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Computer program in sign language for controlling mobile objects and communicating with people

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ABSTRACT

This article emphasizes the need for effective communication methods for people with disabilities, focusing on gestures and finger movements. The study aims to address the communication support gap for this group by creating a specialized Kazakh IT dictionary. It explores practical ways to facilitate communication for people with disabilities through gestures, utilizing computer software for the IT dictionary. The article presents key variables, study design, and data analysis procedures. Results show computer programs effectively enable communication for individuals with disabilities. The study's novelty lies in the IT vocabulary covering gestures, benefiting pedagogy, education, and related fields. Computational linguistics, like automatic language processing and machine translation, enhances communication facilitation for the disabled. Practical recommendations are offered for implementing research findings, improving communication and overall quality of life for people with disabilities. In conclusion, the article stresses the importance of effective communication methods, especially gestures, for the disabled. The IT vocabulary creation through computational linguistics offers innovative ways to enhance communication accessibility, prompting further research.

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1. INTRODUCTION

A new direction of the 20th century was the establishment of gestural and finger movement communicative activities for people with disabilities. And in the 21st century, due to the rapid development of computer technology, many types of communication with people with speech disorders have been established. In developed countries, there are different ways to connect people with disabilities to society. Among them, improved implementation methods using computer technology. Works only in languages of developed countries. Therefore, it is important to create a dictionary of signs in the Kazakh language for people with disabilities using IT terms. The creation of a gesture dictionary that implements complex specialized communication, starting with simple communication in everyday life, is carried out with the help of computer programs. Intelligent technologies used in computational linguistics include automatic natural language processing, computer lexicography, and machine translation [1], [2].

The first clustering method used in this article is to automatically split the resulting nouns into clusters based on their compatibility. The resulting clusters are manually analyzed to see how semantically related the nouns are to each other. One of the main advantages of using neural networks is the ability to quickly and objectively get the position of each region in the overall ranking. The use of neural networks of generalized clusters according to the parameters of nouns makes it possible to reveal hidden patterns of development in related languages. Depending on the parameters of human life, a classification can be proposed. Its purpose is to be useful to people at work without having to read a lot of information. Thus, neural networks for nouns are a means of monitoring the processes of clustering nouns. Today, the topic is very relevant, because the 21st century is a period of rapid development of technology, without dependence on English and Russian languages, and the transition to digitalization all over the world. In the future, working only through the Kazakh language will be a bright reflection for us and the next generation.

Currently, virtual assistants are very widespread in the world and there are many types of them. The topic under study is to some extent relevant for the country of Kazakhstan, because people with disabilities in the country have to communicate with society. Using a computer sign dictionary in Kazakh will greatly help their development and learning. He does and can do many things. The development of a virtual assistant program for people with disabilities is one of the hot topics in our society [3], [4]. Therefore, in this article, a virtual assistant and applications are added to a computer program with a gesture dictionary. This could be very important news as it is intended for people with hearing impairments and includes resources on the dactyl alphabet and sign languages. To date, creating a database of video files of sign language and dactyl alphabet and providing online access are the most relevant and important tasks. Until now, there were no such resources on the Kazakh language on the Internet, so the features and main problems and solutions are given. Also, an important task is to familiarize users of the resources of the dactyl alphabet and sign language with the sign and dactyl languages of the world, including the international dactyl alphabet and international languages. This feature significantly expands the horizons of hearing-impaired people, their isolation.

The relevance of the work depends on: i) Lack of sign language interpreters, ii) The need for automatic sign language translation, iii) Online speeches to help the hearing impaired. The development of intellectual technologies in the Kazakh sign language has not been given attention, so it is considered relevant. The relevance of the development stems from the need to create conditions for learning the little-studied language of the deaf, that is, hard of hearing people. In our country, there is a lack of resources for the education and rehabilitation of the hearing impaired. Modern technologies and the internet provide new opportunities that are very suitable for expanding the knowledge and thinking of deaf people. The project is designed to help anyone who wants to access Kazakh sign language and Kazakh IT terminology resources online for the hearing impaired. Although the system created under this project does not replace sign language interpreters in their work, it can independently help in establishing contacts with the population and obtaining services. The project meets modern requirements, is functionally relevant and socially significant [5], [6].

The aim of the study is education of people with disabilities who cannot communicate with the environment and the public environment, just like healthy people. One way to compensate for these shortcomings is to establish a small, if not complete, connection with the external environment using modern computer technology. Many researchers are developing sign language recognition systems using a small vocabulary and self-created database. In some countries developing sign language recognition systems, there are still no large databases for sign language recognition systems. At the same time, it is necessary to develop and make it available in the field of aviation and rocket and space technology. In the framework of this work, the form of research is the educational process of students with disabilities at school. The scope of application can be noted that people with disabilities can contact the development center. They are in a child development center or with speech therapists at school and kindergarten. Currently, it is used in schools by students who are lagging behind in the development of spoken language.

In this work, it was determined that in computer linguistics the subject of linguistic perception is the computer. Sign language alphabets are highly developed in developed countries: Russian, English, French and Chinese and Japanese. We will add the alphabets of these languages below as additional helpers to our computer program, and add them to the menu base on the image and image. Similar letters of gesture alphabets in three languages (English, Russian, Kazakh) were written in the library of a computer program. Latin in the Kazakh language, when using Kazakh words, the English ymdau alphabet was used. The way of using the words Ymdau is considered, alternating them with images and symbols in the symbol of ymdau. Healthy people can translate different languages into a computer program with the help of modern technologies in computational linguistics. There are a lot of them, namely online translators. It is very easy for healthy people to get translations in many languages and for people with disabilities, this is a difficult process. This is due to the fact that we use mimic images of gestures depending on the meaning of words in the Kazakh language. For example: “Yes”, “No”, “thank you”, “sorry”, “salem”, “love”, “bless you”, “please”, “thank you”, “family”, “home”, “love” - Increasingly used words. He continues to use images in

these facial expressions in English, Russian, French, Chinese and does not require translation, can use images and symbols with common video images. Figure 1 shows the types and applications of hand guidance graphs.

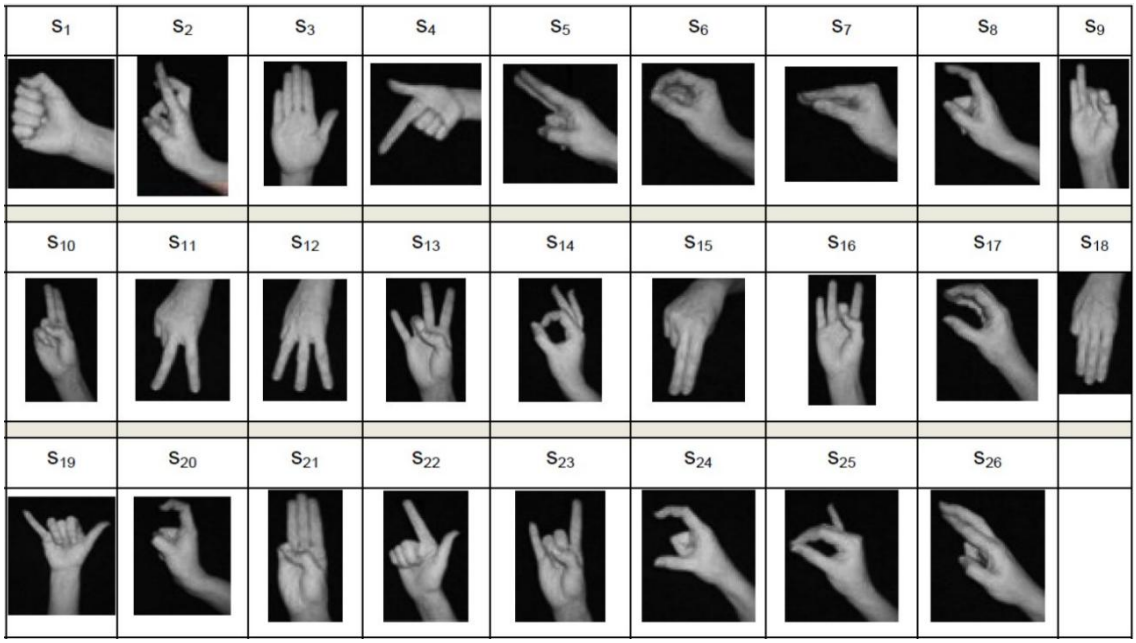

Figure 1. Configuration shows the types and applications of hand guidance graphs

A paper is presented that examines similar signs of the sign alphabet in three languages (English, Russian, Kazakh), recorded in a computer program library. In the Kazakh language, the English alphabet ymdau was used for the Latin alphabet when using Kazakh words. A method is proposed for using ymdau words, alternating them with images and symbols in the ymdau symbol.

2. METHOD

The process of developing a computer program to create a dictionary of IT terms in the Kazakh language includes the use of specialized equipment and software components. Here is a detailed list of required elements:

- Camera device: Used to capture visuals and images associated with terms in the dictionary.
- Computer: required for data processing, as well as for creating and maintaining a computer model of the dictionary.
- Programming languages: Python is used to develop algorithms and process data, and C# is used to create applications and interact with a computer model.
- Programming environment (Visual Studio): provides a convenient and efficient platform for creating, debugging and managing a project, including a computer model of the dictionary.

Each of these components plays a key role in the development and operation of a computer model of a dictionary of IT terms in the Kazakh language. We use the camera to take videos and photographs. The video demonstrates hand direction graphs and facial expressions. We process information from video cameras in a software environment on a personal computer. To implement the creation of a Kazakh language dictionary in a computer program, a complex algorithm will be developed. The process includes initializing parameters, collecting input data about Kazakh terms, checking the accuracy of the data, applying natural language processing for understanding, choosing an appropriate storage structure, extracting terms, assigning values, organizing terms, creating user interfaces for interaction, generating final output, conducting thorough testing, optimization for performance, documentation of the algorithm, and implementation of the program for practical use as shown in Figure 2.

The development of a computer program to create a dictionary of IT terms in the Kazakh language involves a systematic approach. Initially, a comprehensive database is defined, incorporating alphabets and images tailored for individuals with limited knowledge, complemented by a thorough literature review.

Subsequently, the exploration of the stages of emergence and development of computational linguistics as a novel facet of applied linguistics takes place. The third step entails determining the intended form and target levels for utilizing the Ymdau dictionary.

The intellectual processing phase encompasses the utilization of fundamental elements in computational linguistics. This involves the creation of routing graphs and the implementation of computer recognition mechanisms. The efficiency of the program is further optimized through the application of the grouping and comparison method of a convolutional neural network. Additionally, a fund for a dictionary of gestures in the Kazakh language is established to broaden the expressive capabilities.

The next steps involve the insertion of mimic images and symbolic elements into the database, followed by the development and validation of a computer program, leading to the implementation of the achieved results. The overall implementation is facilitated by an intelligent system, with the perceptron element serving as a cornerstone within our intellectual system, as depicted in Figure 3.

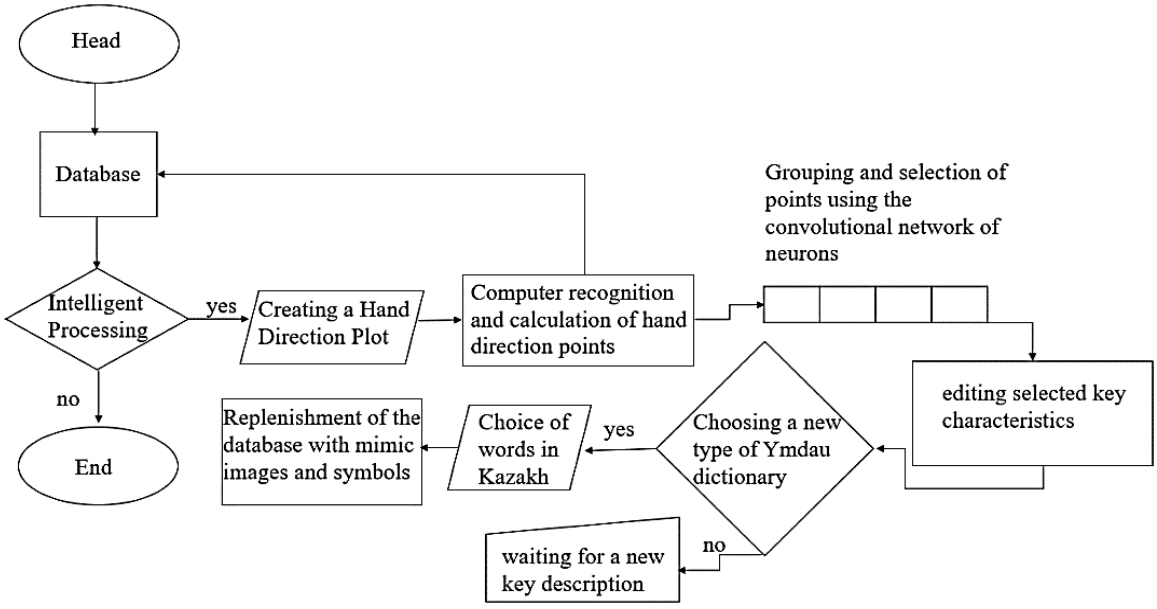

Figure 2. Creation of a vocabulary in the Kazakh language in a computer program in the implementation of the algorithm method of mimic language and sign languages

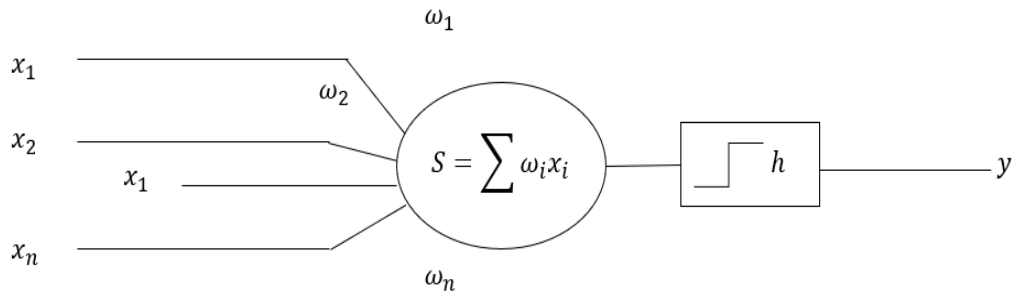

Figure 3. Basic element in the perceptron neural network

An artificial neural network (ins) (eng. Artificial neural network (ANN)) is a set of interacting artificial neurons. In Figure 3, comparing the set of input data, the result of their input set is obtained. Let us build a model of a computer program using the methods of implementing a set of databases when creating the Ymdau dictionary.

In the perceptron element in the neural network, xn is the signal at the first input of the neuron (synapse): wn is the weight at the first input of the neuron (synapse); y–neuron output; h-threshold of neuron functioning. In the model, the sum of the signals at the input of the neuron is compared with the threshold

value h, and if it exceeds this value, a signal is generated at the output. In modern models of neurons, the threshold function is replaced by a nonlinear function Y=f(S), called the transfer function in the case or the activation function of the neuron [3], [7], [8].

A neural network with a certain number of inputs and outputs was created from neurons connected in a certain way. Usually there are three types of nodes (neurons): input (input layer of neurons or Input Layer), output (output layer or Output Layer) and hidden layers (Hidden Layers). The neural network feedforward is represented by the image. The operation of a neural network consists of two stages: training the network in the "correct" or adequate response to input information (input vector) and using the trained network to recognize input vectors. The last step is often referred to as testing. In other words, the network is trained to recognize input vectors, that is, to produce output vectors that match a recognized class of input vectors. At this point, knowledge about the correspondence of input vectors to output vectors is stored within the limits of the weight of synapses and thresholds of neurons.

Implementing a neural network is a difficult task to recognize and search. Therefore, we use methods to determine the set of points. This saves time in finding difficulties and discovering information through methods. To do this, we can create a hand routing graph in a neural network as seen in Figure 4.

In a computer program, the neural network does not look at the image of the hand through the program. It defines the hand by points located along the guide bones. Hand guidance is carried out and is determined by the number of points on the graph. This helps create a convolutional neural network as presented in Figure 5.

Figure 4. We create a graph of pointing hands in a neural network

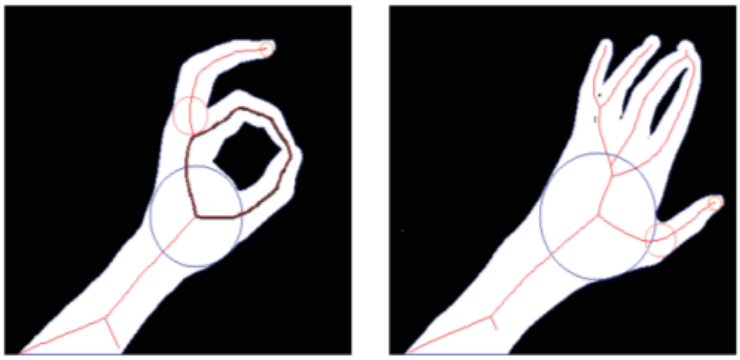

Figure 5. Recognition of the hand graph on the computer through the pointing point

Convolutional neural networks provide partial resistance to changes in scale, grouping of similar elements, rotations, angle changes, and other distortions. Convolutional Neural Networks combine three architectural ideas to ensure that scale, rotation, translation, and spatial distortion are invariant: i) local receptor fields (provide local two-dimensional communication of neurons); ii) general synaptic coefficients (ensure the detection of some features anywhere in the image and reduce the total number of weight coefficients); iii) hierarchical organization with spatial subgroups.

3. RESULTS AND DISCUSSION

This system operates with three main user roles: administrator, user and animator. The administrator is responsible for managing the program and making changes by entering various information. Users, on the other hand, can interact with the animator using sign language, select words by touch, and access lessons. The system is aimed at different categories of users:

- Administrator or System Administrator: Has the authority to make extensive changes to the system.
- User: has full access rights, including search and copy functions.
- Robot: observes and reproduces all user actions.

Candidates to use the system must meet certain criteria:

- The system should not freeze even with a load of up to 1,000 users.
- The data search should complete within 1-3 seconds.
- Searching for news should take no more than 0.5-1 seconds.
- Data exchange time is unlimited.
- Measures to ensure data security are of fundamental importance.
- Adding images and videos should be done within 1-4 seconds [9]–[11].

The block diagram of the software project is shown in Figure 6. The program was created in C# and the MySqlWorkbench database. The picture shows the main page of this program based on sign language techniques as shown Figure 7. The program can perform the following actions [10]–[16]. The program can be used as a user and as an administrator. The following images (Figures 8 and 9) show the user interface as an administrator. There is an additional list of users, a dictionary, and lesson buttons as shown in Figure 10. For general understanding, the words of the Kazakh language are translated into English in this article.

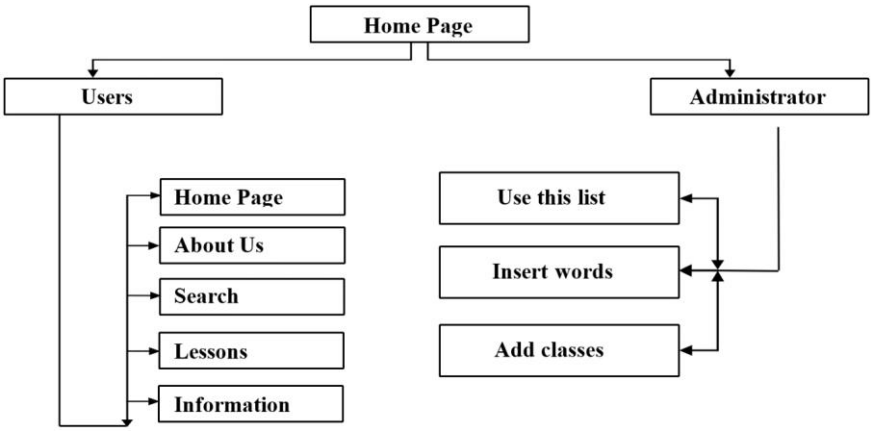

Figure 6. Software project structure

Figure 7. User login

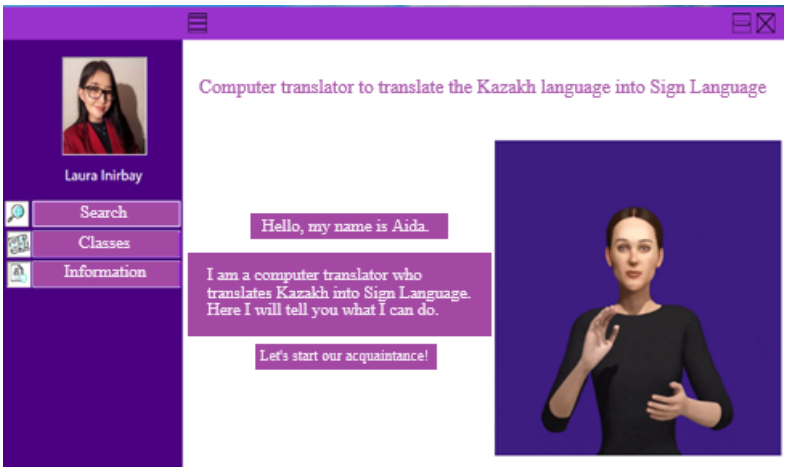

Figure 8. User interface

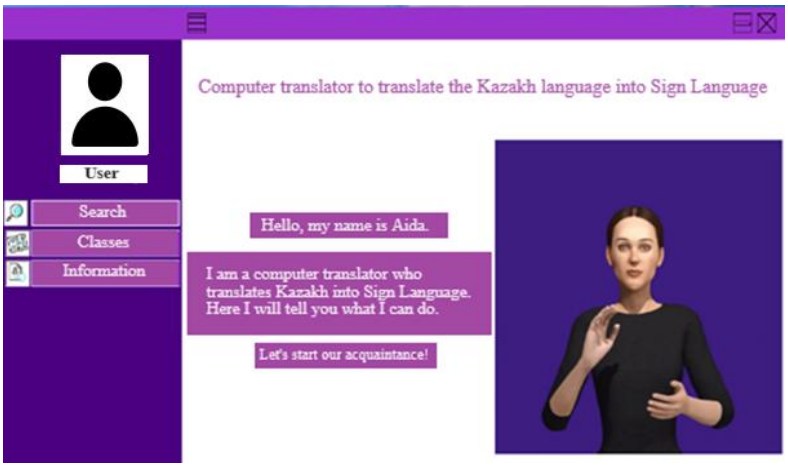

Figure 9. Administrator program interface

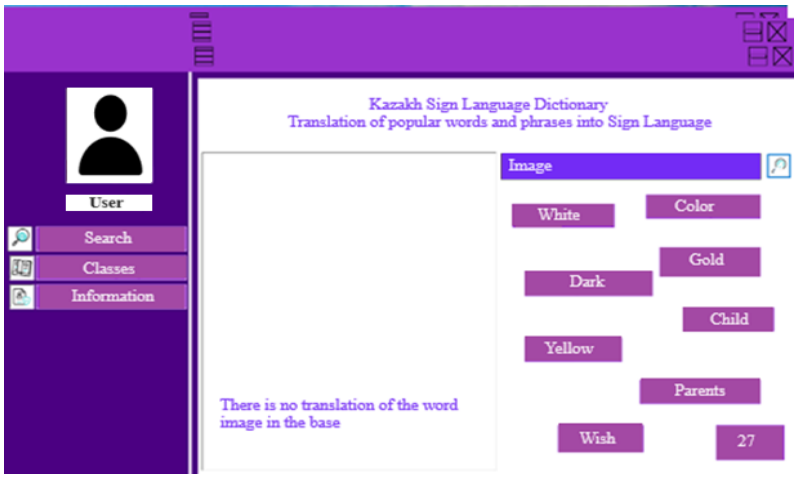

Figure 10. Data entry panel

The data entry panel provides the ability for the administrator to enter and edit dictionary entries and lessons, which is a key element to ensure the relevance and completeness of the material. This ensures the

system's flexibility in response to changing user needs and contributes to its adaptability in a dynamic educational environment. In addition, direct access to content editing increases the efficiency of system resource management, which is important for maintaining a high-quality learning process. The next page displays the translation of the dictionaries created here in the form of a gif file as shown in Figures 11 and 12. On the page with a list of users, a security rule is saved, that is, the password is automatically encrypted, no one can find it out as shown in Figure 13.

User information, including password encryption, highlights the importance of data security in the system. This is especially critical in the context of educational technology, where protecting personal information is a priority. Automating the encryption process not only improves security, but also improves user experience by minimizing the risk of unauthorized access to sensitive information. Such measures increase user confidence in the system, which contributes to its more active and effective use.

About the availability of information through entering IT terms. The functionality that allows users to enter IT terms in Kazakh to receive explanations and images not only simplifies access to technical information, but also makes a significant contribution to the integration of the Kazakh language into the global information space. This helps to expand technical literacy among the Kazakh-speaking population and strengthens the position of the national language in the modern digital world. Such innovations not only provide a deeper understanding of technological terms, but also promote multilingualism in the technical field. On the next interface, users enter any IT term in Kazakh and display its explanation and photo on the screen as presented in Figure 14.

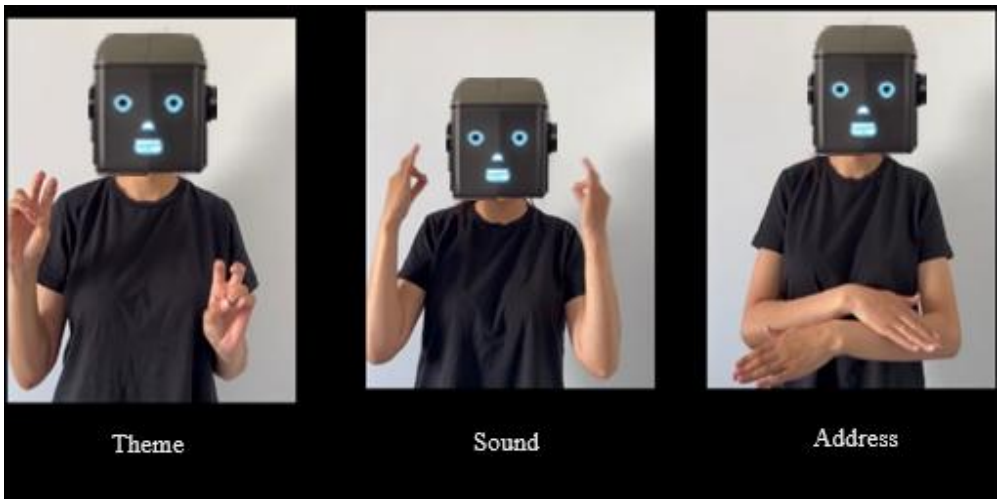

Figure 11. Representation of words in sign language

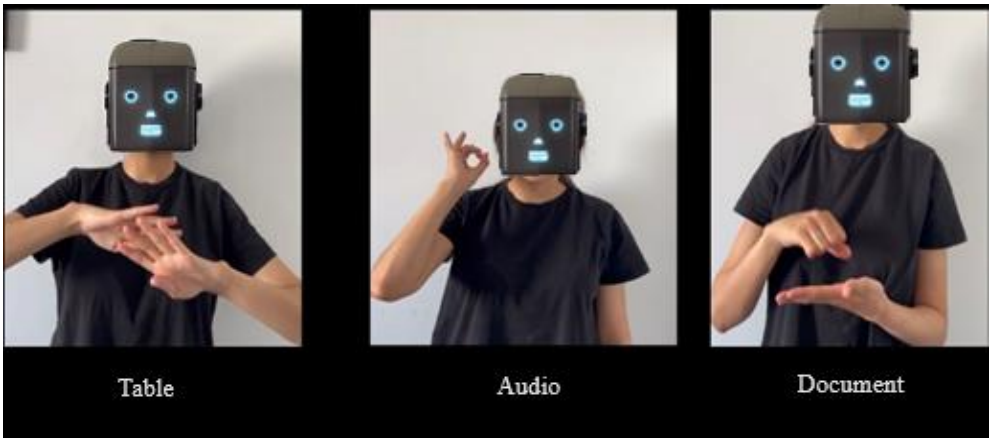

Figure 12. Translation of terms into sign language

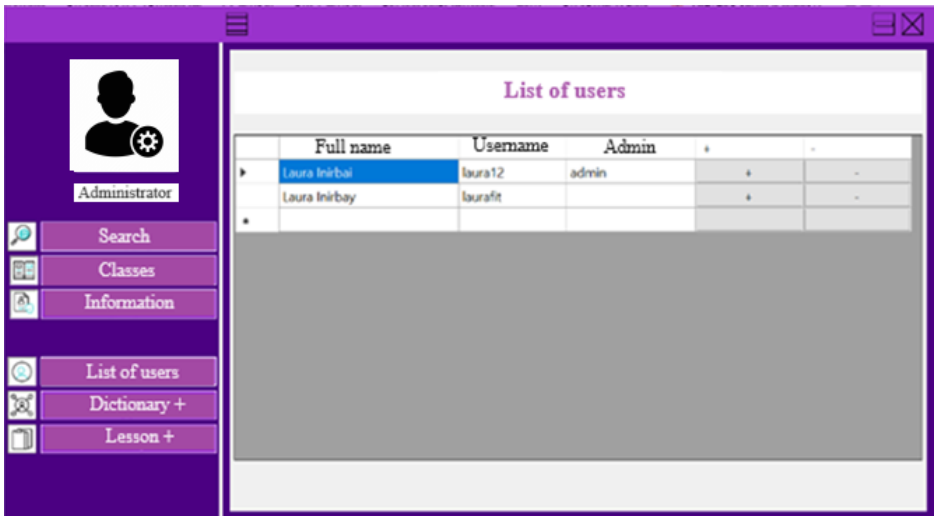

Figure 13. Information about users

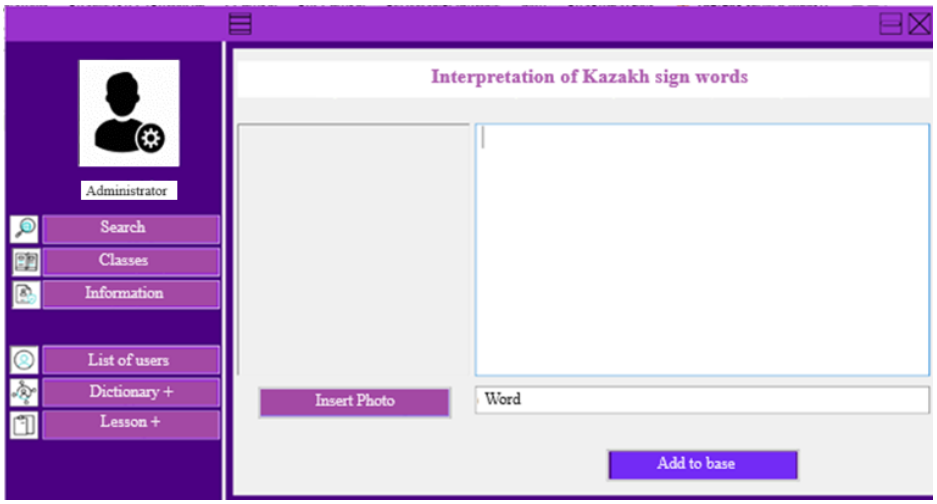

Figure 14. Availability of information

The functionality of entering IT terms in the Kazakh language with the subsequent display of its explanation and photograph reveals the uniqueness of the developed program. This allows not only to facilitate access to specialized information, but also contributes to the integration of the Kazakh language into the IT field, which is a significant contribution to the development of multilingualism in the technical field. This approach promotes a deeper understanding of specific terms and concepts, making the learning process easier and more effective. Here users can access information in the program, search by topic as shown Figure 15. You can see the executed version of the word you entered in the query on the next page as presented in Figure 16. In this developed program you can find out specific information about each term. That is, in what time frame? How? You can get answers to your questions [1], [10], [17].

About the development and use of databases. The implementation of databases created in MySqlWorkbench highlights the importance of structured and secure storage of information in the program. This ensures data is quickly accessed and stored securely, which is critical for educational applications. Project development in Visual Studio using WinformsC# demonstrates a modern approach to programming, ensuring high adaptability and scalability of the project. This architecture makes it easy to adapt and expand the functionality of the system, which is necessary for the continuous improvement of educational technologies. This is where we enter into the database. To log in, the administrator can enter a username and password and continue working at any time. All databases in this work were also created in MysqlWorlbeach as shown in Figures 17-19.

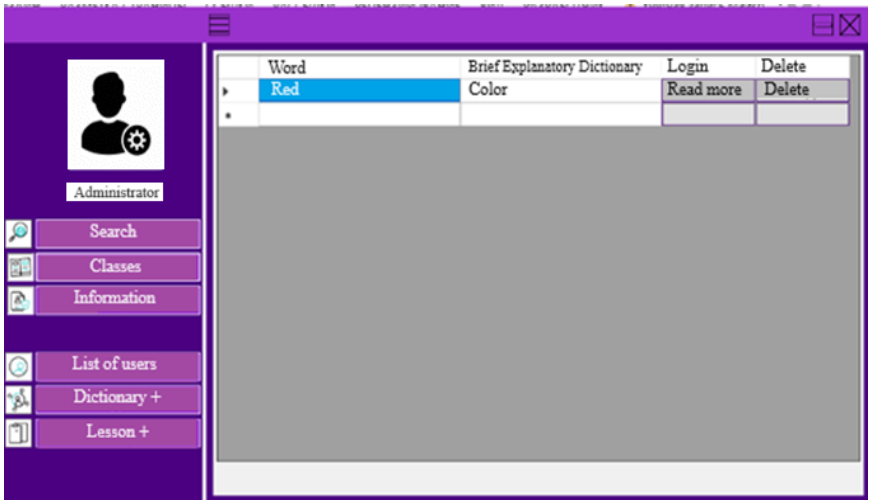

Figure 15. Availability of information

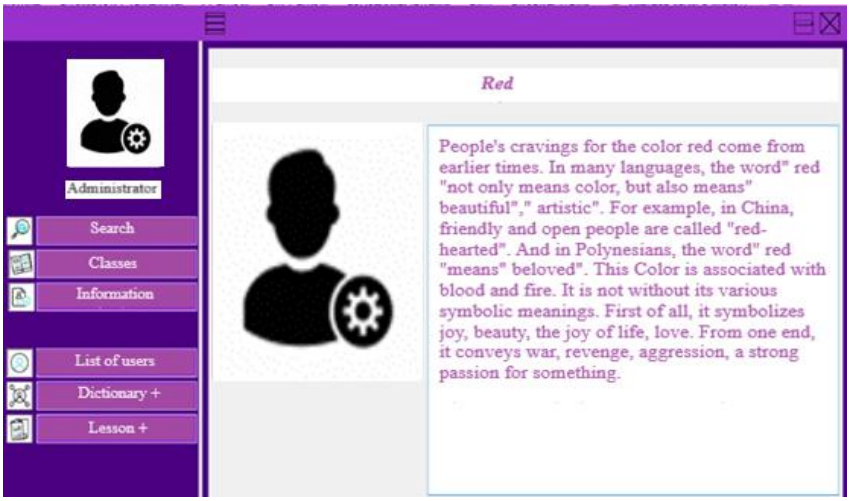

Figure 16. Full word accessibility for the hand

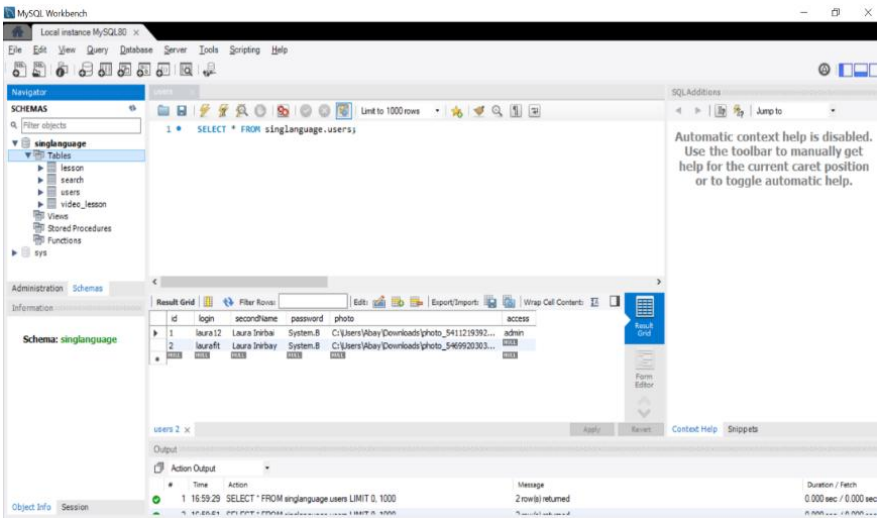

Figure 17. Database

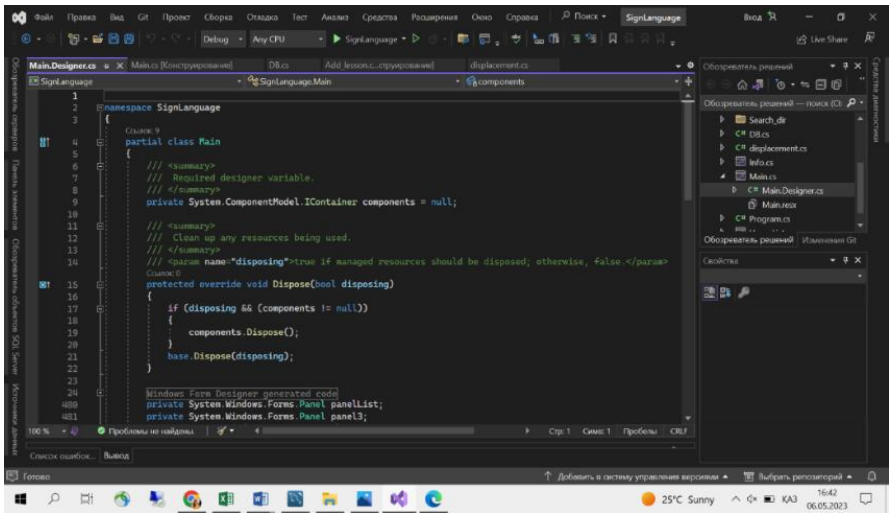

Figure 18. Codes and libraries written using WinformsC# in programming

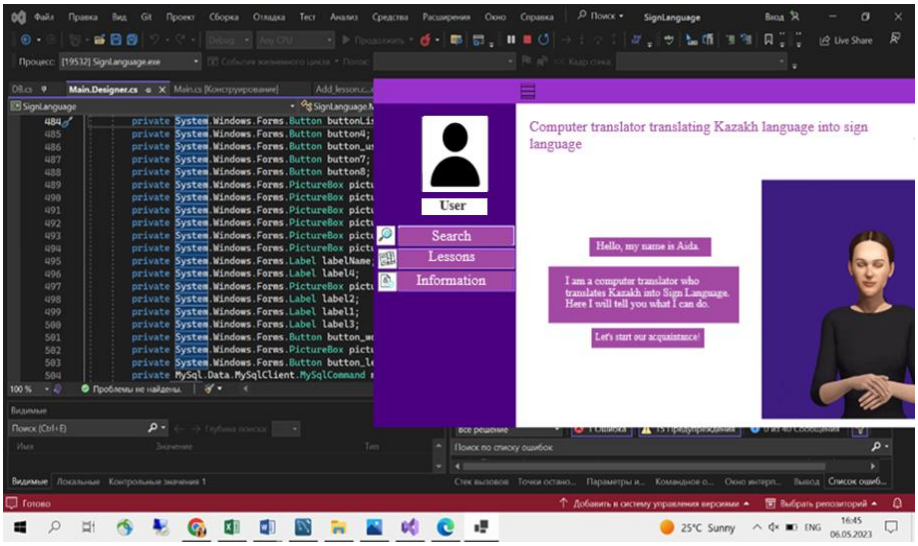

Figure 19. Development of a project created in the Visual Studio environment in programming

There are many more programs for people with disabilities. All of them are developing at a rapid pace along with the development of computer technology. People with disabilities can feel free in society by using iconic alphabets and images in sign language. In the future, it is necessary to constantly improve and develop a computer symbolic dictionary of the Kazakh language. Through the alphabet of gestures and facial expressions, as well as a variety of computer programs, people with disabilities can establish a close connection with the digital world and the environment [18]–[20]. Using the Kazakh symbol dictionary is very convenient for Kazakh citizens. In the menu of this program, the necessary words are entered in Kazakh, English, Russian, French and translated into four languages. Today, computer technology has evolved. Thanks to this, smart intelligent systems and smart programs appeared. The robotic system has also increased the number of assistive robots and watches, as well as the types of software used in mobile phones [21]–[23].

In society, sign language is widely used not only by people with disabilities, but also in the military sphere. When working with a team to scout dangerous areas and apprehend dangerous criminals, you can use gestures to convey orders and discuss military operations [24]–[26]. The human voice is used in locked objects in tank processes and in complex stages of audible signaling through gestures. It is widely used for the purpose of carrying out any military activities. People with disabilities have many advantages in the education system. By guiding a person's hand to create graphs and display them on a screen, words are created in a language that the average person can understand. With the help of this program, people with

disabilities can carry out their activities in any conditions. It allows you to study information on your computer and on the Internet independently. Any computing device has the ability to connect to the Internet. For example, the Kazakh language computer dictionary program in sign language can be installed on all computers, mobile phones, laptops and tablets. There are many well-developed gesture dictionaries and programs for gestures and robotics in the developed world [27]–[30]. Based on these world programs, a dictionary of gestures in the Kazakh language will be developed in the future.

About using the system by people with disabilities. The inclusion of features specifically designed for people with disabilities underscores the program's creators' commitment to equal opportunity in education. The use of iconic alphabets and images in a signed language allows people with hearing impairments to interact more freely with the digital world and environment. This not only promotes their social integration, but also enriches the educational process, making it more inclusive and accessible.

In addition to developing communication methods for people with disabilities through gestures and computer programs, our work suggests the possible application of multifunctional mobile robots in military operations. These robots could be equipped with adaptive cryptographic protection algorithms and control systems based on ultrasonic lasers and sensors, which would ensure reliable data transmission in conditions of high electromagnetic interference. The use of such technologies would significantly increase the efficiency of encrypted information exchange and improve the ability of robots to navigate and avoid obstacles in complex combat environments, expanding their functionality for use in tactical and reconnaissance missions. The use of ultrasonic lasers and electromagnetic waves to control mobile robots when maneuvering and scanning an area is becoming especially valuable. In addition, the robots can be adapted for military field use, including training and support for persons with disabilities, including use by wheelchair users. These robots can also perform the functions of collecting, analyzing and remotely transmitting intelligence to central command, making them indispensable in modern military strategies.

3.1. Limitations of the study and recommendations for further research

Limitations of the study. One of the main limitations of our study is its focus on Kazakh language and sign language, which may limit its application in other linguistic and cultural contexts. In addition, the study was conducted using a limited number of IT terms, which may not fully reflect the wide range of possible user requests for the system. It should also be noted that the system was tested in a controlled environment, which may not fully reflect its effectiveness and ease of use in real-world conditions.

Recommendations for further research. To further develop this research topic, it is recommended to expand the scope of the system to include other languages and cultural contexts to evaluate its universality and adaptability. It is also important to conduct research using a wider range of IT terms and in different educational contexts, which will help identify potential problems and limitations of the system. It is recommended to test the system with real users under a variety of conditions to obtain more accurate data on its effectiveness and usability. In addition, future research could examine the impact of using such systems on the learning and communication of people with hearing loss, as well as explore the possibilities for integrating the system with other educational and communication technologies.

3.2. Discussion of the findings in light of other studies

In our research, we pay special attention to the development of technologies to improve the educational process for people with disabilities, which is reflected in the work of Sekularac and Draskovic [31], which emphasizes the importance of specialized software solutions for children with disabilities. Similar to the study by Fachal *et al.* [32], our study demonstrates how technology can support more effective learning through the development of dictionaries of computer terms in LSA, while paying attention to the needs of hearing-impaired students. Comparing our findings with those of Ahmed *et al.* [33], which focused on creating a dataset and electronic dictionary for Emirati Sign Language, highlights the importance of integrating deep learning and other advanced technologies to improve educational accessibility. This is consistent with the results of Korat *et al.* [34], indicating the importance of e-books with integrated dictionaries for teaching children with different levels of language development.

Addressing the topic of intercultural communication and understanding of disability, the work of AlMeraj and Husain [35] highlights the importance of empathy in disability discourse in different languages. Our research confirms that technology development must be cross-culturally sensitive and promote greater understanding and understanding. Moreover, studies such as Shikako *et al.* [36], [37], analyze how governments around the world have responded to the needs of people with disabilities during the COVID-19 pandemic, highlighting the need to include and adapt policies in line with the UN Convention on the Rights of Persons with Disabilities. This highlights the relevance of our research for the development of policies and technologies that focus on inclusion and the rights and needs of people with disabilities.

Our research also emphasizes the importance of taking into account the specifics of communication and the needs of people with various types of disabilities, which resonates with the work of

Lozynska *et al.* [38], which discusses the importance of individualized approaches to technology development. Research by Doherty *et al.* [39] on the treatment of epilepsy in patients with mental disorders and intellectual disabilities emphasize the need for an integrated approach to the development of medical and educational technologies that takes into account the diversity of user needs. Alshenaifi *et al.* [40] work on analyzing Arabic tweets related to cognitive impairment highlights the value of using social media data to understand and improve communication among people with disabilities. This is consistent with our findings about the need to adapt technology to improve social interaction and support social inclusion.

The importance of accessibility to educational technology is highlighted in a study by Klosko *et al.* [41], which analyzed vaccine-related deaths and disabilities, highlighting the need to develop safe and accessible technology solutions in health care. This further confirms the significance of our research in the context of creating safe and inclusive educational technologies. Norri [42] raises questions about the lexical design of words associated with illness and disability, highlighting the importance of a careful and respectful approach to language in educational technology. This confirms our findings about the need to develop inclusive content that adequately reflects the diversity of user needs.

Bernadotte and Mazurin [43] study optimization of the brain's command dictionary, demonstrating the potential of using neurotechnologies to improve communication and learning. This study confirms the significance of our developments in the field of creating adaptive educational systems that can be customized according to the individual characteristics of users. Oh and Jung [44] conduct a study on the impact of a morphology awareness-based vocabulary intervention program for children with learning disabilities, highlighting the importance of targeted educational strategies to support children with special educational needs. This further confirms the importance of our efforts in developing specialized educational technologies.

The work of Lipton *et al.* [45] assessed functional disability and satisfaction among migraine patients, illustrating the importance of considering quality of life when developing medical and educational decisions. This highlights the need to create technologies that can adapt to different aspects of users' lives, including health. Barthélemy *et al.* [46] analyze neurotrauma in national registries in low- and middle-income countries, highlighting the need to develop accessible and tailored technological solutions in different socioeconomic contexts. This complements our approach to creating universal educational technologies.

Tarapata [47] explores the relationship between disability and writing, which highlights the importance of literary studies in understanding disability. Equestry [48] further expands this discussion by examining literature and intellectual disability in early modern England, which confirms the importance of an interdisciplinary approach in the study and development of educational resources. These studies are important to our understanding of how literary and historical contexts can influence contemporary approaches to education and disability inclusion.

Holdt *et al.* [49] examine negatively defined vocabulary in the Synonym Dictionary of Modern Slovenian, which highlights the importance of making meaningful language choices and avoiding stigmatization when developing educational content. This is a reminder of the need to use language in our technology that promotes a positive and respectful attitude towards diversity. Doty *et al.* [50] study on the association between common treatment side effects and migraine treatment outcomes provides important information about how side effects may influence the effectiveness of educational strategies and technologies targeting individuals with chronic conditions. This reinforces the need to develop adaptive and flexible educational solutions that can take into account the medical and physiological characteristics of users.

Referring to Lozynska *et al.* [38], our research highlights the role of customized technology solutions, such as sign interpreter components, in providing access to information for travelers with disabilities. This confirms that the development of inclusive technologies requires a multidisciplinary approach and close collaboration between researchers, developers and end users. A study by Bekmanova *et al.* [51] on the development of a terminological dictionary of school subjects in the Kazakh language emphasizes the importance of developing language resources to support multilingual education, which is important for our approach to the creation of multilingual educational technologies.

Finally, Kranthi *et al.* work [52] on a two-way communication system for people with multiple disabilities using Morse code demonstrates the potential of using alternative communication methods in technology solutions, which supports our research focus on developing innovative and accessible educational tools. All of the studies mentioned contribute to a broader understanding of the importance of adaptive and inclusive educational technologies, taking into account health, social and linguistic aspects. This validates our approach to creating educational resources that not only improve access to learning, but also contribute to a more inclusive and equitable society. In summary, our discussion of the results and implications, drawing on a wide range of literature, highlights the importance of integrating various technological, cultural and linguistic aspects in the development of educational resources, making our study an important contribution to the development of inclusive education.

4. CONCLUSION

Using information technology terms in the Kazakh language, a stock of gesture vocabulary, facial expressions and symbols was developed for people with disabilities, embedded in a library of computer programs. A dictionary of computer gestures was created based on a set of frequently used words, taking into account the relevance of the study. The gesture dictionary is based on a computer program, methods of using the system and implementing a computer interface, functional processes. A method has been created for creating and compiling a database of the dictionary of gestures in a computer program and methods for intelligent information processing.

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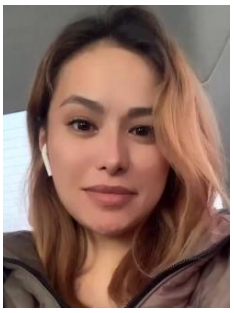

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