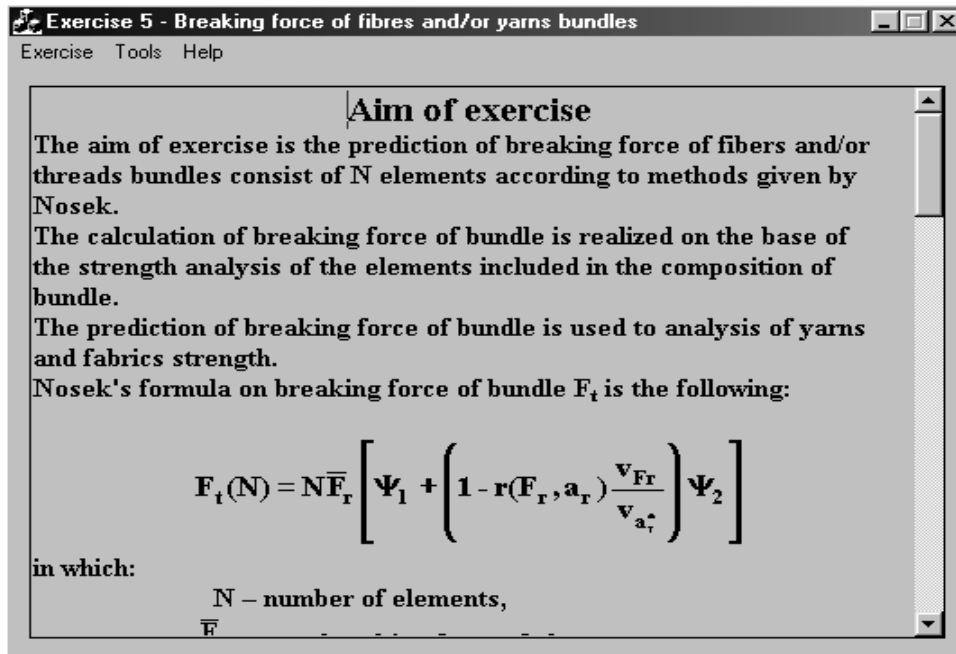


Fig. 3. The screen-shot of page “Aim of exercise” from Exercise 5

The short description of modeling and the theoretical solutions which are the base of specific textiles properties prediction are given in “**Aim of exercise**”. Also the user can open calculator or notepad here, using the option “*Tools*”. Option “*Help*” includes information about program version.

The modeling in every exercise starts when option “**Exercise**” is chosen. The first step “*Tests*” appears (Fig.4). It is associated with the experimental part of the exercises and includes the description of determinations of specific parameters, specimen preparation, calculations and expression of test results. Here students can enter their names along with additional data, i.e. book’s number. The button “*Next*” is disabled until student’s enter their names. Then they can proceed to the second step of the experimental part - “*Data input*”(Fig.5). Information about data obtained form tests, that should be input, is given in the description field in the top of the dialog box. The actual count of input data is shown at the bottom of the respective listbox. In exercises that introductions have more parameters “*Data input*” consists of more than 1 step.

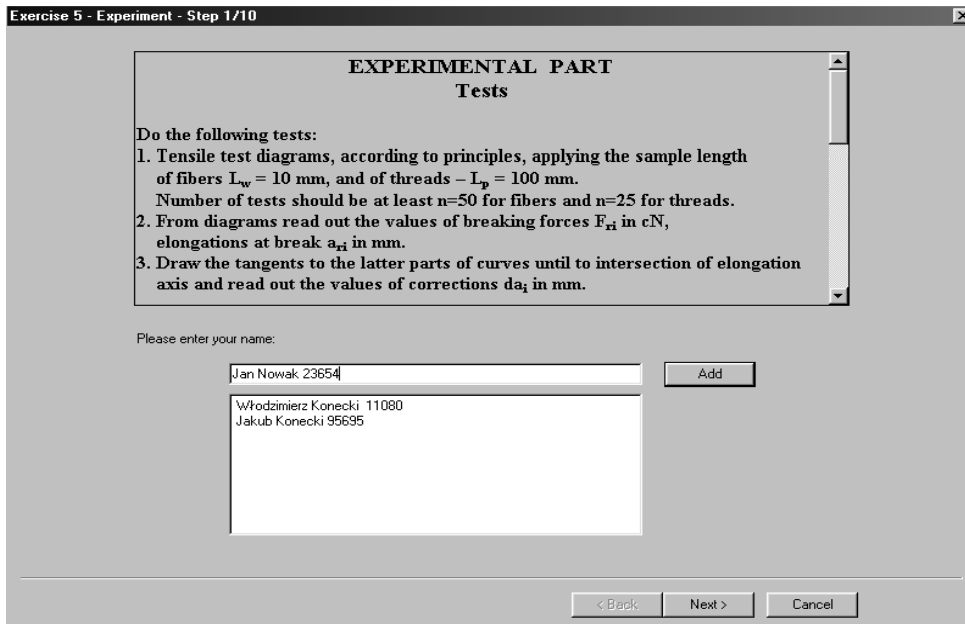


Fig. 4. The screen-shot of step “Tests” from Exercise 5

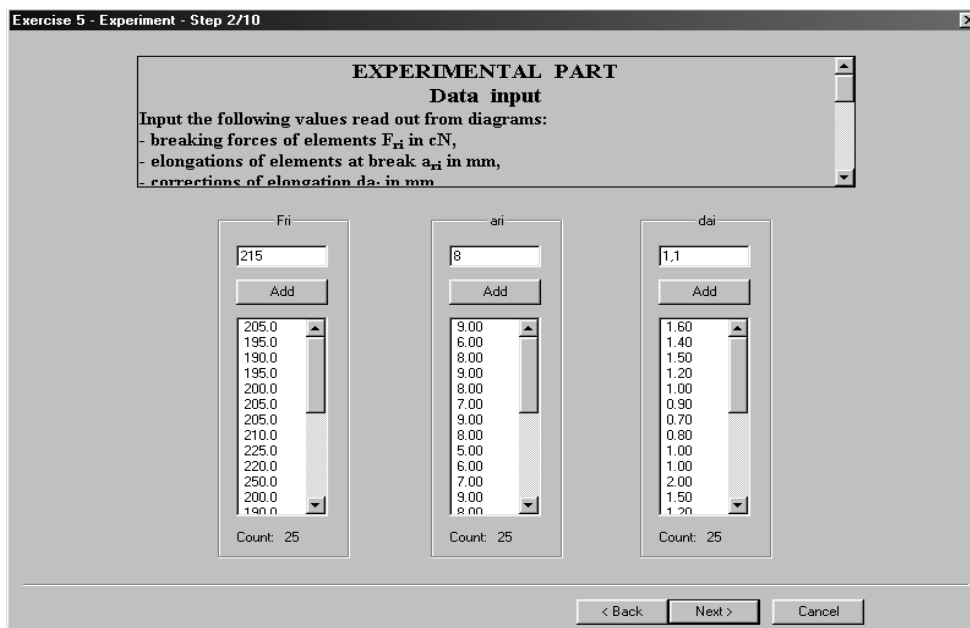


Fig. 5. The screen-shot of step “Data input” from Exercise 5

After the experimental part the modeling part begins with its own “*Data input*” step. Here the values of fibers, yarns and fabrics parameters required for calculation of given property from theoretical formula are introduced. Along with the values of given property obtained from test the values of parameters taken into modeling can be entered. Detailed information about required data is given in the description field. “*Data input*” phase can consist of more than 1 step in exercises that take many parameters into account.

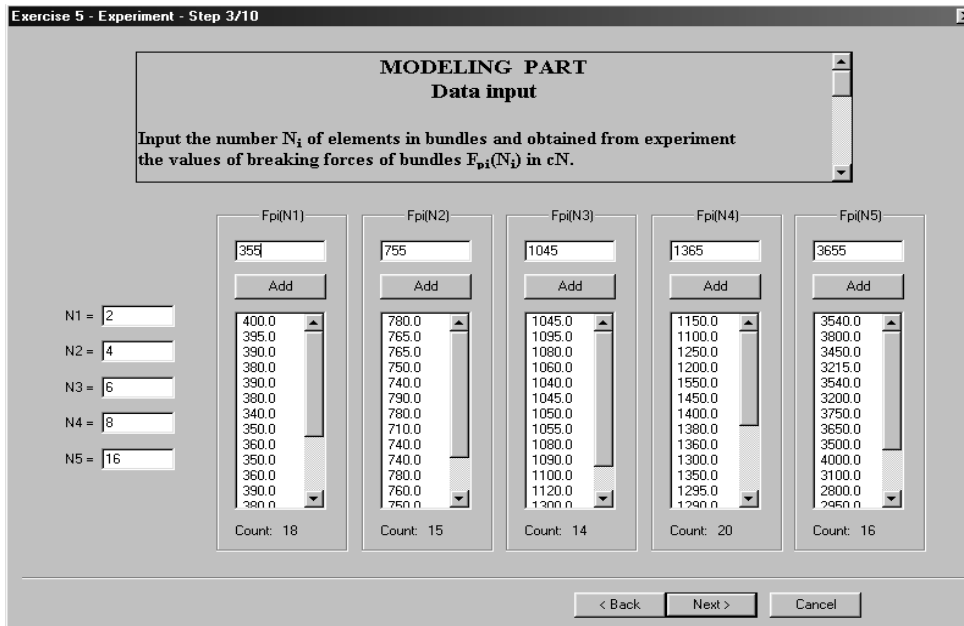


Fig. 6. The screen-shot of step “Data input” in modeling part – Exercise 5

In the next set of steps “*Calculations*” (Fig.7) the value of the property is calculated from correspondent theoretical formula, implemented by the program, on the base of determined parameters, and is compared to experimental result. All values of parameters included in formulas and values of suitable indexes of dispersion for experimental results are also calculated and shown.

The modeling part enables the introduction of an assumed value of yarn or fabric property and fitting the values of fibers, yarns or fabrics parameters to obtain the assumed value. Using the modeling option allows the fitting to be performed in a short time and to investigate the influence of specified parameters on the given property as well. The modeling part can be used not only for didactic purposes, but also for designing properties of linear and flat textile goods, that are implemented in TEXPRO.

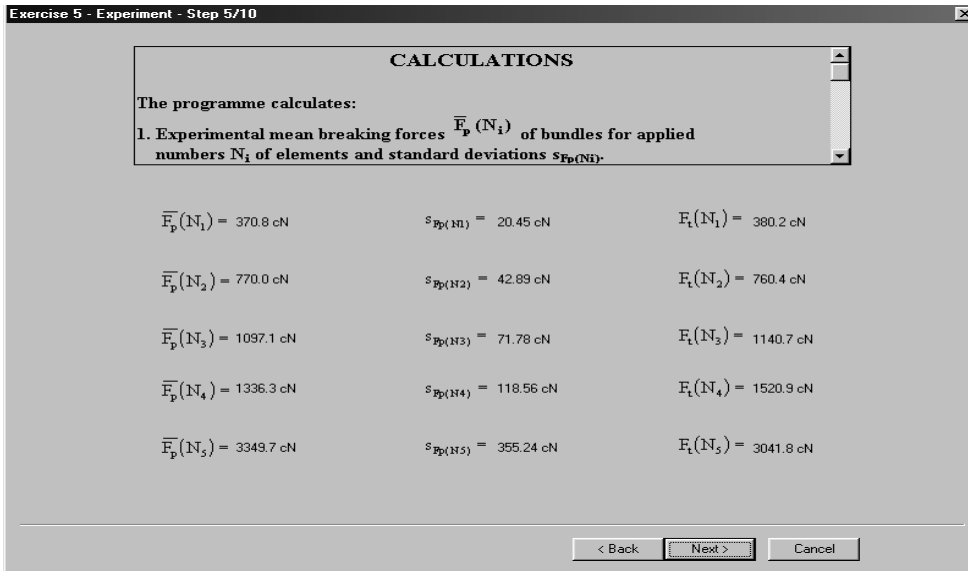


Fig. 7. The screen-shot of step “Calculations” from Exercise 5

The successive step is “*Verification*” (Fig.8) in which the experimental values and ones calculated from formulas are compared in graphical form and/or by use of the t-Student’s test at the significance level $\alpha = 0,05$.

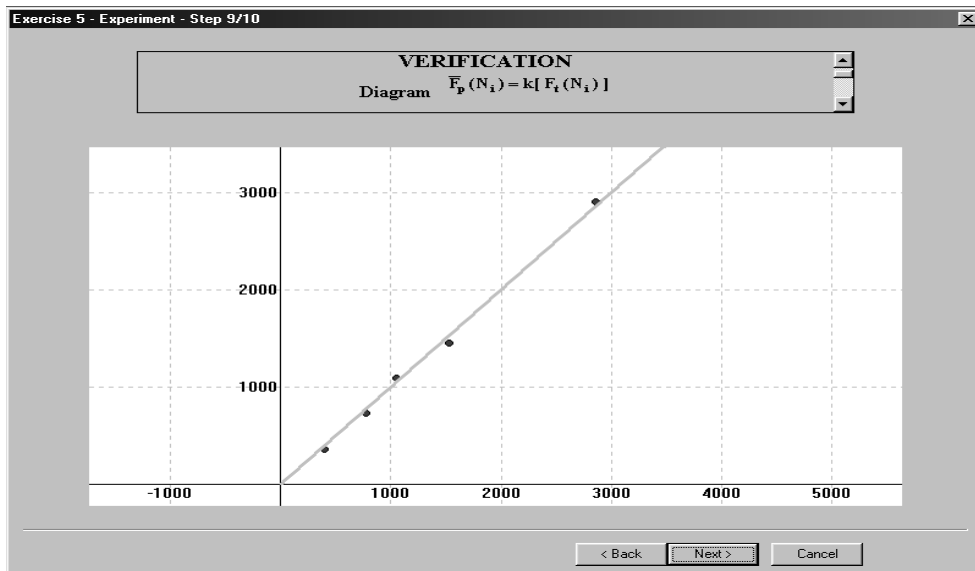


Fig. 8. The example of graphical verification

Notes and observations about obtained results can be entered in the last step “**Conclusions**” (Fig.9)

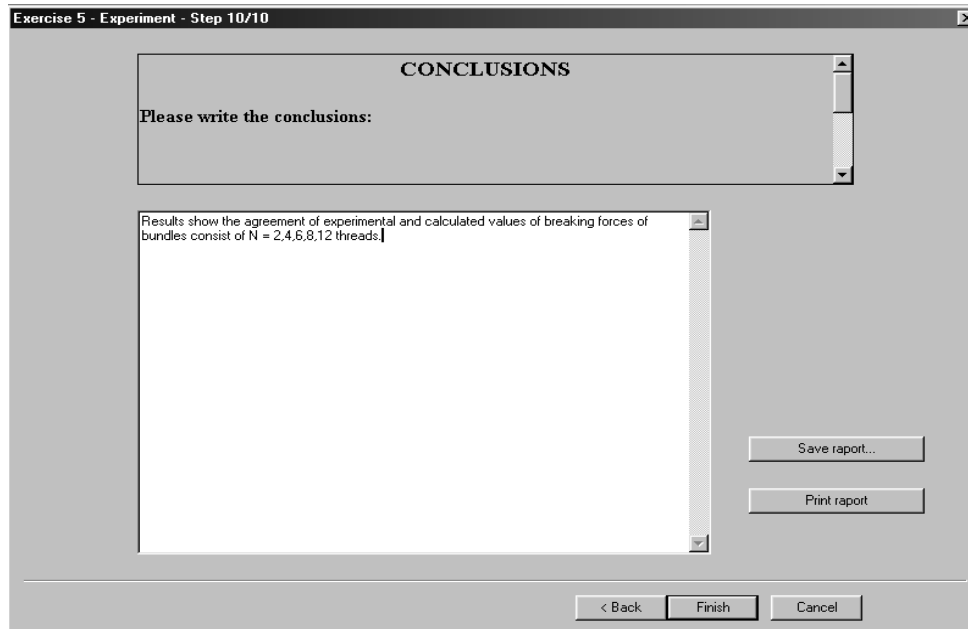


Fig. 9. The screen-shot of step “Conclusions” with options “Save” and “Print” report

For every exercise there exist a blank report, which after automatic filling can be saved on hard / floppy disk or directly printed using a suitable option in step “**Conclusions**”. Every report from exercise is composed of: title page (number and title of exercise, students, data and the date of tests), all data from every step together with corresponding formulas on base of which the particular values were calculated, diagrams and final conclusions.

The program allows to return from every step to former one to introduce the new values of parameters and to carry out the version of modeling.

2.2. EQUIPMENT REQUIREMENTS

TEXPRO program requires MS Windows 95 operating system or higher and MS Word 97 or higher (for saving and printing reports). Its size is about 30 MB.

3. SUMMARY

The program testing was done on the beginning of this year and introduced to didactic process in summer semester. It has met the interest on the students' side, because the realization of laboratory in this form allows them to take more number of modeling variants into account and also to design the textile properties, what was not possible, during the laboratory lasting three hours, before. TEXPRO makes the essential complement of lectures and presents the tool of materials engineering applied to model the textiles properties. The intention of authors is the preparation of the remaining exercises enclosed in handbook [3].

REFERENCES

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