# APPLICATION FOR ANALYSIS SCHEMES IN ELECTRONICS' EDUCATION

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*In this paper is discussed system for projecting and measuring electric schemes. The program consists of 28 examples from different sites of the electronics: gate turn-off thyristor rectifier, uncontrollable thyristor rectifier, low-frequency amplifier, linear electrical network (circuit), thyristor controller of temperature, scheme of operational amplifier, RLC bipolars, toroid windings e.t.c. The samples of electronic schemes might be added and enlarged. The program might be used in electronic education and forms students' ability to project, calculate and mould electronic schemes. The program is structured by Borland- Delphi.*

## 1. INTRODUCTION.

The dynamic development of electronic systems demands new forms and methods for their teaching. The correspondence of study programs with country requirements in some disciplines, the co-ordinating of count of periods with ECTS, lays optimization of learning consistence.

The optimization of all the learning process, the management of learning process and studying redused to rationalizing of the bilateral information exchange between them. One of the possible approachs for realizing the aim is creating models for some regions.

Modeling is a process in which are illustrated conditionally the main characteristics of a real object, phemoninom, or process in mathematic forms. In the entrance of the measurement of a model it may get new information for the real object.

In this paper is discussed system for projecting and measuring electric schemes. The program consists of 28 examples from different sites of the electronics: gate turn-off thyristor rectifier, uncontrollable thyristor rectifier, low-frequency amplifier, linear electrical network (circuit) , thyristor controller of temperature, scheme of operational amplifier, RLC bipolars, toroid windings e.t.c. The samples of electronic schemes might be added and enlarged. The program might be used in electronic education and forms students' ability to project, calculate and mould electronic schemes.

The realization is made with Borland Delphi that is a powerful resource for creating application that works in Windows. They grant a great number of possibilities for the programmers to create its own programs.

## 2.DESCRIPTION OF THE PROGRAM

The program consists of:

1. File with application- "exe"
2. Folder with figure/picture/-"Pic"
3. Folder with help (.txt) files-"Help"
4.

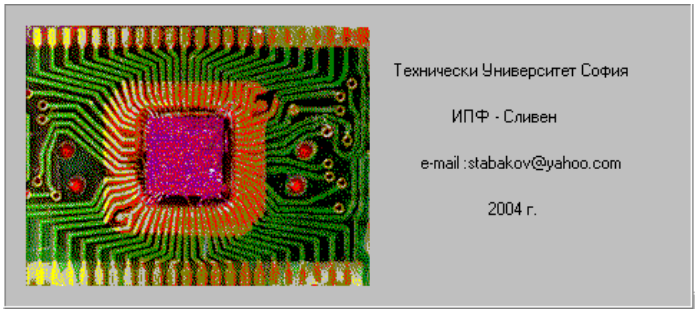



fig.1.

The program is feed for electronic disciplines in Faculty of Engineering and Pedagogy in Sliven. With the project the students will get the skills to project, calculate and modeling the electronic schemes.

When the program is started on the screen is displayed for 5 seconds before the main menu is shown the screen "Splash screen"- fig.1.

The main menu makes the management of the application. The first section is named "File". In this section has only one field- for exiting the program. This operation might be made by a button, which is situated into the form. The next three sections are divided for schemes' models, used in the application. The single models are divided in three categories:

- "Schemes": they consist of: gate turn-off thyristor rectifier, uncontrollable thyristor rectifier, low-frequency amplifier with is TBA810, linear electrical network (circuit), thyristor controller of temperature- fig.2.

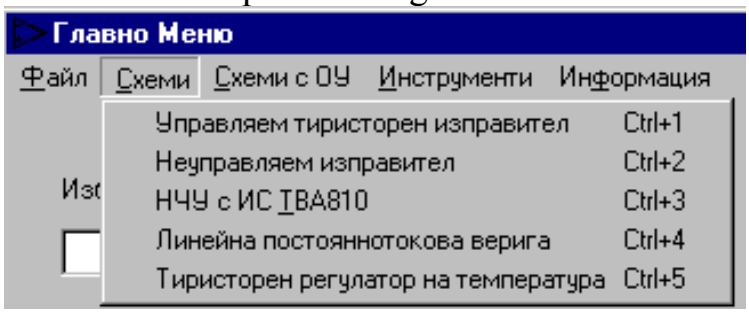



fig.2.

- Schemes with scheme of operational amplifier- they consist of base schemes .-fig.3.

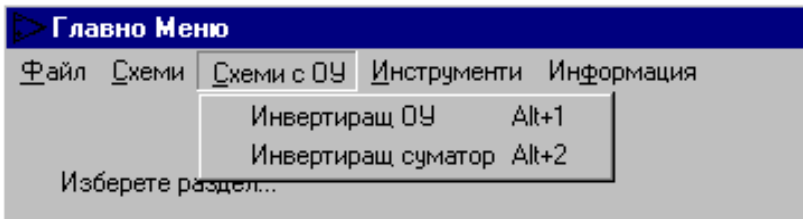



fig.3.

◆ Devices- they consist of some applications for measuring RLC bipolars, toroid winding- fig.4.

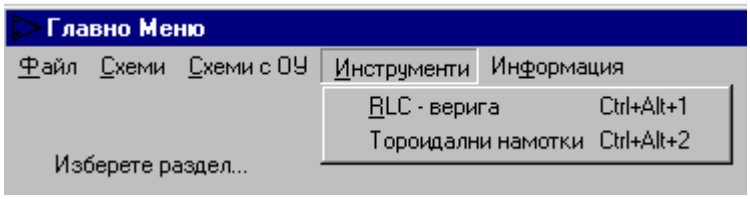



fig.4.

Each category is separated in individual menu. From each menu we may chose the applications. For each of them is foresighted key combination for rapid access.

The last section is 'Information' which consists data for the authors.

There is visual review of the models. There are two combo boxes in the main form- fig.5.

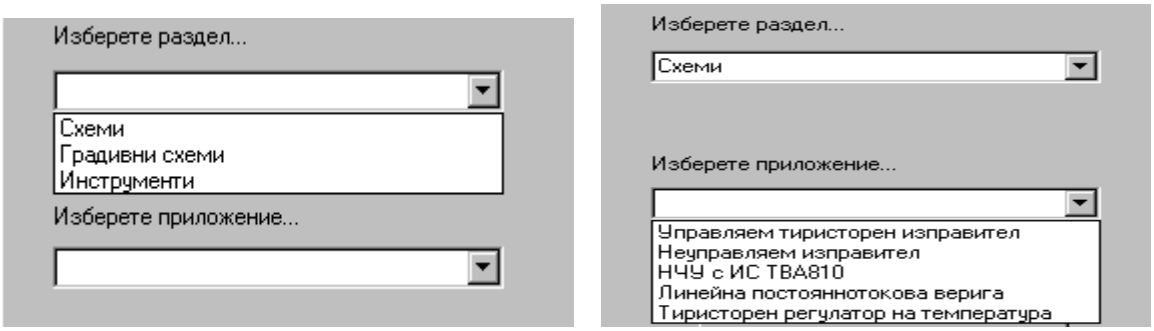



fig.5.

The menu 'Information' shows us a short text file with information for each model. For some data types are input limitations for the information.

## 3.MODELS IN THE PROGRAM

### 3.1 Gate turn-off thyristor rectifier.

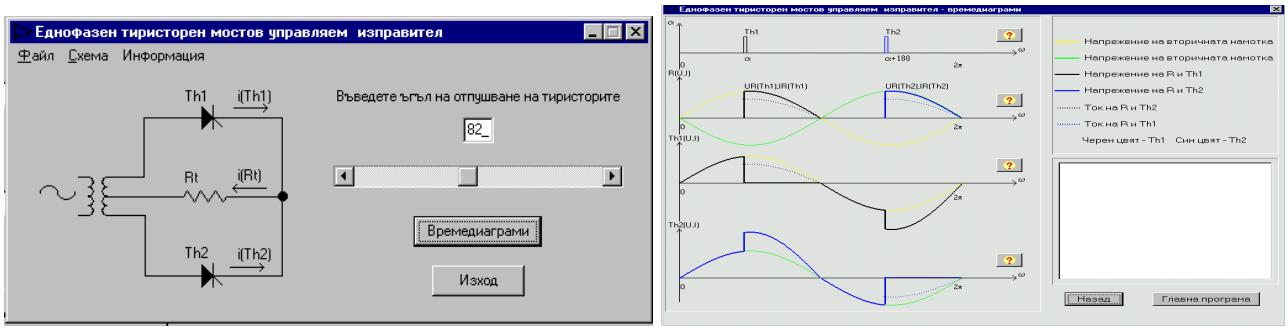



fig.6.

With this model (fig. 6) we may visualized the time diagrams of thyristor bridge rectifier in active burden, when we change the angle, in which the thyristors unclog (0-$\pi$), the control characterization of the rectifier and to calculate some of the parameters.

**3.2 Uncontrollable thyristor rectifier**- fig.7.

When the load resistor $R_t$ is given, the resistor of the secondary winding r, the frequency of supply sine voltage f, the coefficient of pulses K, and the given acuracy of the computations with this shape we may calculate some of the uncontrollable thyristor rectifier's parameters- the voltage and the current of the secondary winding, the peak current before diods, the value of the capacitor.

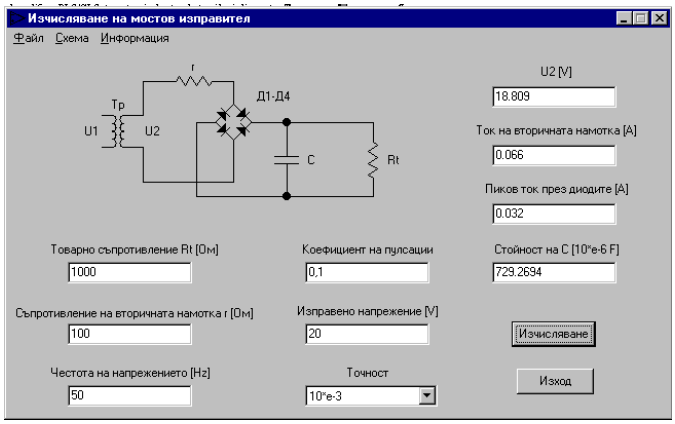
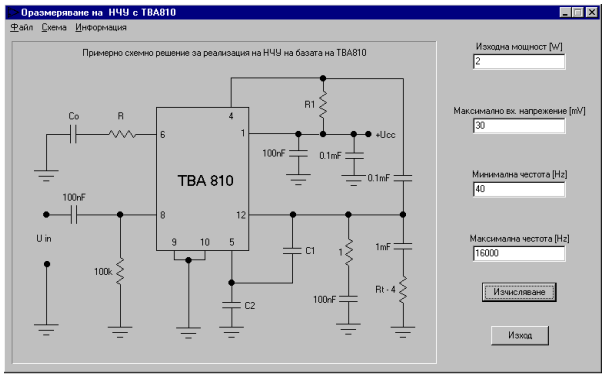



fig.7.

**3.3 Low-frequency amplifier**- fig.8.

When the output power- $P_0$ is given, the max input voltage, the min and the max work frequency are calculated: the necessary supply voltage, radiator, the signed on the scheme resistors and capacitor.



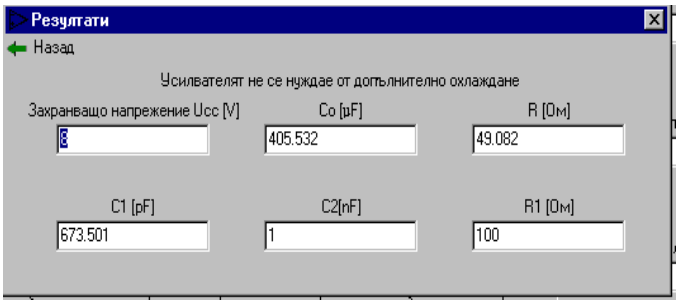




fig.8.

**3.4 Linear electrical network (circuit)-** fig.9.

It is used the method of the nodal potentials. For each of the nodes is used the formula:

$$G_{pp}V_p - \sum_{s=1,s\neq 0}^{n-1} G_{ps}V_s = \sum_{s=1}^{n} G_{sp}e_{sp} \qquad (1)$$

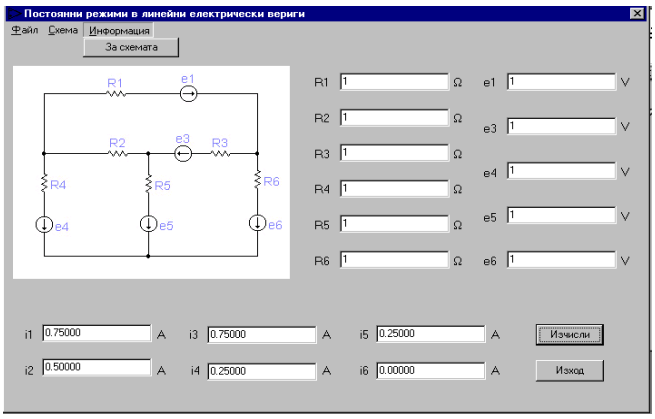



fig 9.

**3.5 Thyristor controller of temperature**-fig.10.

This regulator works in phase principle for control. In the model are presented time diagrams of the scheme for a period $3\pi$. With the set buttons on scheme we may model and observe the time diagrams of respective voltages in different angle of unclog the thyristor, which is connected with the real and given temperature.

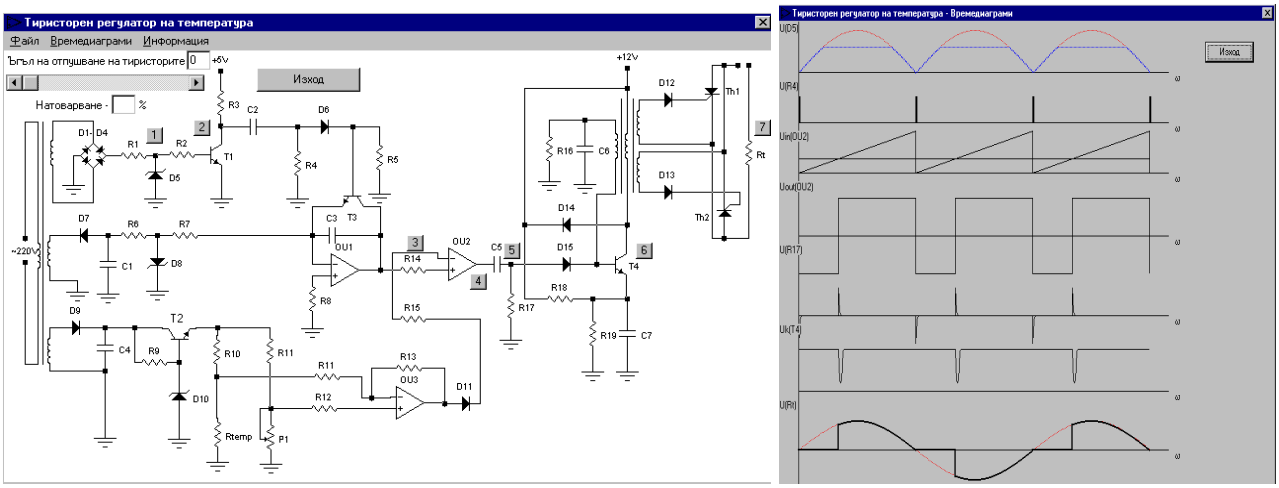



fig.10.

**3.6 Scheme of operational amplifier**- fig.11.

This model gives opportunity to be chosen invert operational amplifier or summator. When the values of the resistors and input voltages are given the program calculates and image graphics the amplifier's coefficients.

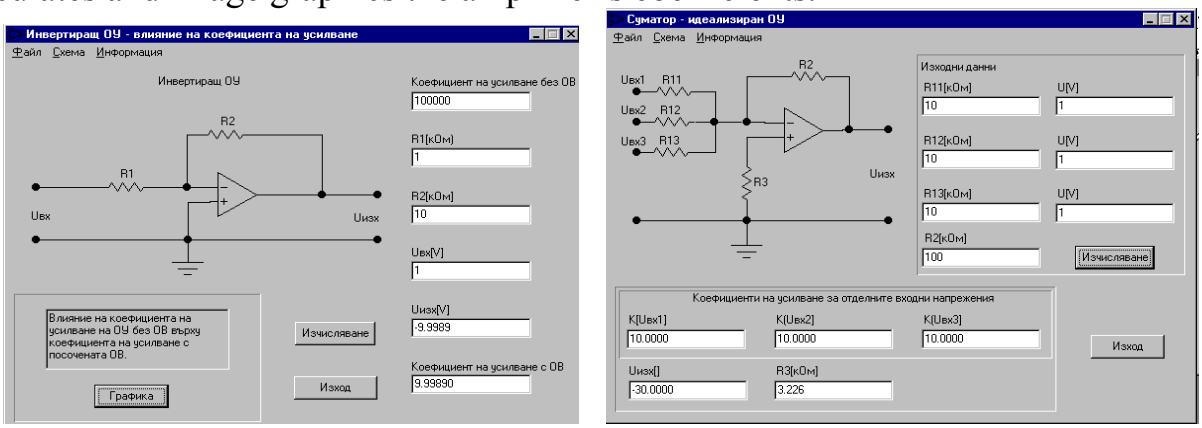



fig.11.

**3.7.RLC bipolars-** fig.12.

With this model investigated in sine behavior sequential and parallel RLC network. The real and the imaginary parts of the equation are presented separately.

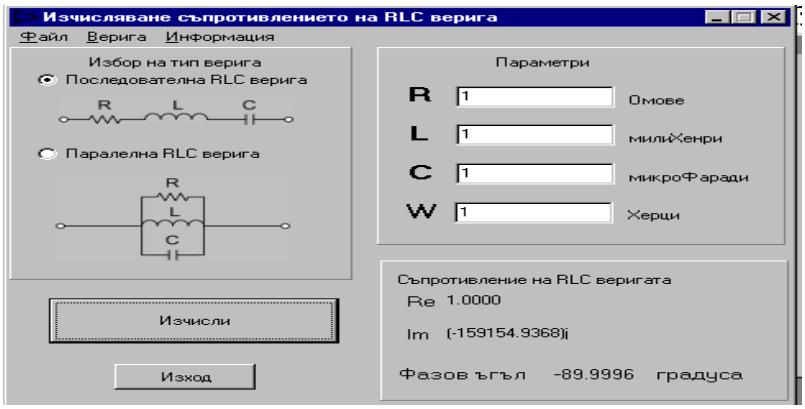



fig.12.

**3.8 Toroid windings-** fig.13.

With this model calculated number of winding when entering toroids diameter, diameter of toroids section, induction and windings type.


fig.13.

## 4. CONCLUSION

With this database is realized the beginning of base of models, which are modeled individually, independently one from other. The database might be added. The program might be used in electronics' learning and forms students' skills to project, measure and model electronic schemes.

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