

ABOUT SIGN LANGUAGE TRANSLATOR APPLICATION

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The Sign language translator is a trilingual mobile app for translating speech into international sign language. The developed mobile application is designed for the people who have hearing problems and use sign language. It converts imported audio information into texts and simultaneously translates it into the international sign language.

The application works for Armenian, Russian and English languages. It has an admin module that allows you to add new words, edit or remove them. It has simple three-language operating interfaces. The application works on both Windows and Android operating systems. It does not require additional resources or investments. It can be useful for inclusive societies and education.

Key words: International sign language, sign language translator, sign language dictionary, online learning, multi-layered training, multi-criterion training.

Introduction

People with hearing problems are everywhere. Societies treat them well and want to ensure full involvement in the socio-economic and cultural spheres. However it is not an easy process. In a situation where online learning has spread to many countries around the world due to the coronavirus, the problem has become more and more complicated for this segment of the society. We offer our solution to the problem.

On October 2, 2010, Armenia adopted the UN Convention about the „Rights of People with Disabilities“, according to it the state parties recognize educational right of people with disabilities.

We did a statistical survey for the period 2011-2020. As a result, it turned out that many hearing-impaired citizens are deprived of their right to education. /The results of the statistics are given in Appendix A/

We tried to understand possibility causes and so:

- we made our own test questionnaire and found out that the Armenian society is not ready for the integration process /Test questionnaire and results are given in Appendix B/
- we investigated the disabled people problems and found out that they are not often ready for the integration process.
- we researched the Armenian market and detected that there are not enough technical means. /Situation in the international market are given in Appendix C/

The purpose of the work

Create a mobile app that will help people with hearing problems integrate into society, especially in the field of education

We tried to understand how this problem is solved in the international market.

- We studied the international experience
- We analyzed the existing solutions
- We found our competitors
- We discovered their strengths and weaknesses.

Here are the results of analysis

- We almost don't have competitors in the Armenian market.
- The demographic distribution in Armenia forces to have a trilingual system / Armenian, Russian and English/.
- There are many foreign language apps on the international market (mostly in English)
- Our competitors are serious organizations

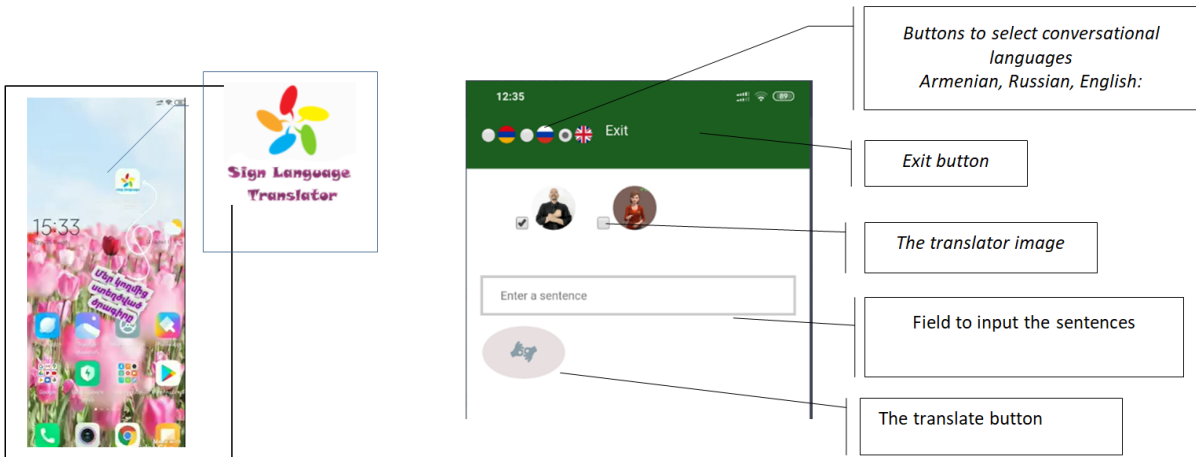
The tasks

To achieve our goal, we set out the following tasks

- To create a sign language translator with the Armenian interface. It must support Russian and English languages.
- To expand the application for Windows and Android operating systems /for PC and mobile/

The app description

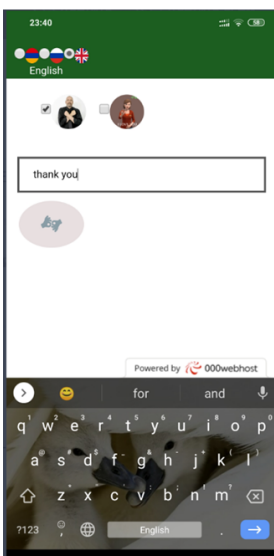
The Sign language translator is a trilingual mobile app for translating speech into international sign language [1,2]. It can be installed on the mobile smartphones and its logo will be on the screen (Pic.1). After running the application the user can see the general interface (Pic. 2).



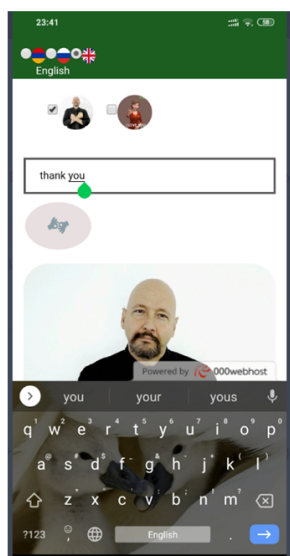
Pic. 1 Sing language translator app’s logo Pic. 2 Sing language translator app /User interface

In this interface, first of all the user must choose a language by the country flags, /Armenian is a default, but the user can select Russian or English languages as well/. Secondly, the user must choose the translator image /male or female /. The user must check a flag in front of the image. Only after that the user can input sentences or a word in the input field. When the user click on the translate button, the application translates the text to the sign language.

Besides typing, the user can speak, the app will type all the text into the sentence input field, and translate it to the sign language too. Picture 3 shows inputting the sentence in the input field and picture 4 shows the result for both cases (typing or speaking).



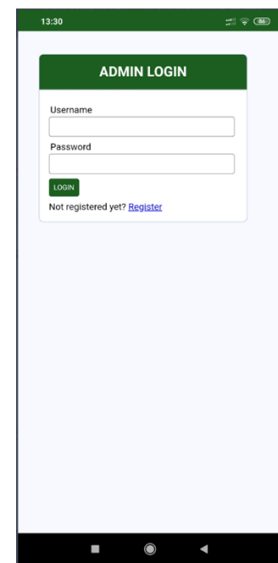
Pic. 3 Sing language translator app user interface Input data



Pic. 4 Sing language translator app user interface Result data



Pic. 5 Sing language translate Admin general interface



Pic. 6 Sing language translate Admin login interface

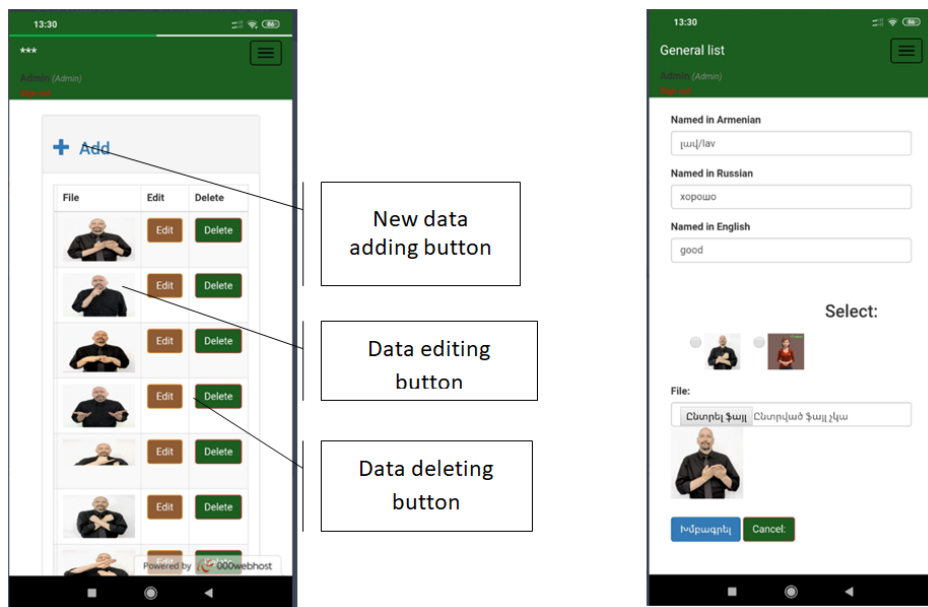
This application has an admin module. It designed for inputting new data, as well as editing or removing them. The admin module consists of one super and several admins. The super admin supports all admins and gives them passwords for a login in the system. Every admin can see the data which was input by himself/herself and can edit or remove them. Super admin can see all admins and their data, and can change it all. He can remove even other admins.

The admin interface is the same as user’s interface. Admin’s general interface has an „Admin” button for login. Picture 5 shows admin’s general interface. Picture 6 shows login interface. The admin interface, after logging in, takes the user to another interface for adding, editing or removing data (Pic. 7). For data adding admin must click „+Adding” button. So on the mobile screen opens another interface /see Pic 8/. The admin can input all data in Armenian, Russian, English and also short videos presenting input word. For saving all the data, admin must click on the „Save” button. If admin want to cancel the work, he/she must click on the „Cancel” button.

To see all the data the admin should click on „General list” button. To edit a data the admin should click on „Edit” button. The editing interface is similar to adding interface. In the editing interface the admin can change old data and save them.

To delete a data admin should click on „Delete” button. The app confirms query and deleting the record.

The admin can be any operator. But super admin must be a master of the field, who is responsible for the correct data.



Pic. 7 Sing language translate Admin interface

Pic. 8 Sing language translate Admin interface /data adding or editing interface/

The application designed on the HTML, CSS, JS PHP MySQL technologies.[3], [4],[5].

To interface design we used HTML and CSS. To add a text to speech function on our application we are using Javascript, we used the Web Speech API, which can be used to synthesis speech which is converting text to speech, and we can also use it to recognize speech to convert speech to text. We were using the following interfaces/property: SpeechSynthesis, SpeechSynthesisUtterance and window.speechSynthesis.

JavaScript SpeechSynthesis Interface is the main controller interface for the speech synthesis service which controls the synthesis or creation of speech using the text provided.

The SpeechSynthesisUtterance Interface is the interface in which we actually create the speech or utterance using the text provided, setting a language type, volume, pitch of the voice, rate of speech, etc.

The JavaScript window.speechSynthesis property is a of the Javascript window object is used to get the reference of the speech synthesis controller interface, on which we call the speak method.

To data base we were using MySQL server and for connection to Web browser we were using PHP. To designer we Part of program code for recognize of speech you can see in Appendix D.

Tasting

After the design work was completed, we tested it and conducted a survey again. We wanted to find out what flaws were in the project. Besides that, we wanted to get new offers. We made tests consisting of 10 questions and got statistics again. It is listed in Appendix E.

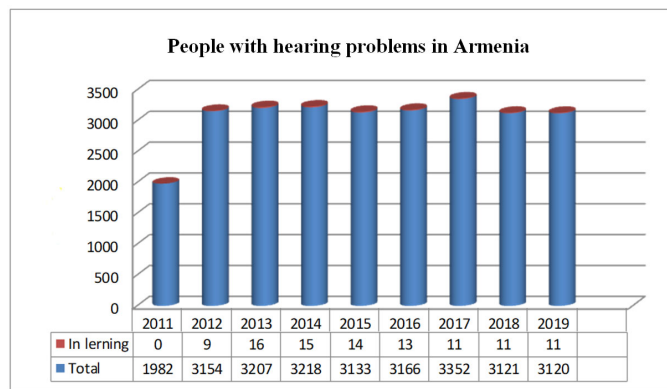
Conclusion

So, we developed application that works on the Windows and Android operation systems.It has 2 modules: users and admin. In the developed application both modules have 3 language interfaces and can work with Armenian, Russian and English words data bases. All interfaces are very easy and comfortable to use. The app can translate a word , a sentence or speech into the sing language

The app is open for adding new words, editing or removing words. So the app can be used for creation new language dictionary /Germany, Spain, China, Japan and others/

The developed application can be useful for all deaf and dumb people or for all those who have hearing problems.It can be useful in educational fields for training the students. The application can be useful in the process of building an inclusive society and so on.

Appendix A



Appendix B

Test questions

Query 1
Is it right to ...

Query 2
Do You want to be a deaf ...

Query 3
Is it convenient to see ...

Query 4
It will be very difficult for ...

Query 5
It will be very difficult for that ...

Query 6
Will have that child a ...

Query 7
You support multi- ...

Query 8
Will you want your ...

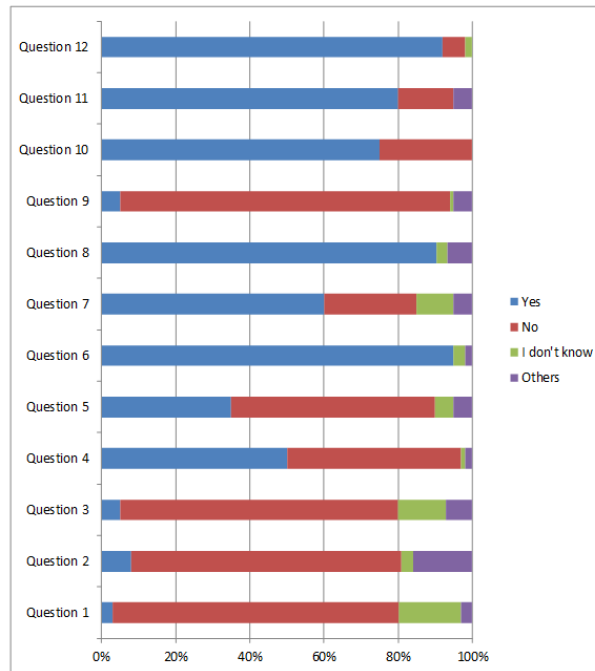
Query 9
If your child has problems ...

Query 10
Are you knowing what is a ...

Query 11
Are you listen about ...

Query 12
Can computer /mobile ...

Appendix B
Result diagram



Appendix C

Table 1: Market players and their

Company name link	Product name	Sentence translator Yes/No	Operation system name Android/Windows	Opportunities:				
				The speech translate into the sign language Yes/No	The sign language translate into the voice Yes/No	Has admin module Yes/No	Support languages	Is used
1	2	3	4	5	6	7	8	9
LLC Surdophone https://www.xn--d1ascahfol.xn--p1ai/	Surdofon	Yes	Android	Yes	No	No	Russian	Social Communication
Yandex Apps https://play.google.com/store/apps/details?id=ru.yandex.subtitles	Яндекс. Разговор: помощь глухим	Yes	Android	No	No	No	Russian	Social Communication
Europeiskt Teckenspråkcenter https://play.google.com/store/apps/details?id=com.spreadthesign.androidapp_paid	Spread Signs	No only words	Android	Dictionary	Dictionary	No	English Germany Spanish Sweden Turkish Ukraine ...	Social Communication by dictionary
RGSU https://play.google.com/store/apps/details?id=ru.rukigovoryat	Руки говорят	No	Android	Training	Training	No	Russian	Teach language Vocabulary Games Tests Interactive exercises
LeTim Games https://play.google.com/store/apps/details?id=ru.avroraventures.com.russiansignlanguage	Язык жестов — азбука	No	Android	Training	Training	No	Russian	Thatching the alphabet Games Social communication

1	2	3	4	5	6	7	8	9
Mind Rockets Inc https://play.google.com/store/apps/details?id=com.mindrocketsinc.mimix	Mimix3D Sign Language	Yes	Android	Yes	No	No	English	Teach language
Daniel Mitchel https://play.google.com/store/apps/details?id=com.sgnasl.signasl	Sign ASL	No	Android	No Only text	No	No	English	Social Communication by dictionary
jpgironb https://play.google.com/store/apps/details?id=com.jpgironb.assistiveguru	Deaf Mute Helper	Text convert to voice	Android	No	No	No	40 language	Social Communication
Software Studios https://play.google.com/store/apps/details?id=com.asltranslator	ASL Translator	Yes	Android	No Text convert to sign	No	No	English	Social Communication
MEDL Mobile Enterprises LLC https://apps.apple.com/us/app/marlee-signs/id566054855?ign-mpt=uo%3D8	Marlee Signs	No	iOS	No Text convert to sign	No Teaching program.	No	English	Social Communication

Appendix D

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35 <p><button type="button" onclick="runSpeechRecognition()">Speech to Text</button> &nbsp; <span id="a
36 <div id="output" class="hide"></div>
37 <script>
38     function runSpeechRecognition() {
39         var output = document.getElementById("output");
40         var action = document.getElementById("action");
41         var SpeechRecognition = SpeechRecognition || webkitSpeechRecognition;
42         var recognition = new SpeechRecognition();
43         recognition.onstart = function() {
44             action.innerHTML = "<small>listening, please speak...</small>";
45         };
46
47         recognition.onspeechend = function() {
48             action.innerHTML = "<small>stopped listening, hope you are done...</small>";
49             recognition.stop();
50         }
51
52         recognition.onresult = function(event) {
53             var transcript = event.results[0][0].transcript;
54             var confidence = event.results[0][0].confidence;
55             output.innerHTML = "<b>Text:</b> " + transcript + "<br/> <b>Confidence:</b> " + confiden
56             output.classList.remove("hide");
57         };
58
59         // start recognition
60         recognition.start();
61     }

```

Hyper Text Markup Language file length: 2 118 lines: 64 Ln: 64 Col: 8 Sel: 0 | 0 Windows (CR LF) UTF-8 INS

Test questions

1. How easy is the software to use?

- A. Very easy
- B. Easy
- C. Hard
- D. Very hard

2. How is the look of exterior design?

- A. Very beautiful
- B. Beautiful
- C. Not pretty
- D. Very bad

3. Was the app useful for you?

Did you learn anything?

- A. Very useful
- B. Useful
- C. Not quite useful
- D. Not useful

4. Would you advise your friends to use this app?

- A. Yes absolutely
- B. Yes, if they ask me
- C. No, never
- D. I don't know

5. The application also has the Web version. Do you think this is good?

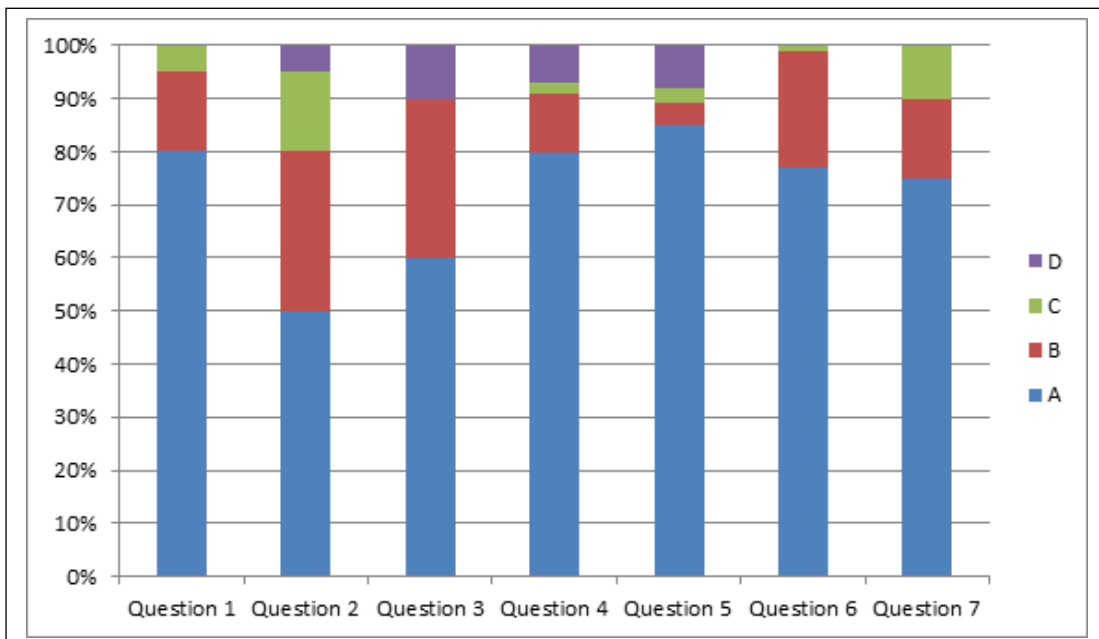
- A. It is very good.
- B. Good
- C. I don't know.
- D. Not necessary

6. Can this app help to build an inclusive school?

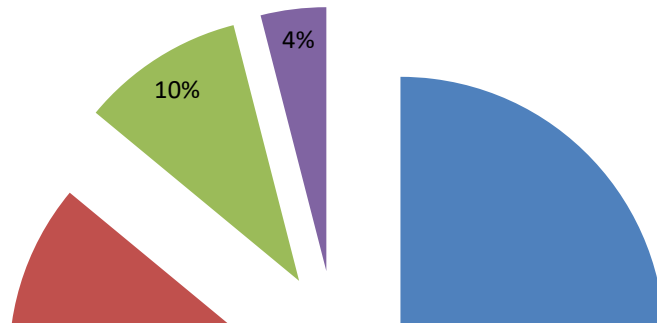
- A. Very much
- B. It can help
- C. I don't know
- D. Will not help

7. Can this application help in the process of building an inclusive society?

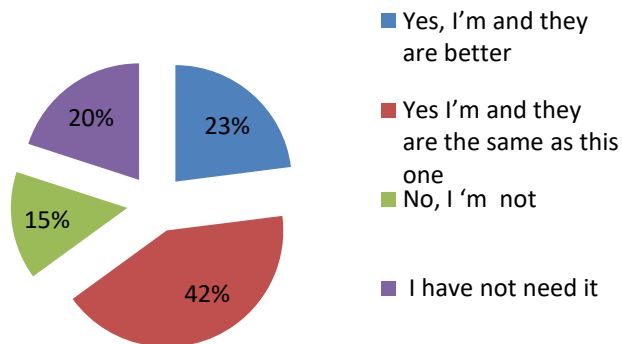
- A. Very much
- B. It can help
- C. I don't know
- D. Will not help



8. Are you familiar with sign



9. Are you familiar with similar Armenian applications?



10. What suggestions do you have?

To create an app for translating words from Sign language

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ՀՏԴ - 621.375.132

ՆՇԱՆՆԵՐԻ ԼԵՋՎԻ ԹԱՐԳՄԱՆԻՉ ՄԻ ՀԱՎԵԼՎԱԾԻ ՄԱՍԻՆ

Ա.Հ. Նավասարդյան, Գ.Գ. Խնկոյան

Խաչատրոս Աբովյանի անվան հայկական պետական մանկավարժական համալսարան

Մշակված է եռալեզու բջջային հավելված, որը նախատեսված է բոլոր այն մարդկանց համար, ովքեր ունեն լսողության խնդիրներ և տիրապետում են նշանների լեզվին: Հավելվածն ապահովում է տեքստի ինչպես նաև խոսքի ձևափոխումը նշանների միջազգային լեզվի:

Հավելվածը գործում է հայերեն, ռուսերեն և անգլերեն լեզուներով և ունի հարմարավետ եռալեզու ինտերֆեյսերով հագեցած 2 մոդուլներ՝ օգտատերի և ադմինիստրատորի: Վերջինս թույլ է տալիս ավելացնել նոր բառեր, խմբագրել կամ հեռացնել դրանք: Հավելվածն աշխատում է ինչպես Windows, այնպես էլ Android օպերացիոն համակարգերում: Այն չի պահանջում լրացուցիչ ռեսուրսներ կամ ներդրումներ և կարող է օգտակար լինել ինչպես ներառական հասարակությունների ինտեգրման, այնպես և կրթության ոլորտում:

Բանալի բառեր. Միջազգային նշանների լեզու, նշանների լեզվի թարգմանիչ, նշանների լեզվի բառարան, առցանց ուսուցում, բազմամակարդակ ուսուցում , բազմաչափանիշային ուսուցում:

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ОБ ОДНОМ ПРИЛОЖЕНИИ ПЕРЕВОДЧИКА НА ЯЗЫКЕ ЖЕСТОВ

А.Г. Навасардян, Г.Г. Хнкоян

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Переводчик языка жестов - это мобильное приложение для перевода речи на международный язык жестов. Разработанное мобильное приложение предназначено для людей, имеющих проблемы со слухом и использующих язык жестов. Он преобразует импортированную аудиоинформацию в тексты и одновременно переводит ее на международный язык жестов.

Приложение работает на армянском, русском и английском языках. Он имеет модуль администратора, который позволяет добавлять новые слова, редактировать или удалять их. Он имеет простые трехязычные рабочие интерфейсы. Приложение работает в операционных системах Windows и Android. Не требует дополнительных ресурсов или вложений. Приложение может быть полезно не только для интегрированных обществ, а также для образования.

Ключевые слова: Международный язык жестов, Переводчик языка жестов, Словарь языка жестов, Онлайн-обучение, Многоуровневое обучение.

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