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Information System for Fast Food Restaurants

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Abstract

This paper describes a practical experience of the implementation of the authors of information system that automates the activities of a fast food restaurant. We studied in detail the functionality a similar system of the most popular in Russia. Before designing we nominated following optimal criteria to be met by the final implementation: 1. To provide the possibility of automation with a single system as a small cafe (or a restaurant), and the whole network of institutions; 2. To develop usability of graphical interface with support of touch screens; 3. To implement operative multiuse's access and managements of orders; 4. To implement a flexible application architecture with the ability to extend in the future; 5. To provide the ability to print various forms of report. The needs to define each optimal criterion is detailed description in the article. It also provides recommendations for the implementation of the client application on the object-oriented programming language and the implementation of a data warehouse as a relational database. To overcome the impedance mismatch it is recommended to use object-related mapping patterns. To reduce costs the owners of restaurants buy single touch screen computers with slow CPU performance. This results in the imposition of limits on computing resources of implemented information system. For the design of an information system the Unified Modeling Language UML is used, class diagram is shown in Fig. The paper describes the purpose of each class and association with other classes. Attention is paid to the design of tree (hierarchical structures) and the procedure of allocation of base classes on the analysis of all existing common attributes. At the end of the article we made a detailed analysis of the results, defined the appropriate implementation of each one selected, received at the beginning of the article optimal criterion along with recommendations for further development of the system.

1. Introduction

Visiting restaurants of a fast food became the integral element in life of the modern person. It led to universal emergence of similar institutions and as a result. There is a problem of automation of activity, a choice and introduction of information system. The success of all business depends on the successful solution of this task. As a rule, there are two main decisions. The first assumes the choice and introduction of existing systems. The second decision assumes independent development of the software product for needs of the organization.

For restaurants of fast food this article is devoted to experience of design and realization of information system. In work the UML chart contains all allocated classes, allowing to show the developed functionality submitted.

2. Review of Existing Publications

The fast food restaurant represents classical system of mass service therefore interest in its studying and formalization of subject domain arose for a long time. So in the work [1] published in 1991, the author proves need of creation of the program complex allowing to imitate behavior of visitors restaurants and creating various standard operations of business processes. The structure and structure of modules of information system is described, and also the stream of implementation of various tests is presented in the form of the chart. At the end article the author describes the arising problems of validation and verification of the created models.

In work [2] authors consider the information system realized in Toshiba corporation which distinguishes oral speech of the client and on the basis of the allocated roots forms requests for creation orders. Article written in 1992 and in detail opens process of allocation keywords, definitions of a root and reviews an example of recognition a voice and the subsequent steaming of words and sequences. Then on the basis of the available grammar there is a compliance with products in information system of restaurant and the order for preparation is formed.

Later work [3] written in 2008 represents own method of an assessment of satisfaction of clients with services of fast food restaurants which authors called TOPSIS. This approach is based on the multiple-factor analysis at which all allocated criteria were distributed on some groups. Authors offer own formal device and a set of formulas which allow to range each criterion within group on the basis of the calculated weight. Then weight are summarized and the integrated indicator turns out. The offered approach is approved at restaurants of the USA and China. Then the received values are considered in details in the form of schedules and tables. Authors presented the program realization in a program language allow to estimate and understand better algorithms in the application.

In 2009 in work [4] realization of the multilink information system allowing to automate completely fast food restaurant and all business processes from formation of the order by the client to obtain the order in kitchen is in detail described. At the beginning of article authors consider process of formation of orders from the point of view of various participants such as the client and the cook. As a result of the found differences the conclusion about need of realization of various links of system and various interfaces is drawn. It is possible to carry the presented drawing with configuration of graphic elements to number of advantages. However from drawing it became clear that the system can't be used on touch screens and assumes use of the manipulator of a mouse for management. At the end of article authors

considered an information transfer chain from the client taking into account orders and directly to the cook. And also paid attention to the return process which essence consists in issue of the prepared order.

In the same 2009 in work [5] authors considered process of development of the software product which uses pocket personal computers (PDA) for creation and service of orders at the fast food restaurants. The touch focused graphic interface is presented and the main objectives which are carried out about its help are described. Thus authors on the example of standard restaurant described number of performers of each task.

The problem of introduction of the modern touch focused appendices is considered and in the work [6] published in 2010 and devoted to process of automation the dining room. Authors began with the analysis of business processes and allocation of key procedures which finally were distributed on some group, which is carried out or by means of the touch focused appendix, or by means of the appendix using the mouse manipulator. From the hardware point of view it was offered to make special types of lunch slots which scheme is submitted in drawing and allows to understand an arrangement of the system unit, touch screen and a projector. Also the attention of the organization of the software is paid, to existence of the server of databases, and also the multimedia server processing advertizing content. At the end of article the table with results of an assessment by clients of the rendered services is submitted.

In the same 2010 in work [7] authors executed reengineering of process of preparation of complex lunches, and then on the basis of the constructed charts carried out process optimization. It allowed to construct the Essence-Communication model in concepts of relational model of data. Finally procedures of formation of the order in concepts of creation of separate elements were described. Thus main types of activity are presented on the corresponding charts were allocated.

One of the latest works published in 2014 and devoted to development of IS for restaurants is article [8]. Authors describe own product which allows to order goods independently by means of the applications started on touch devices. At the beginning it is necessary to enter additional information on itself which is used then when forming orders and reduces thereby a holding time. The advantage of work is the detailed description of architectural concepts, and also structure of the used software. In summary authors showed cases at which information on clients is used especially often. For example, in case of existence of an allergy at the visitor the system automatically excludes the corresponding dishes.

In 2014 work [9] which indirectly belongs to subject of this article was also published and is devoted to process of modeling of system of mass service for restaurants of a fast food. Thus the model of turn of standard real-life cafe was constructed. As mathematical apparatus the model of Markov processes was used.

3. Criterion of an Optimality

The most popular information system automating activity of restaurants in Russia is the iiko [10] system. Existence of a set of introductions allows to claim that the described system is the standard, on its functionality and it is necessary to be leveled. Before own realization it is necessary to allocate the criterion of an optimality (OC) which contain functional features of future realization. The following requirements defining need were allocated:

- 1 To provide possibility of automation by means of uniform system as small cafe (or one restaurant), and the whole network of institutions;
- 2 To develop the developed graphic interface with support of touch screens;
- 3 To realize the operational multiuser to account orders;
- 4 To realize flexible architecture of the appendix with possibility of expansion in the future;
- 5 To provide possibility for the press of various forms of the reporting.

We will consider each criterion in more detail. Requirements of OC1 assume using of uniform IS irrespective of scales of the organization: from single restaurant to a large network. Often similar requirements are called scalability of system. Key advantage in the light of the considered task is decrease in costs of training of the staff (waiters, cashiers, managers, managing directors) and finally increases profit on activity.

Information system of restaurant of a fast food represents the system of mass service intended for processing of demands from clients. As a rule, in crowded places in rush hour the line of clients is formed and therefore it is necessary to take a number of measures for its reduction. Classical information systems, assume existence on workplaces of users personal computers with the keyboard and a mouse. At restaurants of a fast food most often monoblocks PC (often called all-in-one PC) with touch screens are used. Windows-based all-in-one PCs once earned little respect. While most of today's AIOs still lack the graphics horsepower for hard-core gaming (we'll show you one exception), the best models are far removed from the 98-pound weaklings of yore. Many AIOs use laptop parts, which minimize heat, power consumption, and the need for noisy cooling fans. If you crave more performance, pick a model that uses desktop components (the ones we've tested are still relatively quiet). Either way, everything—the CPU, memory, storage, and optical drive—is housed in the same unit as the display, so the computer's footprint equals that of a monitor. And since most all-in-ones ship with a Wi-Fi adapter as well as a wireless mouse and keyboard, the only cable they require is a power cord.

All-in-one specifications are a blend of what you'll find in conventional desktop systems and laptop PCs. The thinnest and most compact systems are almost completely built around the same power-efficient technology as laptops. Unlike with traditional desktop PCs, with an all-in-one computer, what you see is what you get—for the life of the PC. With few

exceptions, you'll never be able to upgrade without chucking the entire machine, so choose accordingly. In addition to multitouch capabilities (to support Windows 8), you should consider three other key factors: display technology, display resolution, and display size. LCD panels that employ IPS (in-plane switching) or PLS (plane-line switching) technology are vastly superior to those based on TN (twisted nematic) technology. IPS and PLS displays are more expensive, and you might find them only in larger all-in-ones, but they are worth every cent.

For this reason the developed graphic interface with support of touch screens is described in requirements of OC2 necessary for the program. Thus the display resolution, as a rule, makes 1024 on 768 pixels and it is necessary to place optimum output information and elements of the graphic interface. For the purpose of reduction the cost of the equipment of the worker at a place, owners buy rather weak monoblocks with Intel Atom processors with a clock frequency of 1,66 GHz. These hardware impose restrictions on realization and a choice of a target programming language.

Business process of restaurant corresponds to system of mass service and in the simplified look assumes existence of one computer with the installed program access to which a great number of users of various categories have: waiters, managers, commodity researcher. Access is provided on the unique code stated in the proxy map. I.e. each user approaching the computer brings the proxy card to the reading-out element and having authorized in system carries out the demanded actions. Then it quits the system and the following user approaches. Service speed in many respects depends on the speed of login. I.e. it is required to realize the operational multiuser account orders that is written down above as OC3. Thus various groups of users need to provide various interface, optimum for performance of functions. For example, the waiter needs to bring and edit orders. The manager needs to look through and have opportunity to delete orders only. Thus it is necessary to provide possibility of performance of various operations under a certain role of the user. For example, the waiter for granting a discount has to invite the manager and only the last one can choose a discount and confirm it. The standard interface of the user allow to bring new commodity positions, to organize them in hierarchy that it is simplest to realize by means of such elements of management as the dropping-out lists necessary for the commodity researcher.

OC4 demands to realize flexible architecture of the appendix with possibility of expansion in the future. Progress doesn't stand still, constantly there are new devices and technologies. Therefore the development of flexible architecture will allow to keep investments in the future when serious completions of system are required. Now for the development of new software products object-oriented programming languages which main properties such as encapsulation, polymorphism, inheritance are used most often. For saving information in long-term memory the DB operated by DBMS is used. Now relational DBMS are the most popular. Because of distinctions of existence of essential distinctions in

the organization and data processing in object-oriented programming languages and in relational control systems of data there is an object and relational discrepancy for which overcoming of consequences use methods (templates, patterns) object and relational display. Popular approaches of the solution of the described problem are in detail presented in works [11-12]. Thus, for compliance of OC4 to one of decisions development of the client application in the OO-programming language is and as storage of information to choose relational DBMS is used. The primary goal of object-oriented development is the assurance that the system will enjoy a longer life while having far smaller maintenance costs. Because most of the processes within the system are encapsulated, the behaviors may be reused and incorporated into new behaviors. Object-oriented system tend to model the

real world in a more complete fashion than do traditional methods. Objects are organized into classes of objects, and objects are associated with behaviors. The model is based on objects, rather than on data and processing.

Printing forms of the reporting is one of the integral elements of modern information system. Feature in our case that only the printer of checks (connected on USB or RS-232), using a paper 8 cm wide roll for printing is connected to a workplace of the user of IS. Therefore all created reports have to use this type of paper instead of the standard A4 format. The situation is complicated by the fact that besides the direct check (the account by request) it is necessary to print the report on cash change containing both detailed and summary information on all orders. The fact described above allowed to create requirements of OC5.

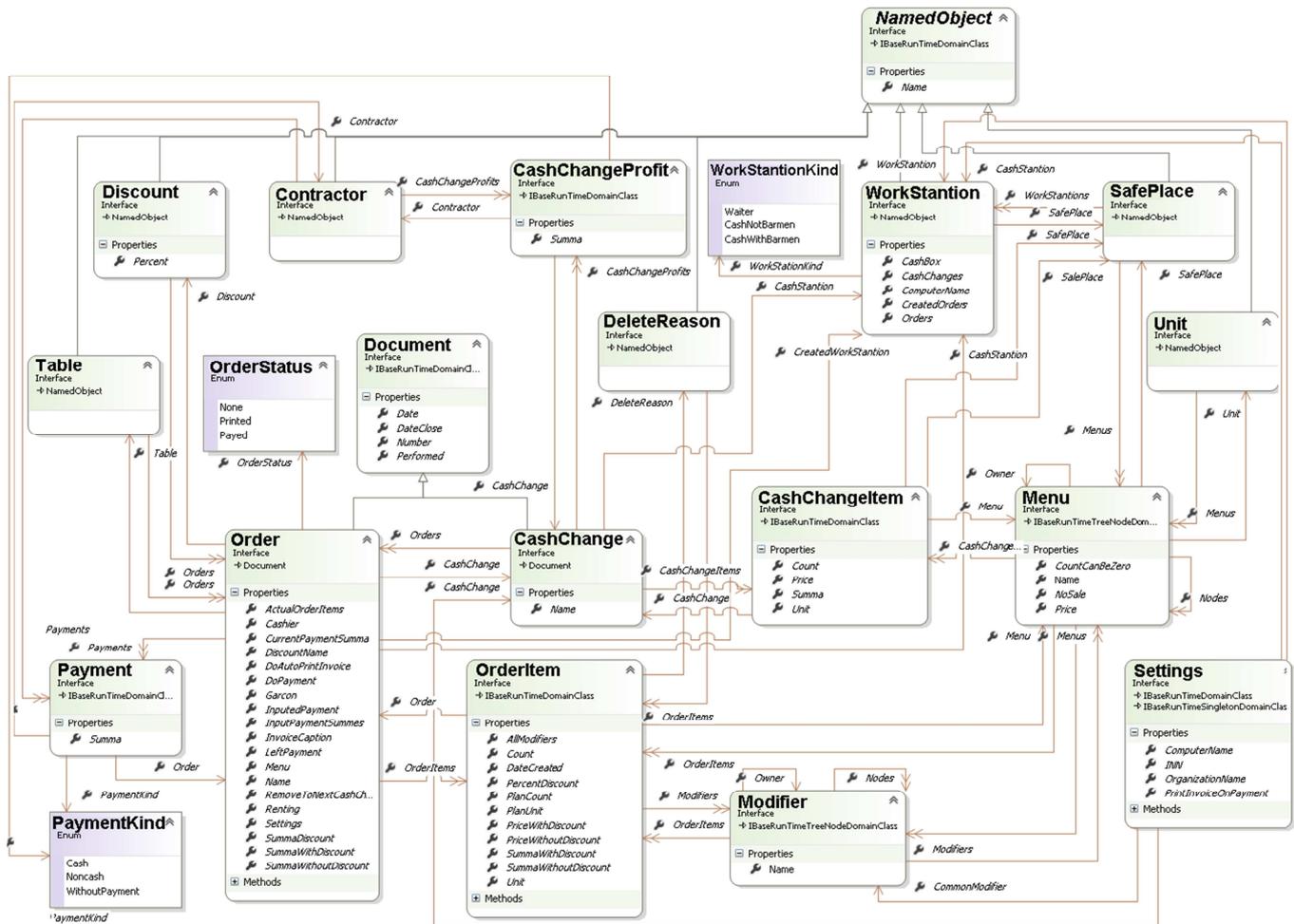


Fig 1. The UML chart of classes of information system for restaurants of a fast food.

4. Implementation of Information System for Restaurants of a Fast Food

We will pass to consideration of realization of the described system. Design of the modern information systems developed in the OO-programming language is carried out

with the help of creation of the chart of classes of the unified language of modeling of UML. The main goal is to become a common language for creating models of object oriented computer software. Benefits of UML can depend on many factors. In some situations it is likely to be more beneficial. I try to mention some of them. Likely to be more beneficial:

- Larger and completer is your subject, more benefit you can expect. Especially when they are relationship between different aspects

- If this SW maintenance means some extra development/extension, it could be very useful to use UML to clarify it. You can show existing system and the way it should be extended. You can of course always show the nerd.
- If your system is already modeled in UML, you can use it to locate the problem and plan further enhancements
- If both modeler and model reader know OO and have some experience in UML, they will almost always make it beneficial.
- If you want to generate some code further more
- If you need to support a system with no documentation, it could be useful to document it first (use reverse engineering to import the code and organize it in UML)
- If you plan to maintain this system for a long time and with lots of people

In figure 1 this chart is submitted. Key feature of the OO-paradigm is possibility of the organization of hierarchy of classes by means of inheritance. The considered subject domain contains a set of reference books, such as Tables, Discounts, Contractors, Workstations, Places of storage of products, Units of measure. All these contain only one Name attribute therefore it makes sense to allocate the basic abstract class NamedObject and to inherit all reference books from it (see fig. 1).

The reference book of goods is hierarchical structure, breaking goods on categories and subcategories. In the program it is realized in the form of a tree and presented by the class Menu, containing the Owner attribute for saving the link to the parental knot and the calculated Nodes attribute containing knots, affiliated from this knot.

At creation of the lines of the order containing a product the client can refuse any ingredient. For the accounting of this refusal in the program the hierarchical reference book Modifier is created.

Two types of documents are provided in system by a root abstract class for which the class Document acts. The first represents the order and it is described by the class Order. For the description of the ordered dishes the set of lines which copy is described by the class OrderItem is used. The second document is CashChange, i.e. cash change.

We will consider compliance to the developed hierarchy to the criteria of an optimality allocated earlier. OC1 demands to provide possibility of automation by means of uniform system as small cafe (or one restaurant), and the whole network of institutions. Apparently from fig. 1 there is no binding to the certain organization, i.e. it was succeeded to unify system, as it was required to make.

The requirement to develop graphic interface with support of touch screens is provided in OC2. This requirement since it is the basic for end users is at the moment realized.

By means of separate structure of groups of users of and users the operational multiuser account is realized by orders. We will note that the developed hierarchy orthogonally to this requirement to realize OC3 won't make special work.

In the appendix the classical two-level architecture "client server" where as DBMS Microsoft SQL Server 2012 is used

it is realized, and the client application is written on the .Net Framework platform. The first real database management program was IBM's Information Management Systems in 1968. Databases store large amounts of data. Companies use databases to store inventory, customer information, employee information, item and pricing information. Internet search engines use databases to find web pages. People use databases to store personal contact information, home inventory and even financial records. Database programs must quickly find and return this information. SQL (Structured Query Language) started in 1973 to facilitate access to databases. Based on the Sybase Program, Microsoft SQL Server 1.0 was released in May 1989. SQL Server 1.1, released in May 1990, was the first version to support Windows 3.0. The software offers several advantages to adopters.

Therefore, the system satisfies OC4 since it succeeded to realize flexible architecture of the appendix with possibility of expansion in the future.

Printing forms represent in essence selection of data during performance the multitable queries for RDBMS. After application of methods of object and relational display the set of relational tables which physically represent the classes presented in fig. 1 was received. Requirements of OC5 are as a result realized.

5. Conclusion

Further development of system is writing of various validation rules allowing to check reliability of information already at a data input stage. Since for realization of the described information system our own environment of development presented in work [12] is used, similar restrictions are presented in the form of a set of logical expressions which detailed description can become the material for the following article.

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