

analysis. Based on experimental research, it was found that transformer models provide the highest accuracy for analyzing the tone of responses, significantly surpassing classical methods, such as. It was found that the effectiveness of all models significantly depends on the specificity of the domain and the quality of data preprocessing. Domain adaptation and additional training on specific data corpora significantly increase the accuracy of analysis, especially for specialized industries with their own terminology.

The cost-effectiveness of implementing automated feedback analysis systems is confirmed by a significant reduction in the time and human resources required to process feedback, as well as by improving the quality of the insights obtained, which allows companies to make more informed decisions regarding the development of products and services. The practical significance of the results obtained lies in the possibility of using them to create effective automated user feedback analysis systems that can be integrated into the business processes of companies of various scales and industries. Such systems allow not only to reduce the costs of feedback analysis, but also to obtain deeper and more objective insights into the perception of products and services by users, to identify hidden trends and patterns, and to respond promptly to critical problems.

Thus, the conducted research makes a significant contribution to the development of methods for automating user feedback analysis based on natural language processing and creates a basis for further improvement of such systems.

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CONCEPT OF CONSTRUCTION OF AN INFORMATION AND MEASUREMENT SYSTEM BASED ON VIRTUAL COMPUTER SIMULATORS

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An analysis of traditional methods and measuring instruments and proposals for an alternative solution to the problem were made. It was noted that in addition to their intended use, i.e. as virtual measuring instruments, the use of virtual devices for building virtual simulators based on them is quite promising, which will ensure increased visibility and quality of training, which, in turn, creates the prerequisites for including them in existing ones or creating new virtual devices based on them. The study involves highlighting virtual devices as basic for building virtual simulators based on them, which ensure increased efficiency and visibility of the educational process and create the prerequisites for creating and improving distance learning systems.

Statement of the problem.

The gradual development of computer technology, computerization of all sectors of the economy suggests the use of such a powerful technological potential as computerization in improving the measurement process in information and measuring systems.

The search for a solution led to the need to create computer simulators based on virtual devices, analogues of which already exist and demonstrate huge advantages over the so-called traditional devices, which provides an incentive and opportunity to create, based on the virtualization of the measurement

process, virtual computer simulators designed to increase the visibility and efficiency of the educational process.

The relevance of this direction lies in the fact that:

- firstly, with the help of virtual computer simulators, it is possible to acquire practical skills in working with the most modern means of computing, which, due to limited technical or economic capabilities, are not yet used in the educational process;
- secondly, virtual computer simulators can be used by students during their independent preparation for classes, because they are quite easy to operate, do not require special knowledge in the field of programming, are not critical to the hardware and software of a personal computer, and contain tips and comments that practically guide the operator's actions;
- thirdly, it is advisable to create virtual computer simulators, first of all, for the most modern devices that are not yet part of the laboratory and technical base of the institution, at the preliminary stage of preparation for work on standard equipment, during independent preparation for classes, during correspondence training, etc. inappropriate;
- fourthly, a virtual computer simulator can be provided with additional functions that are not inherent in a real device, for example, to display the physical processes that occur inside the device during a measurement experiment, verification, provide reference information, process and store measurement and diagnostic results, and conduct testing and control;
- fifthly, the virtual computer simulators under consideration have an appearance that fully corresponds to the appearance of real devices; for this purpose, non-standard ActiveX elements were created, which is also not unimportant from the point of view of the effectiveness of the learning process.

A distinctive advantage of virtual computer simulators is, first of all, the versatility of such devices and, no less importantly, the practically unlimited potential for expanding functionality, without changing the hardware, but only by improving the software [1; 3].

Thus, it is possible to formulate the goals of the research conducted, namely, increasing the efficiency of the educational process through the development and implementation of virtual computer simulators based on the created virtual devices.

Presentation of the main material.

For solving measurement problems and conducting a measurement experiment, the quality of visualization is not critical, but if we are talking about a virtual simulator involved in the educational process, the issue of visualization, that is, how much the appearance of the simulator corresponds to the appearance of a traditional device, becomes of paramount importance.

Thus, the issue related to the visualization of the measurement process, i.e. the development of a virtual simulator, the appearance and functionality of which could be adjusted both during development and in the process of operation, becomes relevant.

Thus, a virtual measuring complex was developed in the form of a software package under the general name "Virtual Measuring Laboratory", which included several computer simulators.

The developed computer simulators can be used in the educational process both separately and as part of a general practical cycle.

The methodology for conducting a measurement experiment using a particular virtual simulator is practically the same as the existing methodologies inherent in the corresponding traditional measuring devices, and therefore is not considered in this article.

The developed software product has a modular structure and contains a control unit or software shell common to all virtual simulators that are part of the virtual measuring laboratory and allows the user to familiarize themselves with the structure of the virtual workshop, have direct access to the main sections of reference information. works, as well as save the results of the work, print a report on the results of the research, etc.

Conclusions.

An important feature of the developed software product is that its operation can be implemented in prompt mode, when the program actually controls the operator's actions, provides comments and prompts, and is also blocked when the operator performs actions that can cause a critical error.

The possibility of expanding the functionality of computer simulators, primarily those not inherent in traditional devices, is practically unlimited.

Therefore, depending on the purpose of each specific virtual simulator, some modules of the software product contain interactive spreadsheets, time charts, and graphs that reflect the physical processes occurring in the device during a measurement experiment, which helps to increase the efficiency of the learning process.

As for the field of application of virtual computer simulators, in our opinion, it is first of all advisable to create them for modeling the most modern devices that are not yet part of the laboratory and technical base of the institution or the acquisition of which is difficult in terms of their cost, as well as at the preliminary stage of preparation for carrying out work on standard equipment, that is, in cases where access to standard measuring equipment is limited or impractical.

The developed software package is a complete and self-sufficient software product, which includes an installation module adapted for most software platforms.

This software product is fully adapted for use on the Internet or local computer networks.

Another important feature of the software product is that it is the basis for building virtual measuring devices and computer simulators of other types and types.

But it should be noted that the introduction of computer simulators into the learning process does not imply a certain replacement of standard traditional devices with their computer models, but on the contrary, it only complements and expands the capabilities of both teachers and students.

The issue related to the development of a concept and methodology for the joint use in the educational process of both standard traditional devices and their computer models-simulators still requires serious consideration and, unfortunately, is not the purpose of this publication.

In terms of further development of the software package, it should be noted that the possibilities of replenishing the fleet of virtual instruments are practically unlimited, so it would be interesting to build, for example, virtual analog instruments, spectrum analyzers, etc.

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