Automated analysis of disorders of work of drivers

Análisis automatizado de trastornos del trabajo de los conductores

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Abstract

A system was designed to detect possible violations of the operating rules of the enterprise without changing the behavior of the entire system as a whole, as well as to automatically start the assembly of the simulated behavior of a real application using unit and functional testing technologies. In the work, an analysis was made of the subject area of the work process of drivers, managers and operators. It was found that the time to find possible violations exceeds the permissible value. The audit department engaged in verification had problems with the quick unloading of potential violators. The department made unloading and manual search, which led to a longer identification of violations both from the side of drivers and managers. It is possible to solve this problem and increase the efficiency of the process by developing an automatic analysis system. An analysis of the management process was carried out. Based on the analysis, a model of system use cases was developed, from which user and functional requirements were defined and formed. A functional model of the system was introduced. The basic algorithms are described. Connections between system entities were revealed, analysis classes and detailed UML diagrams were compiled. Thus, when performing the work, all the features and nuances of the design of information systems were taken into account, then according to the presented models, you can develop an information system and implement it in various organizational structures.

Resumen

Se diseñó un sistema para detectar posibles violaciones de las reglas de operación de la empresa sin cambiar el comportamiento de todo el sistema en su conjunto, así como para iniciar automáticamente el ensamblaje del comportamiento simulado de una aplicación real mediante pruebas unitarias y funcionales. tecnologías. En el trabajo se realizó un análisis del área temática del proceso de trabajo de conductores, gerentes y operadores. Se encontró que el tiempo para encontrar posibles violaciones excede el valor permitido. El departamento de auditoría dedicado a la verificación tuvo problemas con la descarga rápida de posibles infractores. El departamento realizó la descarga y la búsqueda manual, lo que llevó a una identificación más prolongada de las infracciones tanto por parte de los conductores como de los gerentes. Es posible solucionar este problema y aumentar la eficiencia del proceso mediante el desarrollo de un sistema de análisis automático. Se realizó un análisis del proceso de gestión. A partir del análisis, se desarrolló un modelo de casos de uso del sistema, a partir del cual se definieron y formaron los requisitos funcionales y de usuario. Se introdujo un modelo funcional del sistema. Se describen los algoritmos básicos. Se revelaron las conexiones entre las entidades del sistema, se compilaron clases de análisis y diagramas UML detallados. Por lo tanto, al realizar el trabajo, se tuvieron en cuenta todas las características y matices del diseño de los sistemas de información, luego, de acuerdo con los modelos presentados, puede desarrollar un sistema de información e implementarlo en varias estructuras organizacionales.

Drivers, Automation, Network, Logistic, System

Conductores, Automatización, Red, Logístico, Sistema

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Introduction

The global problem of the Russian segment of the economy was the use of foreign products and means to solve their problems, but in view of the instability of price relations with our market, organizations are trying to reduce risks and increase the predictability of their segment (Valiev, et al., 2020; Díaz Iglesias, 2021). The most important thing for every organization is the reliability and flexibility of the tools used (Lenar, et al. 2019). During the review, problems were found in the field of data use and the difficulty of using third-party modules, as well as the difficulty of using and introducing new developments necessary for the tasks of the organization in question (Petrov, et al. 2019; Estupiñán Báez & Lozano, 2021).

A taxi service company provides services to drivers and passengers (Mustafina, et al. 2019). The main advantage of the company is a fully automated interaction of drivers and customer passengers. The company also provides cargo transportation services (Zubkov, Galiullin, 2019; Romero Sueiro, 2021). There is a hardware and software complex, thanks to which deep analytics and business process management using IT technologies are implemented.

The service serves a huge number of cities, so the number of orders produced daily amounts to hundreds of thousands. Which requires fully automated fault tolerant software.

Due to the large number of software implementations of business processes, the problem arose of the slow operation of part of the logic, and also part of the logic requires a review of the implementation of existing implementations in order to optimize and accelerate the overall operation of the system.

The most problematic place is the work of the department that deals with the identification of irregularities in the work of other company employees: drivers, operators, other managers related to the progress of the execution of orders.

Thus, the relevance of the work is due to the need of managers in an automated analysis system to detect violations of regulations.

Methods

The goal of any business is to make a profit. Business owners are interested in the fact that the company not only showed a positive balance of costs and revenues, but also showed annual revenue growth. Thus, any commercial organization is interested in scaling up its business.

The problem area of the company is the interaction with the database of company employees, primarily managers and developers (Kolesnikov, et al., 2016). Many business processes occur in manual mode, which greatly slows down employee productivity (Zubkov, 2016). There are many operations performed by managers, but in the implementation, there is only raw data and the search for what is needed for the manager is done directly on the raw data and finding problem places becomes very difficult and time-consuming process. And the search for problems must be done as soon as possible, and reflection requires an instant reaction. A manager can spend up to 4 hours searching for a problem driver.

The list of identified types of fraud committed by drivers is quite large and checking for each type of check becomes unacceptable both in time and in the quality of the search for problematic company employees (Ilyukhin, Zubkov, 2015; Estupiñán Báez & Lozano, 2021). Often, due to fatigue and a large amount of data, an employee overlooks problematic orders, and sometimes employees who did not commit unlawful actions, but were on the list of those, can be punished.

All this greatly affects the reputation of the company as a whole (Khafizov, et al. 2019; Romero Sueiro, 2021). Unacceptable quality can be critical and may cause the client or a bona fide employee to leave for another supplier.

To meet the aim of the current study, data storage was carried out in databases, which are of several types, suitable for our organization can be identified as follows:

-   A hierarchical data model, where the data representation is presented in the form of a tree structure.

- Relational Database Management System (RDBMS); An RDBMS is a DBMS designed specifically for relational databases. Therefore, RDBMSes are a subset of DBMSes. A relational database refers to a database that stores data in a structured format, using rows and columns. This makes it easy to locate and access specific values within the database.

- Object-oriented database: An object-oriented database (OODBMS) or object database management system (ODBMS) is a database that is based on object-oriented programming (OOP). The data is represented and stored in the form of objects. OODBMS are also called object databases or object-oriented database management systems.

- Functional database. A functional database brings together data from multiple disparate sources and ties the disparate data sets into coherent consumable models. It also brings data scattered over multiple spreadsheets under control.

The main reason for this was that after the transition to the new database management system, the difficulty of writing a test due to the lack of marking functions was used in the Microsoft system.

Results and Discussion

Since it is supposed to automate the company's processes, we highlight the main business processes. To compile the business process, the most informative BPMN notation was chosen.

The general outline of the order process is presented (Katasonov, et al. 2018). After the user logs in, he is given a choice of settings and order parameters, such as a seven-seater car, payment method, route, fare, gratuity and others. After that, a request is sent to the taximaxim service information system, where an order is created in the system based on the parameters passed.

A request for creating an order can be carried out in several ways:

1) Make a call to the taxi order service, where the necessary parameters will be collected by a specific operator.

2) Enter the application "maxim" enter all the necessary parameters manually.

Not all parameters are entered manually when creating a request; some parameters are collected in automatic mode, for example, the current position.

Based on the collected data, a record is made in the operational database, and information about the new order is transferred to the general order stack. Managers, drivers, and operators can view the general list of orders. All drivers who are subscribed to notifications in the zone of which the order is created receive an appropriate notification.

The driver appointment process takes place in two stages. After receiving a notification, drivers can pick up an order for execution. But after a certain time, no driver can take it, then the system begins to select the contractor itself. The wait timer for the start of an auto destination can be different. The main factor in this problem is the congestion of zones. And before choosing a driver, the system makes sure that there can potentially be a free driver.

The auto-assignment process can be repeated several times. Auto designated contractor may refuse to complete the order. The driver who refused to fulfill the order will not be re-assigned, but at the same time, it remains possible for him to take this order for execution from the general list of orders. The driver, even after taking the order, can refuse it, while indicating the reason for the refusal. For example, a flat tire or other failure occurred.

Due to the fact that most violations occur during the execution of the order, it is necessary to select it in a separate diagram. After the driver is appointed and the contractor is ready to start work, the system draws up a route in the application for the driver, by which he can get to the customer's place. The driver can get to the place not on the specified route, but at the same time his traffic map will still be recorded in the database.

Upon reaching the arrival point, the driver sets the status of his arrival, on the basis of which a notification is automatically sent to the user, after which the waiting time begins. After this, the passenger lands, at the end of which the driver becomes the contractor.

Next, a route is constructed in the internal system by which the driver must deliver the passenger. The route is advisory in nature, and following a different route is not prohibited, but deviations from the route should have a reason, for example, roads are being repaired along the constructed route, and not the driver needs to call in some institution along the way. The entire driver's path is saved so that you can map a route along it.

At the end of the route, the driver notes that the order has been completed, and if the end point of the route corresponds to the desired point, then payment is calculated between the customer and the contractor.

In parallel with this, documents are being prepared for placing an order. After a complete settlement has been made between the driver and the company, as well as between the driver and the customer and other participants, all data is structured and stored in the taximaxim information system.

At the end of the main processes, verifiers are included in the work. On a special platform, special employees check for suspicious orders. Now there are checks on which violators of the regulations are found. But there are still intruders in the company, and they are searched by selecting all orders. After unloading the list of orders, a search is made for the criteria by which the violation can take place, and if a suspicious order is found, it is sent to the general audit with an indication of the type by which it fits the violation. Next is an investigation into the violation. The actions and reasons of the participants are clarified. At the end of the investigation, the inspector establishes a violation on the order and enters the reason, later a memo is written with a description of the violation. The decision on the following actions is transferred to the responsible manager, and he already decides what actions to take, either re-conduct the investigation, or draw up a reprimand act, or enforce the punishment provided for by the type of violation, or completely refuse further cooperation with the violator.

Summary

In the analysis of requirements for the development of an information system for a taxi company, the general structure of the company was considered. The main business processes in the company were reviewed and compiled.

It was found a lot of labor during the preparation and conduct of inspections. An employee of the inspection department, when allocating problematic operations, spent a large amount of time compiling a list of potentially problematic employees. The main problem of this turned out to be a huge amount of the total number of orders, and orientation was only on complaints from customers.

Thus, were compiled:

- Business requirements for the system.

- User requirements based on use case diagrams.

- Functional system requirements.

- Precedent specifications.

This data allows you to make a complete solution and is sufficient for the design of an information system.

Conclusions

Overall, the chief purpose of the study was to investigate the automated analysis of disorders of work of drivers. To that end, an analysis of the management process was performed. Given the analysis, a model of system use cases was developed, from which user and functional requirements were defined and formed. Initially, after the contractor performs an operation on his order, the system prepares a series of documents, according to which a series of operations for the distribution of funds between its participants are prepared: directly by the contractor, the employer organization and the main organization. After all the documents are prepared, the system checks the possibility of conducting cash transactions. Since payment provides for cash and non-cash payments, the system does not always have the ability to carry out cash allocation operations, and therefore the system has difficulties in this regard. Therefore, if there was a payment transaction by bank transfer, the system performs all operations with personal accounts of participants. At the end of the main actions in the system, the processing of the received data for the determination of suspicious orders begins. All suspicious orders go into the status of "suspicious" and on their basis a general list is compiled indicating the type of check. For each type of check, certain groups of people are assigned, who are signed up for notifications of new suspicious orders.

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Acknowledgements

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