



SignMatch: Find the Meaning of an approximate Sign

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Abstract

- The purpose of the project is the development of search tools in the dictionary of sign language on the specifics of signs execution the user is not exactly remember. A distinctive feature of this search method is not search accuracy but its completeness. For example, as a result of one query can be selected gestures that have the same shapes of the hands, but different directions of movement or hand position. *The project results can be useful not only for the benefit of teaching sign language, but also for linguistic studies of the language.*
- Final goal of our work – Corpus of Russian Sign Language. Current project is labour-rent of tools which may be used in such corpora.

ROADMAP and MILESTONES

► **Creating of Multimedia Russian Sign Language Explanatory Dictionary.**

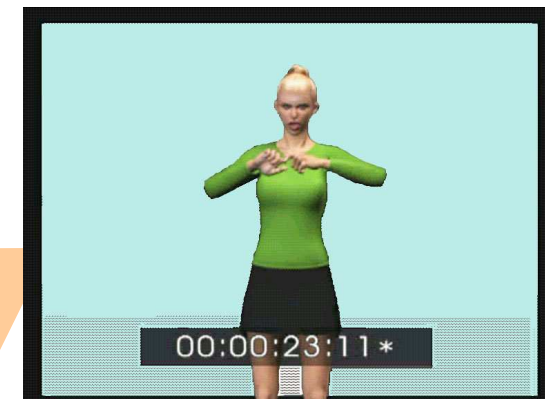
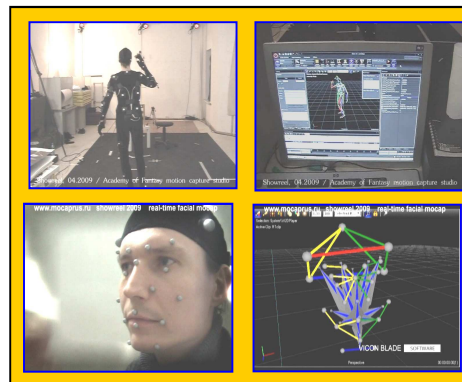
Dictionary now contains 2343 gestures and 2537 words (tokens), includes a morphological analyzer, which converts the various forms of Russian words into tokens, as well as the interpretation of the values of tokens. The relationship between tokens and gestures made on a semantic level. Implemented gestures search for their approximate description: find a gesture and give its value (if the student remembers the gesture only approximately).

► **Comparative Analysis of Verbal and Sign Languages.**

► **Replacing of Gesture Videotapes on Three-dimensional Animation**, created by motion capture (in the implementation).

► **Recognition of Gestures and Sign Language Understanding.**

► **Making the Intellectual System of Sign Language Interpretation.**





Team (part of)

- Alexander Voskresenskiy – leader
- Nadezhda Chaushyan – teacher of school for deaf children (deaf)
- Sergey Ilyin – head of mocap studio “Academy of Fantasy” (www.mocaprus.ru)
- Elena Shamaro – postgraduate student of Moscow State University *
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- Daniil Kononenko – student of Moscow University of Physics and Technics
- ...

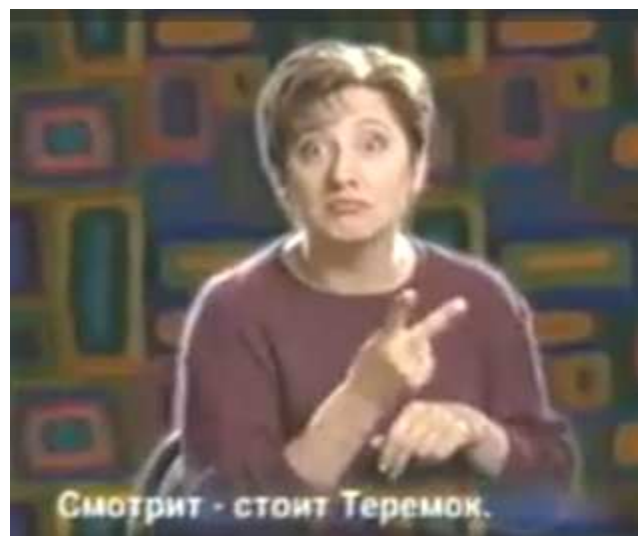
With support of:

- Vladimir Bazoev, PhD, head of Moscow branch of Russian Deaf Association (deaf) (www.deafmos.ru)
- Andrey Kibrik, Dr. of Sc. (Linguistics), Institute of Russian Language RAS, Moscow State University
- Grigory Kreindlin, Dr. of Sc. (Linguistics), Moscow State University of Humanity (Nonverbal Semiotics)

* They create and moderate website signlang.ru

Why are we doing it?

- Sign styles may be varied.
- Machine search based on fixed parameters can not finds gestures in dictionary in some cases.





Russian Sign Language Explanatory Dictionary (RuSLED)

- 2537 words (with interpretations of their meanings)
- 2343 video images of gestures (including variants of the sign)
- Gestures are from Video dictionary “Specific means of deaf communication” (Pavlovsk) based, in turn, on Geilman dictionary (Saint-Petersburg)
- Semantic relations between words and signs
- Morphologic analysis of entered words
- For word explanations more 30 web encyclopedia were used
- Searching of words (with explanations) and related gestures (with explanations of most gestures)
- Searching of gestures and explanations to corresponding words
- RuSLED not be issued to public use because Moscow deaf people said it contents “wrong gestures” (Signed Russian v. Russian Sign Language)

RuSLED – from words to gestures

You can limit the selection of words chosen grammatical categories: nouns, verbs, adjectives, etc.

You can enter a word in any grammatical form, or select the token from the list.

If the word-form correspond to the number of tokens, they will be displayed indicating the grammatical characteristics.

Explanation of the chosen word meaning.

Here, name of gesture is displayed for the selected word or a list of names, if the word corresponds to a few gestures.

Explanation of the chosen gesture.

Video of the selected gesture (to be replaced by the avatar) can be stopped in the right place to continue or to see the individual phases of movement by moving the slide manually.

RuSLED – from gestures to words

The diagram illustrates the RuSLED interface with several key components and annotations:

- Position Set L_u** : A box pointing to the 'Местоположение' (Location) section of the interface.
- Configuration Set K_u** : A box pointing to the 'Конфигурация' (Configuration) section of the interface.
- Select the gesture position**: A red box pointing to the 'Местоположение' section.
- Configuring hands**: A red box pointing to the 'Конфигурация' section.
- The resulting list of gestures**: A red box pointing to the 'Найдено жестов' (Found gestures) list.
- Explanation of the chosen word meaning**: A blue box pointing to the 'Значение слова' (Word meaning) section.

Definitions:

- G - set of gestures;
- L - set of positions;
- K - set of configurations;
- L_u - number of preset positions;
- K_u - number of preset configurations (hand shapes)

Mathematical Formulas:

$$f_1: L \rightarrow G; f_2: K \rightarrow G$$

$$G_f = G_1 \cap G_2,$$

$$G_1 = f_1(\{x: x_1 \# x_2 \# \dots \# x_1 \checkmark L_u\});$$

$$G_2 = f_2(\{x: x_1 \# x_2 \# \dots \# x_k \checkmark K_u\}).$$

Text:

In this case, the search results will display all the gestures that contain at least one of user-defined position and configuration.

Selects gestures, containing all the assigned position and configuration. If the number of preset values exceed the number of positions or configurations for any gesture, this gesture will not be included in the results set G_f , even if it contains the specified user attributes.

Annotation of Signs – RuSLED as workplace

Location: таблица

LocId	Description
1	Над головой
2	У лба
3	У щеки
4	У подбородка
5	Около головы
6	У шеи
7	Около плеч

Configuration2

ConfId: 1
Description: Пальцы собраны в кулак.
View:

SignConfig...

SignId	ConfId
1780	8
2156	20
2374	8
2542	33
2542	3
2542	10
*	0
0	0

SignLocs...

SignId	LocId
2371	11
2374	11
2378	11
2380	11
2380	8
2542	11
*	0
0	0

RuSLED: форма

выберите из списка

администрация После этого нажмите клавишу ВВОД (ENTER)

Исходная форма
(при наличии нескольких выберите нужное слово из списка)
администрация сущ., «ия»

Пояснение к слову
Руководство организации, предприятия, муниципальной территориальной единицы.

Название жеста
(при наличии нескольких выберите нужный жест из списка)
администрация

Пояснение к жесту
Жест "управлять".

Остановлено

Table of Sign Entries

SignId	Name	Mode	Sign	Sem
236	анекдот	0	Video\анекдот.mpg	1 Жесты "выдумать" и "смеяться".
237	античность	0	Video\античность.mpg	1 Дактилема "а", жест "старый", затем жес
238	апельсин	2	Video\апельсин.mpg	1 Имитируется очищение апельсина от ко
239	аппетит	2	Video\аппетит.mpg	1 Дактилема "а", жест "еда" (жест исполня
240	апрель	0	Video\апрель.mpg	1 Дактилемы "а", "п".
241	аптека	2	Video\аптека.mpg	1 Жест "лекарство", затем "помещение".
16	арбуз	2	Video\арбуз.mpg	1 Правая рука в конфигурации "р" несколь
242	Аргентина	0	Video\Аргентина.mpg	1 Имитируются вертикальные полосы на ф



What is made to this time?

- Revised lists of parameters.
- Revised previous tagging of locations.
- Annotations of hand shapes (configurations) are tagging from beginning (it's not so time consuming as repair old annotation)
New lists of parameters allow shorten tagging time because it is more easy to make decisions on choosing labels to hand shapes.

Some conclusions:

1. To translate verbal sentences to signs (and vice versa) it is need thoroughly consider semantics prior syntax.
2. Semantic meanings of signs (and words in some cases) can be more clear if to give proper weigh to disposition of subjects. So linguistic ontology must have an structured image supplement.



Why is hand tagging?

- We consider now a set of hand shapes regardless of it turning. Machine program for this case will be very complex and will make many mistakes, but human easily solves such task.
- In process of hand tagging we study as signs are shown and may to verify used sets of labels.
- Our main aim – semantic tagging of Sign Language Corpus. Corresponding decisions may be made only by human.

We hope product of our work will be first semantic tagged corpus of Sign Language resembling corpora used in NLP.

Some examples are shown in next slide from Prof. E. Hovy work.

Semantic annotation projects in NLP

- Goal: corpus of pairs (sentence + semantic rep)
- Format: semantic info into sentences or their parse trees
- Recent projects:

