DEVELOPMENT OF AN AUTOMATED WORKPLACE FOR THE PC COMPONENTS WAREHOUSE

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Abstract:

Today, automated workplaces can be observed in a variety of fields. In this work, the development of an automated workplace of the call-center operator for technological diagnostics, repair and maintenance of the PC system unit was made. The purpose of the work is to develop an automated workplace for the operator to manage the warehouse of components for the PC. When developing a model of an automated workplace, it is necessary that the program performs a number of functions that will help to increase the efficiency of the head of the organization: input of initial information and filling in the database; correction and storage of data; presentation of data in a convenient form; issuance of reference data. Taking this into account, the structure of the automated workplace software is formed. One of the parts of the successful work of the call - center and guarantee of long-term profitable relationships with customers is high-quality and efficient service. Quality and efficiency of service is formed: from the availability of a single database; of highly qualified personel; from the established system of processing applications; from the availability of high quality material and technical base; of the profit of the vehicle and mobile communications. The service center is the principal operations: receiving requests from customers; storage of applications in the information base; create progress reports for clients; monitoring progress and contributing to the database on the current work. For the distribution of components in the warehouse, we were based on the solution of the linear programming problem. To determine the distribution of PC components in warehouses, the algorithm for calculating the roots of the objective function under these restrictions was considered.

Keywords:

Warehouse, automated workplace, information system.

ACM Computing Classification System:

Computing and business, Service-oriented architectures.
Interaction design process and methods

Introduction

The basics of information and other software related to their use as a tool occupy an important place in the course of the company. Their application makes it possible to reduce the time required for processing customers ' orders, and, consequently, the speed of service with customers in the enterprise as a whole.

Of course, in order to identify all possible abilities, without exception, which carries the use of databases, it is necessary to use a complex of software and hardware as detailed as possible to the set tasks. Due to this, at the present time there is a great need for computer programs that would support and coordinate the process [1, 2].

Today, automated workplaces can be observed in a variety of fields. In this work, the development of an automated workplace of the call-center operator for technological diagnostics, repair and maintenance of the PC system unit was made.

The purpose of the work is to develop an automated workplace for the operator to manage the warehouse of components for the PC.
Work tasks:

1) workplace automation analysis;
2) analysis of the operator's activity in warehouse management;
3) development of a model of an automated workplace for warehouse management;
4) development of the operator's arm functioning algorithm for warehouse management;
5) development of the operator's arm user interface for warehouse management;
6) development of the operator's arm program for warehouse management;
7) realization of the operator's arm model for warehouse management, repair and maintenance of the PC system unit.

1 Conceptual modeling of the automated workplace of the operator on warehouse management of PC components

The operator's workstation of the call-center needs to be provided with the following tasks:

- consultation on required data;
- automatic processing and formation of waybills;
- routing for scheduled jobs and the control of the route;
- payroll and the cost of transportation.

Making analysis of the listed responsibilities of the operator and the tasks which are solved with the help of automation. In this paper, a program that will allow:

- shaping directions in automatic mode;
- keep a log of the work of drivers and vehicles;
- issuance and storage of reference data;
- creating and updating client database.

To solve the tasks, you need the source, output and intermediate data. To create a client database, source data:

- type of work;
- the name of the head;
- phone number;
- address for correspondence;
- legal form;
- payment details;
- long-term plan.

These data are needed to implement the automated workplace function, can be represented in the form of a relational data model [3,4].

Data redundancy is the repetition of values in tables or attributes.

Due to the compilation of tables for different sources, there is a data inconsistency.

Data computability is the significance of individual attributes can be determined according to known values.

Information is almost impossible to lay out on minor and elementary relations, and there is no connection between the information, it is permissible to move to the compilation of the file texture.

The structure of the file for saving "Clients" information is shown in table 1.

Table 1 - Structure of the file for storing "Clients" information

Field name	**Field type**	**Field length**
Legal form	Line	100
Address for correspondence	Line	100
Shipping and payment details	Line	100
Phone number	Line	11
The name of the head	Line	30
Type of work	Number	30
Perspective (date and order quantity)	Line	30

On the basis of this file structure, the necessary documents are created. The program sets the necessary filtering and sorting settings depending on the type of document. Also, certain arithmetic operations are carried out with the data. The output is projected as raw information that has been processed or in the original form.

When developing a model of an automated workplace, it is necessary that the program performs a number of functions that will help to increase the efficiency of the head of the organization:

- input of initial information and filling in the database;
- correction and storage of data;
- representation of the data in a convenient form;
- the results of reference data.

Taking this into account, the structure of the automated workplace is formed (figure 1).

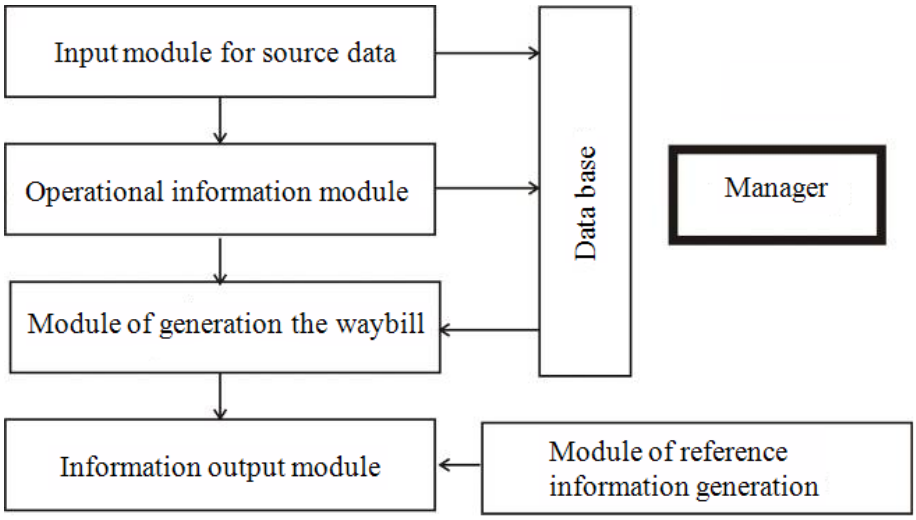

Fig.1. Structure of the automated workplace

The structure of this program consists of seven modules:

* the call centre operator or the operator;
* initial information input module;
* module for the accounting of timely information;
* module for editing waybills;
* information base;
* module for generating reference information;
* output module.

For specific tasks, there are a large number of different algorithms for their resolution. Finding the necessary method is subject to additional conditions that apply to these methods. The procedure for forming a method is associated with the recording method in a particular language.

The algorithm of the automated workplace model can be different. It uses all types of algorithms: linear, cyclic, branching. All this is necessary for accurate data processing and creating the necessary reports.

The linearity of the algorithm is the sequence of actions in the basic module of the program. Branching algorithm is needed to extract information from files. That is, when you press the desired key, a process is performed, which is described in the event according to the pressing of each key.

The method of this program uses opposite connections, which allow the operator to choose the necessary approach to continue the program.

The call-center operator executes the project management. In the process, it contains the necessary modules and ensures their correct interaction.

The advantage of this method is the ease and probability of structure and connection of specific elements to be clearly reflected.

When developing this program, it is important to pay special attention to the problem of accessibility, clarity and convenience of dialogue between the PC and the operator.

The program that creates a model of a call center specialist workstation is necessary to perform on the principle of modularity. This makes it more versatile and allows for upgrades as needed [5, 6].

For the convenience of the operator you need to display the necessary tips and buttons.

One of the parts of the successful work of the call - center and guarantee of long-term profitable relationships with customers is high-quality and efficient service.

Quality and efficiency of service is formed:

- from the availability of a single database;
- of highly qualified personnel;
- from the established system of processing applications;
- from the availability of high quality material and technical base;
- of the profitability of the vehicle and mobile communications.

The service center is the principal operations:

- receiving requests from customers;
- storage of applications in the information base [7];
- create progress reports for clients;
- monitoring progress and contributing to the database on the current work.

2 Description of the linear programming problem

To determine the distribution of PC components in warehouses, consider the algorithm for calculating the roots of the objective function under these restrictions.

Variables that are included in only one equation of the constraint system with a coefficient of 1 are called basic variables (for our problem these are variables). The other variables are called free variables. Then equating the basis variables to the corresponding right-hand parts of the constraints, and the free variables to zero , we obtain a reference plan defined by a system of unit vectors, which form the basis of the m-dimensional space.

For the convenience of calculations in the simplex method, all data on the problem are recorded in the simplex table:

Table 2 - Simplex table

x_δ	c_δ	B	c_1	c_2	…	c_k	…	c_j	…	c_n
			x_1	x_2	…	x_k	…	x_j	…	x_n
$x_{\delta 1}$	$c_{\delta 1}$	b_1	a_{11}	a_{12}	…	a_{1k}	…	a_{1j}	…	a_{1n}
…	…	…	…	…	…	…	…	…	…	…
$x_{\delta s}$	$c_{\delta s}$	b_s	a_{s1}	a_{s2}	…	a_{sk}	…	a_{sj}	…	a_{sn}
…	…	…	…	…	…	…	…	…	…	…
$x_{\delta i}$	$c_{\delta i}$	b_i	a_{i1}	a_{i2}	…	a_{ik}	…	a_{ij}	…	a_{in}
…	…	…	…	…	…	…	…	…	…	…
$x_{\delta m}$	$c_{\delta m}$	b_m	a_{m1}	a_{m2}	…	a_{mk}	…	a_{mj}	…	a_{mn}
		F	Δ_1	Δ_2	…	Δ_k	…	Δ_j	…	Δ_n

In the top row of the table coefficients are made for all variables in the objective function.

In the first column of the table, the basic variables are introduced in the order in which they come into the concept of restrictions, in the second – the coefficients of the objective function for the basic variables, in the third – the right shares of all restrictions, in the subsequent columns – the coefficients for certain unstable constraints in the concept.

In the lower line of the table, estimates are made according to any variable, which are then characterized by:

It is obvious that for the basis unstable estimates are zero.

At any iteration of the simplex method, the conclusion from the basis of some other unstable variable and the inclusion of another variable with the proper recalculation of the table components are carried out. Before solving the problem it should lead to the canonical figure.

3 Using the simplex method to implement a model of the operator's automated workplace for the management of the components PC warehouse

The organization consists of 4 branches, each of which has its own warehouse. For example, there are 3 types of goods that are needed in these warehouses. The number of goods of each type, which should be on average in the warehouses is given in the table:

Table 3 - Example of using the simplex method

Type of goods	1 warehouse	2 warehouse	2 warehouse	3 warehouse	The total number on the basis of wholesale
I	3	2	2	0	20
II	1	1	3	2	37
III	1	1	0	4	30
Profit from the sale of 1 PC, rub	9	6	11	6	

The table shows the total number of goods of each type on the wholesale basis and profit from the sale of one unit of goods.

Determine how many goods of each type should be in warehouses to maximize the profit from the sale of goods.

The final version of the system of equations:

x 0 = 137-7 / 8 x 2-17 / 8 x 5-9 / 4x6-3/8 x 7
x 3 = 7-1/16 x 2+1/16 x 5-3/8x6+3/16x7
x 4 = 7-3/32 x 2+3/32 x 5-1/16 x 6-7/32 x 7
x 1 = 2-5/8 x 2-3/8 x 5+1/4x6-1/8 x 7

The optimal plan can be recorded as follows:

x3 = 7
x4 = 7
x1 = 2
F (X) = 137.

4 Software implementation of the Simplex method

As a result of the analysis of the task and trading activity of the enterprise, a software implementation was developed for the solution using the simplex method.

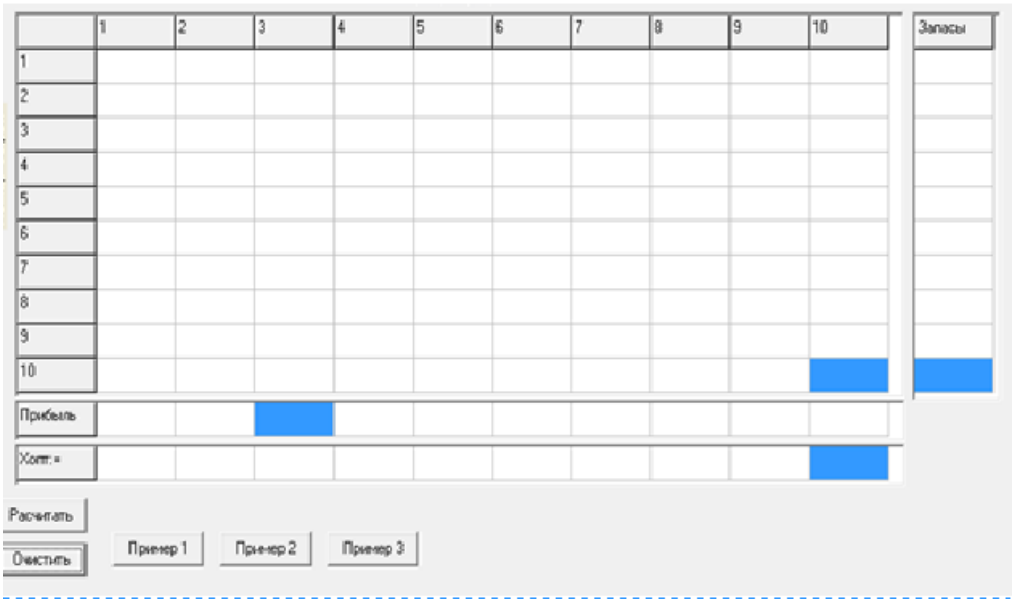

Fig.2. Window interface of the developed program

For the problem discussed in detail in the example above, the solution using the program will look like this:

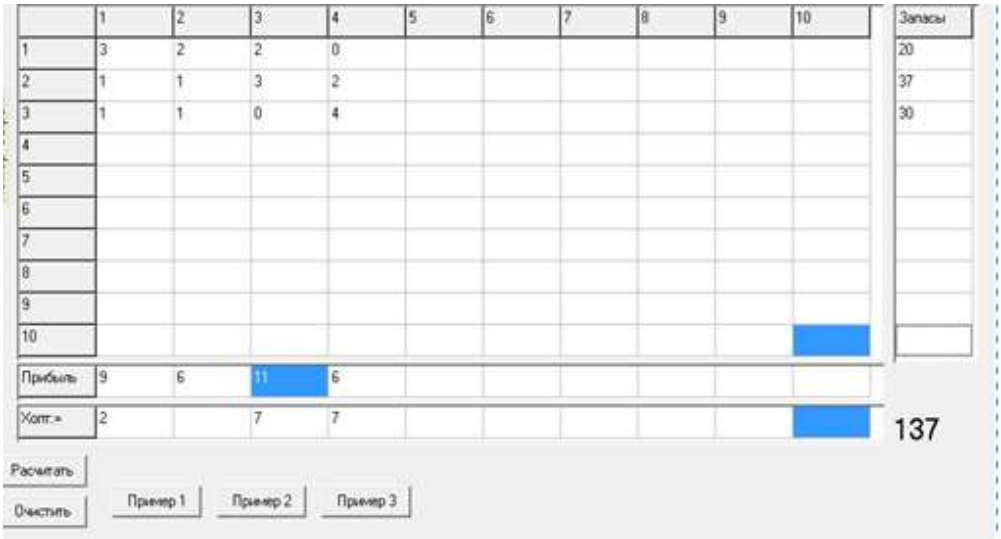

Fig.3. Example of solving the problem using the simplex method

After receiving the result, we can draw the appropriate conclusions. With a given number of PC components of each type, the maximum revenue from the sale of these products will be 137.

Let us consider a few more examples and solve them with the help of the developed program. With the given parameters, to determine the maximum income from the sale of PC components:

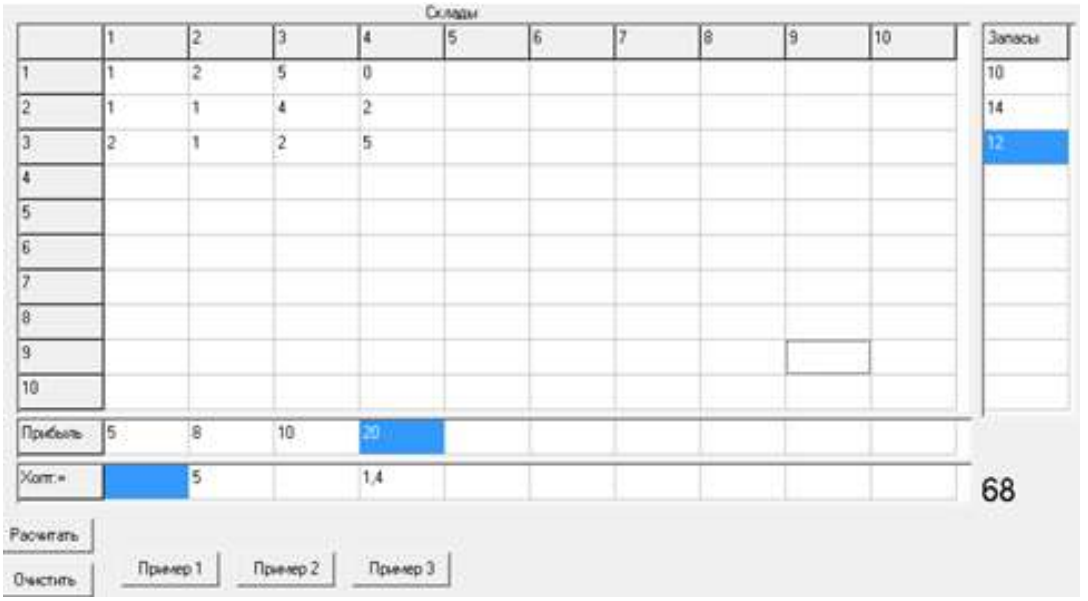

Fig.4 An example of solving the problem by simplex method.

The maximum income from a given amount of goods in this problem will be 2860 rubles.

Testing of the developed program showed that the software completely copes with the tasks assigned to it, finding the maximum in functions under the given restrictions.

Table 4 - Example of ordering of goods by the organization

Type of goods	**1 warehouse**	**2 warehouse**	**2 warehouse**	**3 warehouse**	**The total number on the basis of wholesale**
TV BBK	0	0	0	10	170
Monitor LG	0	30	10	0	200
Camera-re-corder	6	0	0	0	120
Profit from the sale of 1 PC rub.	5400	2500	2500	3700	

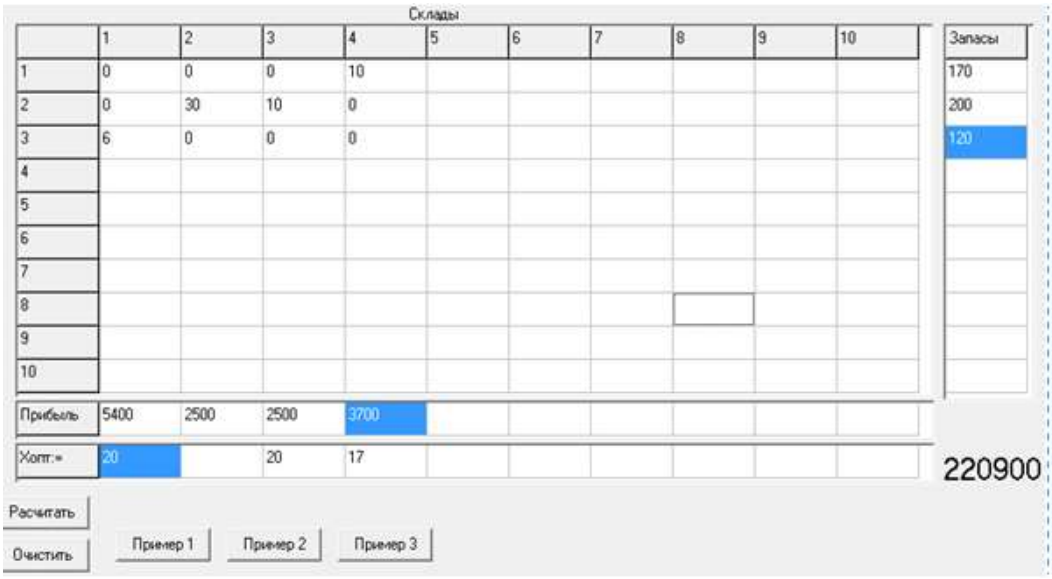

Fig.5. Determination of income from the ordered goods

The result shows that the maximum profit from the order will be 220900 rubles.
Let's analyze one more order:

Table 5 – Example of ordering of goods by the organization

Type of goods	**1 warehouse**	**2 warehouse**	**2 warehouse**	**3 warehouse**	**The total number on the basis of wholesale**
Keyboard BTC	50	0	0	20	300
Монитор LG	0	0	20	0	200
Camera-re-corder	0	40	0	0	120
Profit from the sale of 1 PC rub.	300	3200	2500	300	

Fill in the appropriate table in the developed program:

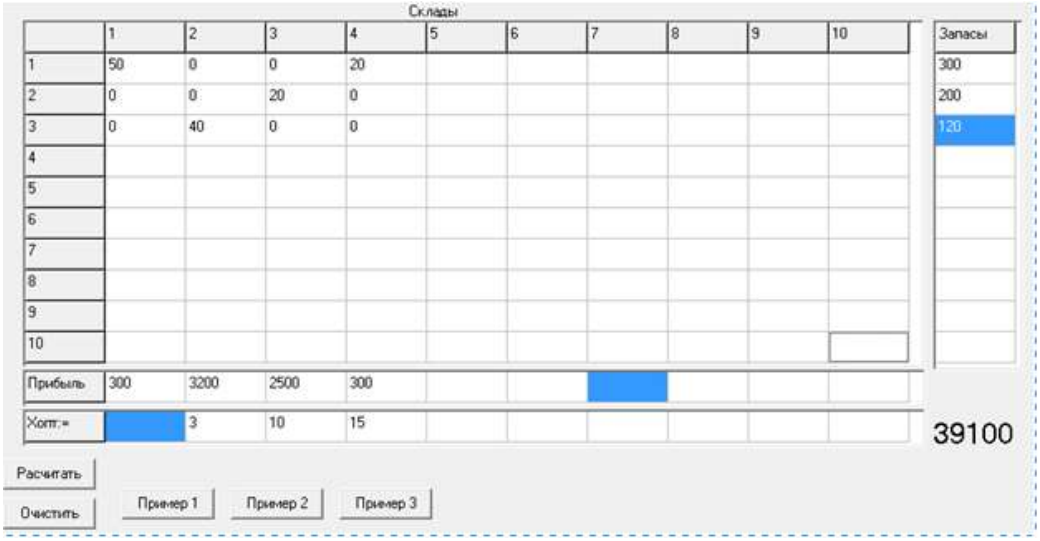

Fig.6. Determination of income from a given product

The income from this order was 39100 rubles.

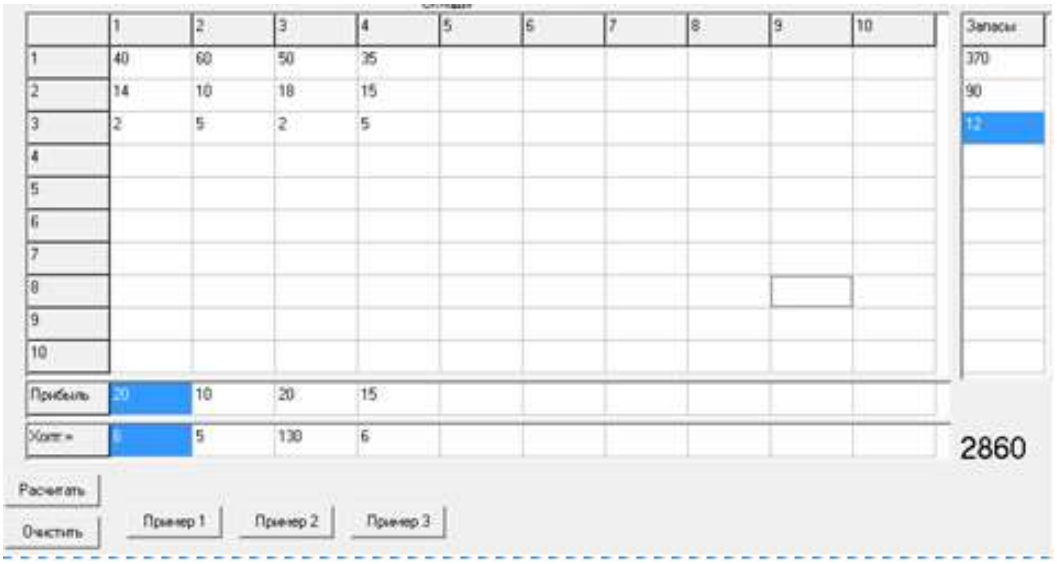

Fig.7. An example of solving the simplex problem

Now, from abstract numbers, go directly to the problem that will be solved in the trading organization with the help of the developed program.

Table 6 – Example of ordering of goods by the organization

Type of goods	**1 warehouse**	**2 warehouse**	**2 warehouse**	**3 warehouse**	**The total number on the basis of wholesale**
Keyboard BTC	50	0	0	20	300
Монитор LG	0	0	20	0	200
Camera-re-corder	0	40	0	0	120
Profit from the sale of 1 PC rub.	300	3200	2500	300	

We will enter the data into the developed program.

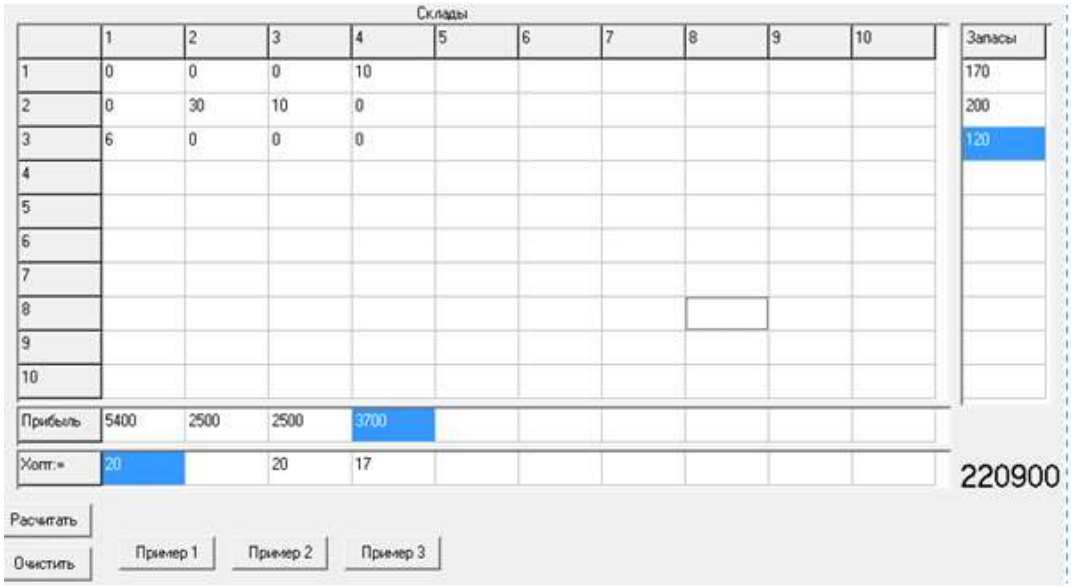

Fig.8. Determination of income from the ordered goods

The result shows that the maximum profit from the order will be 220900 rubles.

Let's analyze one more order:

Table 7 – Example of ordering of goods by the organization

Type of goods	**1 warehouse**	**2 warehouse**	**2 warehouse**	**3 warehouse**	**The total number on the basis of wholesale**
Keyboard BTC	50	0	0	20	300
Монитор LG	0	0	20	0	200
Camera-re-corder	0	40	0	0	120
Profit from the sale of 1 PC rub.	300	3200	2500	300	

Fill in the appropriate table in the developed program:

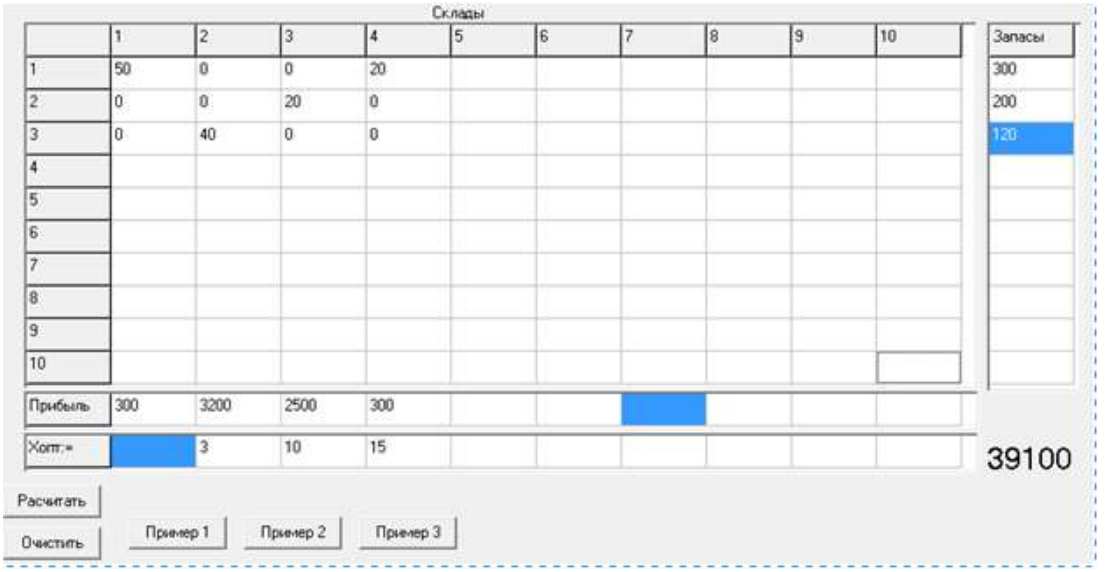

Fig.9. Determination of income from a given product

The income from this order was 39100 rubles.

Conclusion

The placement of goods in the warehouse plays a key role in the optimization of warehouse processes. The quality and speed of selection depends on how the goods are placed in the warehouse.

In this paper, the problem of goods placement in warehouses was presented in the form of a linear programming problem and solved using the simplex method. For the presented problem the program was made. The use of the created program at the enterprise allowed to expand the method of storage used in the organization in a warehouse.

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