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IMPLEMENTATION OF THE VORONYI DIAGRAM METHOD

The existing areas of application of the Voronoi diagram were considered, it was determined that these diagrams are used in quite a few fields, such as cartography, architecture, biochemistry, etc. The task of implementing this method was formed. Based on the results of the study of the subject environment, a list of tasks that were solved to achieve the goal was determined. A detailed analysis of the subject area was carried out, during which the requirements for input and output data were formed and described. Based on the analysis, an object-oriented model is built. On the basis of the data obtained in the process of analysis, the corresponding mathematical methods for constructing Voronoi diagrams have been formulated. Based on the results of object-oriented design, the tools for the software implementation of the automated system were chosen. Hardware and software requirements are formulated. A user manual for a software product has been developed, which was developed within the framework of the conducted research.

The development of modern technologies leads to more and more automation of processes performed by humans in various spheres of life, in particular such as education, medicine, industry, agriculture, etc. These tasks either cannot be solved by simple methods, or their solution will require a significant amount of time and resources. To solve this kind of problem, there are special methods and algorithms.

The Voronoi diagram is an important tool in solving so many problems. In general, a Voronoi diagram is a plane partition in which each region of the partition forms a set of points that are closer to one of the elements of the set than to any other element of the set.

Sampling an area using Voronoi cells provides a quick search for natural neighbors for a given point. Finding natural neighbors based on information about neighboring nodes derived from the Voronoi diagram significantly reduces the time it takes to construct interpolated functions.

Voronoi diagrams allow you to visualize complex data, making it easier to understand and analyze. Voronoi diagrams can be used to identify implicit structures and patterns in data, which is essential for making informed decisions. Voronoi diagrams are used to solve optimization problems, for example, to determine the optimal location of objects in space.

Voronoi diagrams: help determine the optimal location of stores to minimize competition and maximize profits; are used to plan the location of public facilities such as schools, hospitals, etc.; help determine the optimal location of base stations to

ensure maximum coverage when solving the issue of optimizing wireless networks. Versatility, intuitive visualization, and the ability to detect hidden patterns make Voronoi diagrams an indispensable tool for analyzing data and making informed decisions. Based on the above, the purpose of the study was formulated, namely, the software implementation of the system for searching for the nearest elements by the method of constructing a Voronov diagram.

At present, there is a wide variety of algorithms specifically for solving problems of computational geometry. However, the scope of such algorithms is usually very narrow. For example, the well-known algorithms for constructing a Voronoi diagram can be effectively applied only to points or segments. But when solving practical problems, you usually have to deal with more complex geometric objects, which can be defined as points and segments, as well as curves of arbitrary shape. Building a Voronoi diagram for such geometric objects is a non-trivial task, and therefore the study of Voronoi diagrams is reduced to the study of their approximations [1].

A Voronoi diagram is a mathematical object that is not described strictly in this way. A Voronoi diagram of a given finite set of points M of a plane (space) is a partition in which each region (Voronoi cell) of a given partition forms such a set of points that is located closer to one of the elements of the set M than to any other element of this set [2]. The purpose of the software implementation of the Voronoi diagram method is to provide a quick search for natural neighbors for a given point. The search for natural neighbors derived from the Voronoi diagram greatly reduces the time it takes to construct functions.

To achieve the goal, the following was performed: analysis of the subject area; select the main input and output objects; analyze the limitations of the system; choose the necessary algorithm; specify external storage; display the designation on the sheet.

During the research, the existing areas of application of the Voronoi diagram were considered and it was found that today these diagrams are used in many fields, such as cartography, biochemistry and architecture. The method of constructing the Voronoi diagram is used in many fields, so the task of implementing this method has been formed. The purpose and objectives of the diploma project are formulated, the object and subject of research are determined. Based on the results of the study of the subject environment, a list of tasks that were solved to achieve the goal was determined. A detailed analysis of the subject area was carried out, during which the requirements for input and output data were formed and described. Based on the analysis, an object-oriented model is built. On the basis of the data obtained in the process of analysis, the corresponding mathematical methods for constructing Voronoi diagrams have been formulated.

To implement the methods of system classes, the following algorithms were built: an algorithm for calculating the area; algorithm for independent location of points; algorithm for uploading data to a file; Algorithm for editing points. Based on the results of object-oriented design, the tools for the software implementation of the automated system were chosen. As a programming language in the Visual Studio Code development environment, a formalized programming language, namely, C#,

was chosen. On the basis of the object-oriented model, a software product was created, which is implemented in accordance with the principles of object-oriented programming and consists of ten classes.

Hardware and software requirements are formulated. A user manual has been developed for a software product that has been developed within the framework of these studies. The instructions describe the user's capabilities when working with the software product, reveal the purpose of windows and commands, and also provide forms corresponding to the screen.

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РОЗРОБЛЕННЯ ПРОГРАМНОГО ЗАБЕЗПЕЧЕННЯ ІНФОРМАЦІЙНО-ВИМІРЮВАЛЬНОЇ СИСТЕМИ НА БАЗІ ВІРТУАЛЬНИХ КОМП'ЮТЕРНИХ ТРЕНАЖЕРІВ

Проведене дослідження ґрунтується на аналізі традиційних методів і засобів вимірювання та пропозиції віртуалізації процесу вимірювання як альтернативного вирішення проблеми. Зазначено, що крім використання за прямим призначенням, тобто як віртуальних вимірювальних приладів, досить перспективним є використання віртуальних пристроїв для побудови на їх базі віртуальних тренажерів, які забезпечують підвищення наочності та якості навчання, насамперед у так званих інструментальних навчальних дисциплінах, що, у свою чергу, створює передумови для включення їх у існуючі або створення на їх основі нових систем дистанційного навчання. Дане дослідження передбачає визначення віртуальних пристроїв як базових для побудови віртуальних тренажерів на їх основі, які забезпечують підвищення ефективності та наочності освітнього процесу та створюють передумови для створення та вдосконалення систем дистанційного навчання.

Сучасний прогресивний розвиток комп'ютерної техніки, комп'ютеризація всіх галузей економіки наводить на думку про використання такого досить потужного технологічного потенціалу, як комп'ютеризація, в удосконаленні процесу вимірювання в вимірювальних системах. Пошук рішення привів до необхідності створення комп'ютерних тренажерів на базі віртуальних пристроїв, аналоги яких вже існують і демонструють величезні переваги перед так званими традиційними пристроями, що дає стимул і можливість створення віртуальних комп'ютерних тренажерів на основі віртуалізації процесу вимірювання зразків, покликаних підвищити наочність і ефективність навчального процесу і створити передумови для значного розширення функціональних можливості систем дистанційного навчання. Саме актуальність даного напрямку полягає в тому, що: по-перше, за допомогою віртуальних комп'ютерних тренажерів можна забезпечити набуття практичних навичок роботи з найсучаснішою комп'ютерною технікою, яка в силу обмеженості технічних або економічних