DEVELOPMENT OF AN AUTOMATED WORKPLACE OF THE EXPERT IN ROOFING MATERIALS

Igor Lvovich, Alexander Plotnikov

Abstract:

Currently, a variety of software tools are widely used when working with a computer. Among them are automated information systems. Information system (IS) - a system of processing, storage and transmission of any information that is presented in a certain form. In modern computing IS is a software package that allows you to securely store data in memory, perform data conversion and perform calculations using a convenient and easy-to-use interface. The purpose of this work is to develop an automated workplace specialist roofing materials, performing the calculation of the flow and the presence of material residues, as well as the calculation of the cost and timing of work.

Keywords:

Automation, information system, workplace.

ACM Computing Classification System:

Enterprise computing, operations research, planning and scheduling, software system structures.

Introduction

In the modern world, in an age of flourishing computer technologies, there is a growing desire and desire to share manual and hard human work with powerful multi-core computers to increase productivity, thereby facilitating problem solving for workers, scientists, engineers, designers various fields of activity and management personnel. Accordingly, the problems of all kinds of process control automation are becoming very relevant today. To speed up the work of the staff and to work quickly, a huge amount of data is perfectly handled by computers installed directly in the workplaces of specialists [1]. An increase in automated workplaces may follow from this. Computers have penetrated into all sectors of the national economy and the need has arisen to develop an automated workplace for a roofing materials specialist, as there is a need for instant calculation and proper distribution of material and financial resources together with the proper organization and distribution of human resources. Roofing materials specialist needs a quick calculation of upcoming work, information about the material in stock and instant calculations of the cost of the order.

The purpose of this paper is to develop an automated workplace specialist for roofing materials, performing the calculation of the flow and the presence of material residues, as well as the calculation of the cost and timing of the work. With features to add, remove materials, orders and suppliers.

To achieve this goal it is necessary to solve the following main tasks:

1. Understand what is an automated workplace.
2. Separate the main types and classifications of APM.
3. Create an information model of the automated workplace of a specialist in roofing materials.
4. Describe the information support of APM.
5. To implement a software for the automated workplace of a specialist in roofing materials.

1 Information model of the APM of the specialist

To create our information model of an automated workplace, it is necessary to answer the questions: “What do we want to see at the end?”, “What information will we store and will we keep information at all?”, “What data operations will we perform?” And “With which software just we want to work? ". Answering these questions, we collect a set of information characterizing the essential properties and states of the automated workplace object and on the basis of this information an information model will be built [2].

At the output, we want to see a software product running on most modern computers that uses a minimal set of peripheral devices, that has cross-platform, accelerates the work of the operator and naturally performs the necessary calculations [3].

In order to answer the question about stored information, you need to figure out what information will have to work. A computer cannot make all physical work for the person, but what a person can calculate in a few hours a computer can decide in an instant. The roof workman can cover the roof, but the computer does not. The workman can make calculations on a piece of paper, spending a lot of time, while this work can be entrusted to a computer. Calculations involving the name and quantity of the material, the required number of people, the number of days to close the object, as well as the name and coordinates of the customer’s company and the total cost of the work are more expediently stored in a computer for quick access [4].

The program interface should be intuitive, even for a beginner, in order for new employees to quickly get into the work process and not waste time on extra training. More useful information and data will appear in the automated workplace about the work required by the customer or the company. For customers, we will make a separate table, where the data will be located, as shown in table 1.

Table 1. Example of a customer table

Company name	Address	Directors	Phone	Email
OOO «SamStroy»	Lipetsk, Pervomayskaya st., д.1	Ivanov I.I.	212-34-56	Samstroy@mail.ru
OOO «Teleset»	Lipetsk, Bolshevikov st., д.2	Prtrov I.I.	265-43-21	Teleset@mail.ru
OOO «SamStroy»	Voronezh, Sadovaya st., д.3	Sidorov S.P.	231-25-52	ServStroy@gmail.ru

It would be absolutely correct and reasonable to add buttons direct to the table on screen, with the help of which the data in the table at any time can be deleted or added new, as well as to make the transition to other screens.

Speaking about the stored data, you should take into account the data of the materials themselves, such as the name, cost, rate of output for the worker, the daily salary of the worker. Such data are presented in table 2.

Table 2 - Table of information about the materials

Name	Unit price	Working rate for worker	Daily Salary
Metal tile	10000	5	1000
Tiling	7500	10	1100
Slate	1000	13	1200
Ondulin	6700	3	1300
Ruberoid	5400	10	1400

Accordingly, in the development process and for this form it is necessary to save data, as well as add the ability to add data, change and delete. For ease of navigation, place the button with the transition to the next form [5].

Of course, the above data would not be logical to leave in vain, they are involved in the preparation of an order for work and cost. Information about orders rationally should be placed in the following table with the name "Information about orders", visually can be seen below in table 3.

Table 3 - Table of information about the materials

Ordering number	Start date	Number of work days	Material	Amount of material	Material costs	Number of workers	Worker Payment	Total to pay	Work company
1	2012-07-22	1	Metal tile	500	500000	10	10000	510000	OOO «Sam-Stroy»
2	2014-02-03	3	Ruberoid	6700	3780000	20	84000	3864000	OOO «Tele-set»

This table is the main one and in this table the timing and economy will be calculated. The user adds orders, the computer calculates the parameters and displays the corrected data on the screen. In case of a filling in or canceling an order, you can delete the entire fully formed order in the line [6].

As for the timing - this is the dependence of the number of days to work on the number of workers. The rest of the economic calculations such as material costs, worker's wages, total payments are calculated according to data from the table “Information about materials”.

Composition of information support:

1. Information support of the automated workplace is very necessary for presenting a more accurate picture of the project. Information support will cover information on issues such as organizing information support, organizing the collection and transmission of information.
2. For proper development of an automated workplace of a roofing materials specialist, it is necessary to choose the type of database with which the specialist will work. First, let's remember what a database is, what database models exist, and choose the most suitable for our tasks.
3. Database - a simple language, a certain set of interrelated data that can be easily used for a large number of applications, to quickly obtain and modify the necessary information.

Database models are based primarily on the modern approach to the processing of stored information. The structure of the database information allows you to create logical records of their elements and their relationships, which is very convenient.

Relationships are of three kinds: one to one, one to many, and many to many. The choice of one or another type of relationship is determined by three database models: hierarchical, network, relational.

The hierarchical model in its form is represented as a tree graph. Of the main advantages can be noted that this model allows you to describe the structure of the data, as well as at the logical and physical level. It may be noted the disadvantage of a tight relationship between the elements. Therefore, any change in the relationship requires a change in its structure. In addition, access speed was achieved due to one more minus - the loss of information flexibility, i.e. for one pass through the tree it is impossible to obtain information located on another branch of communication. This model implements only one type of one-to-many communication [7].

The network database model is presented in the form of a diagram of links. In the network model, any kinds of connections between records are allowed, restrictions are imposed only on the number of feedbacks. The principle of many to many is used. The advantage of this model is greater information flexibility compared to the hierarchical model, but the disadvantage remains - the rigidity of the structure [8].

The relational database is used in the case of frequent reorganization of the information base. This model is the most perfect, compared to the network and hierarchical. In this model, there are no differences between objects and relationships. The type of connection of such a model is one to one. In this model, relationships between objects are presented in the form of two-dimensional tables - relations. Since any data structure can be transformed into a simple two-dimensional table, and this view is most convenient both for the user and the machine, the vast majority of modern information systems work with such tables, i.e. with relational databases.

Relationships have the following properties:

- each item is one item of data;
- there are no repeated groups;
- the elements of the column have the same nature;
- the table does not repeat the line;
- rows and columns can be viewed in any order.

The advantage of this model:

- the simplicity of the logical model;
- system flexibility;
- data independence;

Therefore, in this project it is more appropriate to use the relational model of the database. The database in the project will have the name “krovelsik” and contain four tables: “customers”, “materials”, “orders” and “users”, with which the operator will work through the user interface of the application.

Organization of information support:

Since the automated workplace does not require instant or automatic backup to a separate or remote data storage, it would be more logical for the data storage to use the HDD of the personal computer directly to the one the roofing materials specialist works for.

Organization of the collection of information:

Information collection should be carried out directly by a roofing materials specialist (operator), who has relevant personal computer skills and has been instructed to work with this software. The operator uses the method of dialogue with the customer to make an order with entering the relevant information in the tables defined by him.

The operator can enter the software only by authenticating with the login and password issued by the database administrator.

2 User Interface Development

To create a program, create a project. The name can be any, but I called the project final. Remember that the name of the project must match the name of our main class.

When developing an APM GUI, you need to create a connection to our database. To do this, download the jdbc driver called mysql-connector-java-5.1.23-bin.jar. We will deal with the structure of the project. Consider the class tree Fig.1.

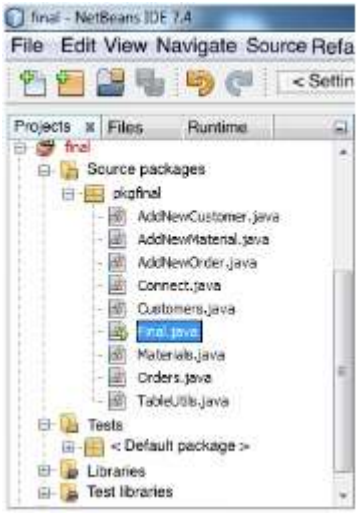

Fig.1. Class tree.

We create 9 classes for the program to work: “Final.java”, “Connect.java”, “Customers.java”, “AddNewCustomer.java”, “Materials.java”, “AddNewMaterials.java”, “Orders.java”, “ AddNewOrder.java ”and“ TableUtils.java ”.

When you enter your login and password and click on the "Login" button, a connection to the database is created with the username "root" and the password "root".

```
try
{
Class.forName ("com.mysql.jdbc.Driver");
con = DriverManager.getConnection ("jdbc: mysql: // localhost: 3306 /
                                    krovelsik", "root", "root");
} catch (ClassNotFoundException ex)
{
System.err.println ("KFDB.Cannot find this db driver classes.");
ex.printStackTrace ();
} catch (SQLException e)
{
System.err.println ("KFDB.Cannot connect to this db.");
e.printStackTrace ();
}
```

To connect to the database, the class “Connect.java” responds.

The “Customers.java” class is responsible for the “Enterprise Details” table. On this form, you can add a new enterprise to the database (button to add an enterprise) Fig.3 or remove the old one from the database (delete company button) Fig.2. When adding a new enterprise, the table increases line by line and does not display a huge number of empty fields, which gives the advantage of comfortable work with a small number of enterprises. With a significant increase in the number of new enterprises, a “scrolbar” appears on the right, which, when scrolling, in turn makes it possible to work comfortably with a large amount of data.

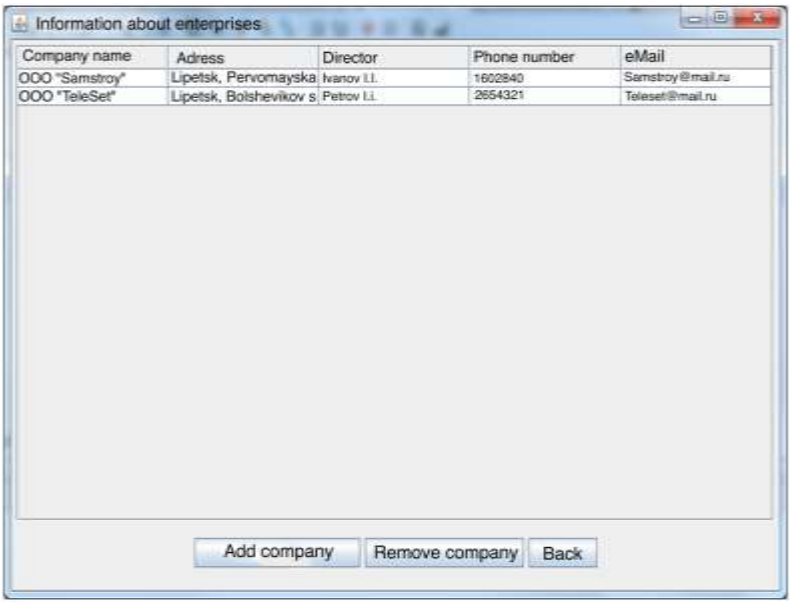

Fig.2. Information about enterprises.

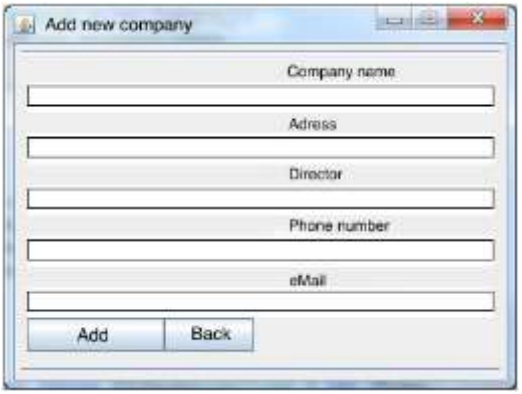

Fig.3. Adding a company to the database.

The class “AddNewCustomer.java” is responsible for adding a “new enterprise” to the database and deleting the “old” one.

Before updating the table, the program checks for the presence of empty fields; if all data is entered correctly, the following code is executed:

```
int rs=stmt.executeUpdate("INSERT INTO custom-
ers(NAME_OF_COMPANY,ADRESS,DIRECTOR_NAME,TELEFON_NUMBER, EMAIL_ADRESS)"+ " VALUES
('" + name.getText() + "','"+adres.getText()+"','"+director.getText()+"',"+ tele-
fon.getText()+",'"+ email.getText()+"')");
```

If you enter error data, an error message is displayed. Form "Information about materials" Fig.4 works with the help of the “Materials.java” class, where you can add new material to the database with the parameters “Price per unit”, “Production rate for the worker”, “Daily worker salary”, the class “AddNewMaterials is responsible for this. java ” Fig.5 or delete an existing material with all its parameters.

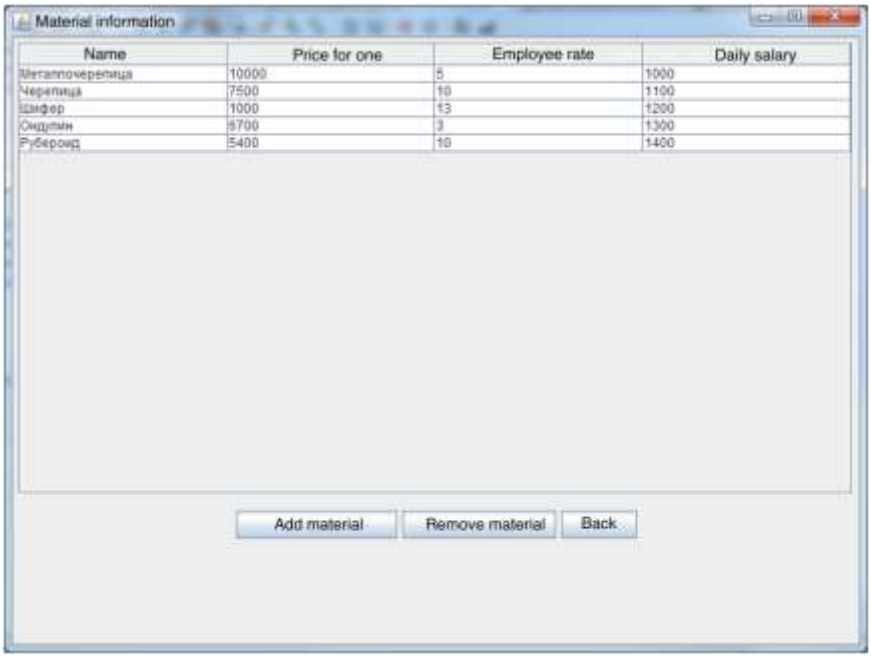

Fig.4. Material Information.

Fig.5. Adding a new material.

The following table is “Order Details” Fig.6. This table is formed by the class “Orders.java”. In this table, you can add the order in Fig.7, delete the order, go to the forms "Go to the list of enterprises", "Go to materials" and calculate the dates and economic parameters. The presence of material in the warehouse, the calculation of the cost of deadlines.

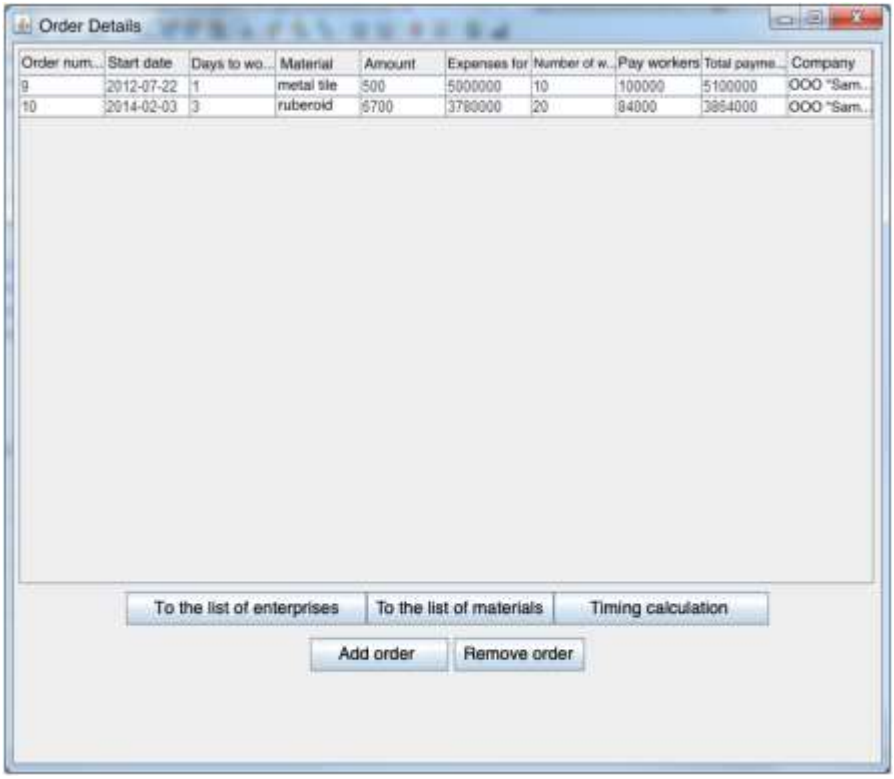

Fig.6. Order Details.

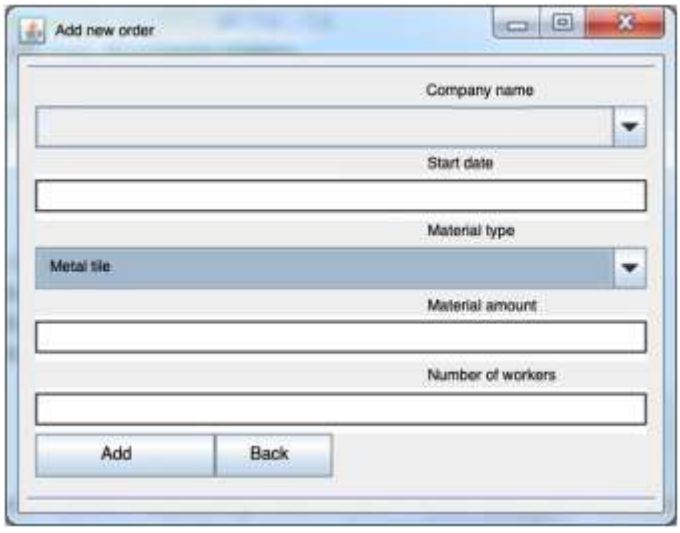

Fig.7. Adding a new order.

On the form "Add a new order" using the JComboBox component, you can choose from already existing enterprises already registered in the database. It is very convenient if there are many cooperating firms and there is no need to memorize them all in order to enter the name of the customer's company manually. And you can also choose the name of the material from the base, and if there are a lot of varieties of material in stock, you can thereby further speed up the work of the operator, saving him valuable time.

The last class working in the program is called "TableUtils.java", its implementation is presented below.

```
package pkgfinal;
import java.sql.ResultSet;
import java.sql.SQLException;
import java.util.Vector;
public class TableUtils {
public Vector data;
public Vector tableData(ResultSet rs, int numColumns) throws SQLException{
data = new Vector();
while (rs.next()) {
Vector row = new Vector();
for (int i = 1; i <= numColumns; i++) {
row.add(rs.getString(i));
}
data.add(row);
}
return data;
}}
```

This class responds by accepting as parameters a variable with sample values from the ResultSet rs table and accepts the number of columns with the table, then iterates through all the values that came from the table and fills them with an object of the Vector class, and then sends it to the calling class for display in a specific table.

Conclusion

In the process of performing this thesis, the concept of an automated workplace and characteristics, the main types of AWS structure and their classification were considered.

Based on the analysis, a software product was developed for an automated workplace for a roofing materials specialist, in a high-level Java language, using the MySQL Server DBMS, which performs the tasks of automating economic calculations. The calculation of the consumption and the presence of remnants of material in the warehouse, the calculation of the cost and timing of the work is carried out on the basis of orders for roofing work. At the expense of what is an effective distribution of human resources and focus on obtaining more profit.

References

[1] Maksimov I.B. (2014) Principles of the formation of automated workplaces. *Bulletin of the Voronezh Institute of High Technologies*. № 12. Pp. 130-135.

[2] Guskova L.B. (2012) On the construction of an automated workplace manager. *Successes of modern science*. № 6. P. 106.

[3] Maksimov I.B. (2014) Classification of workstations. *Bulletin of the Voronezh Institute of High Technologies*. № 12. Pp. 127-129.

[4] Korolkov R.V. (2013) Controlling in a trade organization. *Bulletin of the Voronezh Institute of High Technologies*. № 10. Pp. 287-290.

[5] Korolkov R.V. (2013) On financial management in organizations. *Bulletin of the Voronezh Institute of High Technologies*. No. 11. Pp. 144-147.

[6] Lisitsky D.S., Preobrazhensky Yu.P. (2008) Construction of a simulation model of the socio-economic system. *Bulletin of the Voronezh Institute of High Technologies*. № 3. Pp. 135-136.

[7] Chernikov S.Yu., Korolkov R.V. (2014) The use of system analysis in the management of organizations. *Modeling, optimization and information technology*. № 2 (5). P. 16.

[8] Preobrazhensky A. P., Choporov O. N. (2018) Opportunities for innovative development of modern organizations. *The Science Of Krasnoyarsk*. Vol. 7. No. 1-2. Pp. 133-138.

Authors

Prof. Igor Lvovich, Doctor of Technical Sciencies.
Voronezh Institute of High Technologies, Voronezh, Russia
office@vivt.ru
Main interests are: system analysis, optimization.

Dr. Alexander Plotnikov, PhD.
Voronezh Institute of High Technologies, Voronezh, Russia
office@vivt.ru
Main interests are: system analysis, optimization.