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БАЯЧОРОВА Б.Ж., ПАНКОВ П.С., МУРЗАКУЛОВ С.М.
Ж. Баласагын атындагы КУУ
БАЯЧОРОВА Б.Ж., ПАНКОВ П.С., МУРЗАКУЛОВ С.М.
КНУ им. Ж. Баласагына
BAYACHOROVA B.J., PANKOV P.S., MURZAKULOV S.M.
KNU J. Balasagyn

МАКСАТКА БАГЫТТАЛГАН ЭТИШТЕРДИ КОМПЬЮТЕРДЕ КӨЗ КАРАНДЫСЫЗЧАГЫЛДЫРУУ

НЕЗАВИСИМОЕ КОМПЬЮТЕРНОЕ ПРЕДСТАВЛЕНИЕ ЦЕЛЕПОЛАГАЮЩИХГЛАГОЛОВ

INDEPENDENT COMPUTER PRESENTATION OF GOAL SETTING VERBS

Аннотация: Мурда табигый тилди өздөштүрүүнүн компьютердик каражаттары пайдалануучуга тааныш башка тилге багытталып түзүлүүчү. Авторлор тарабынан табигый тилдерди компьютерде көз карандысыз түрдө чагылдыруу сунушталган жана кээ бир этиш, зат атооч, сын атооч сөздөрү үчүн математикалык жана компьютердик моделдер иштелип чыгып, этиш создөрү үчүн жаңы классификациялоо сунушталып, кыргыз жана англис тилдериндеги кээ бир түшүнүктөрдү компьютерде чагылдыруу ишке ашырылган. Бул макалада кээ бир татаал этиш сөздөрүнүн математикалык моделдери сүрөттөлдү. Алар табигый тилдерди компьютерде чагылдырууну андан ары өркүндөтүү жана тилди өздөштүрүү үчүн колдонулушу мүмкүн.

Аннотация: Ранее компьютерные программные средства для изучения языков основывались на других языках, знакомых пользователю. Авторы предложили независимое компьютерное представление естественных языков. Они разработали математические и компьютерные модели для некоторых глаголов, существительных и прилагательных, предложили новую классификацию глаголов и реализовали некоторые понятия кыргызского и английского языков на компьютере. В статье описываются математические модели для некоторых сложных глаголов. Это может быть использовано для дальнейшего развития таких компьютерных представлений и изучения языков.

Annotation: Supra, computer software to learn languages were based on other languages which are familiar to the user. The authors proposed independent computer presentation of natural languages. They developed mathematical and computer models for some verbs, nouns and adjectives, proposed new classification of verbs and implemented some notions of Kyrgyz and English on computer. In the paper mathematical models for some complicated verbs are described. It can be used for further development of such computer presentations and learning languages.

Негизги сөздөр: классификациялоо; этиш; компьютерде чагылдыруу; математикалык модель; көз карандысыз чагылдыруу

Ключевые слова: классификация, глагол, компьютерное представление, математическая модель, независимое представление

Keywords: classification; verb; computer presentation; mathematical model; independent presentation

1. Introduction

Supra, computer software to learn languages were based on other languages which are familiar to the user. In details, investigating and learning a living language were implemented with the assistance (including bilingual dictionaries and text-books) of persons who had a complete command of it. Invention of recording sounds gave possibility to fix examples of an oral language objectively. Invention of talking pictures fixed examples of phrases with connection to situations and actions. Computer games gave the user the opportunity to choose actions with corresponding phrases. Hence, before our publications software to learn languages based on languages native to the user, nevertheless some notions are presented independently. This survey demonstrates that there were not completely independent presentations of natural languages.

We proposed to develop interactive computer presentations of natural languages. By our definition, if a computer software for presentation of any object or process does not depend on the user's knowledge and skills on similar objects then we call it independent. Such presentations, by our opinion, are more convenient because the user can learn a language by its own notions, and begins thinking in it, without translation in mind.

Using ideas [1], [2], [3] we [4-11] proposed definitions and developed sketches of such presentations. We proposed to use random generation of objects in tasks and situations and feedback for checking-up knowledge of a language. We described contents and forms of mathematical models [12].

Existing classifications of notions in grammar are based on involved grammar forms only and are scanty for computer presentation. For further developing of such presentations we developed a corresponding classification of notions (nouns and verbs) of languages.

We will use Kyrgyz language for examples and mention other languages too.

2. Preliminaries

We put the following hypothesis. A human's genuine understanding of a text in a natural language can be clarified by means of observing the human's actions in real life situations corresponding to the text.

Definition 1. If outer influences of low energy can imply sufficiently various reactions and changing of the inner state of the object (by means of inner energy of the object or of outer energy

entering into object besides of such influences) at any time then such (permanently unstable) objectis an affectable object, or a subject, and such outer influences are commands.

A system of commands such that any subject can achieve desired efficiently variousconsequences from other one is a language.

Definition 2. Simple mathematical models consist of

- fixed (F_i) sets;
- movable (M_j) sets;
- temporal sequence of conditions of types: embedding ($M_j \subset F_i$?), intersection ($M_j \cap F_i = \varnothing$?),($M_j \cap F_i \neq \varnothing$?).

Animated objects and Avatar (presentation of the person) are denoted by trembling.

Mathematical models can also include self-moving objects, sounds.

More complex mathematical models also include objects that transform other objects (tools) andobjects to be transformed.

We propose to construct computer interactive presentations are built on the base of mathematical models.

Definition 3. For any notion (word of a language):

If an algorithm acting at a computer:

- generates (randomly) a sufficiently large amount of situations covering all essential aspects of the notion to the user;
- forms a command involving this notion in each situation;
- perceives the user's actions and performs their results clearly on a display;
- detects whether a result fits the command

then such algorithm is said to be a computer interactive presentation of the notion.

These commands can contain other words too. But these words must not give any definitions orexplanations of the notion.

Remark. Existing vocabularies do not give definitions of words. They explain words by other wordswhich causes vicious circles. For example, the soft ABBYY Lingvo x3:

Write – «mark (letters, words, or other symbols)…» Mark – «write or draw (a word, symbol, line, etc.)…»

Definition 4. If all words being used in Definition 3 are unknown to the user nevertheless s/he is be able to fulfill the meant action (because it is the only natural one in this situation) then the notion (word of a language) is said to be primary. If the user has to know supplementary words to complete the action then the notion is said to be secondary. Thus, there arises a natural hierarchy of notions.

Definition 5. If a presentation of a verb demands an only action by the user then such presentation issaid to be minimal.

If a presentation of a verb involves (not necessary but denoting valence of the verb) auxiliary objects then such presentation is said to be extended.

If a presentation of a verb demands some actions (denoted by other verbs) by the user then such presentation is said to be goal setting.

Verbs having only goal setting presentations are said to be goal setting ones.Results of execution of some verbs, for instance

Example 1. ОЙЛОО [think], ТАБУУ [find]

cannot be verified immediately. In such cases we propose actualizing: additional verb of action which detects whether the user understands the verb by means of the user’s action.

Some other verbs also need additional actions. We will mark them with *.

3. Classification of verbs

3.1. The well-known intransitive / transitive verbs.

3.2. The well-known valence. It is the number of arguments controlled by a verb as predicate including the subject. There are: intransitive (monovalent/monadic); transitive (divalent/dyadic); ditransitive (trivalent/triadic); tritransitive (quadrivalent/quadradic) …

We will denote: Val-min is the minimal valence; Val-exm is the valence in an example.

Remark. Transitive verbs in Kyrgyz language are detected by using Табыш жөндөмө (Accusative Case). Many of intransitive verbs can be made transitive by means of affixes of Кат буйрук (Causative voice), for instance

Example 2. ӨЗГӨРҮҮ Val-min=1 [transform yourself] - ӨЗГӨРТҮҮ* Val-min=2 [transform anything].
We specify these notions for computer implementation.

3.3. Avatar verbs.

"Self-transitive verbs" can be explained as "Change your outer state". Meanings of many transitive verbs can be returned to the doer, for instance "paint (anything)"- "paint yourself". Some actual intransitive verbs can be presented in such a way. In mathematical models an (auxiliary, random) thing standing for direct object is to be changed to Avatar.

3.4. Inner-state-changing verbs, Val-min=1.

Example 3: ОКУ [read], КӨРҮҮ [see], КАРОО [look].

3.5. Moving verbs, Val-min=3.

Example 4. КОЮУ Val-min=3 [put], АЛУУ* Val-min=3 [take], ЖЫЛДЫРУУ Val-min=2[move], ТҮРТҮҮ Val-min=2 [push] .

3.6. Effecting verbs, Val-min=3.

Such verbs are related to affectable objects only.

Example 5: БЕРҮҮ [give], ТАМАКТАНДЫРУУ [feed].

3.7. Transforming and tool verbs.

Example 6: БҮКТӨӨ Val-min=? [flex]; 20) КЕСҮҮ Val-min=3 [cut], КУЮУ Val-min=3 [pour in], БАЙЛОО Val-min=4 [connect], СИММЕТРИЯЛОО Val-min=? [symmetrize], ТҮЗҮҮ Val- min=3 [compose].

3.8. Goal setting verbs.

Example 7. КӨРСӨТҮҮ Val-min=3 [show] (anything to anybody) , ТАБУУ* Val-min=? [find], САЛЫШТЫРУУ* Val-min=3 [compare] .

4. Minimal mathematical models of verbs

Auxiliary random objects will be denoted with italics.

Let КОРОО [Yard] be an arc of 270^0 of a circle on display.

Example 8. ЧЫГУУ [go out]. Environment: Yard and Avatar within Yard.Command:
ЧЫК!

Example 9. КИРҮҮ [come in]. Environment: Yard and Avatar out of Yard.
Command: КИР!

Example 10. ТҮРТҮҮ [push]. Environment: Thing and Avatar out of Yard.
Command: Айлананы ТҮРТ! [Push the circle!].

Example 11. ӨТҮҮ [pass]. Environment: River, Bridge and Avatar.
Command: Көпүрөдөн ӨТ! [Pass the bridge!].

Example 12. КОЮУ [put]. Environment: Thing and Place. Command:
Китепти тактага КОЙ! [Put the book onto the desk!].

Example 13. АЛУУ* [take]. Environment: Place1, Thing in it and Place2.
Command: Китепти отургучтан АЛЫП тактага кой! [Take the book from the chair and put itonto the desk!].

Example 14. КУЮУ [pour in]. Environment: Tape with red spot and Bowl under it.Command: КУЙ!
Example 15. БЕРҮҮ [give]. Environment: Food and Animal. Command:
Алманы тыйынга БЕР! [Give the apple to the squirrel!]
Example 16. КӨРСӨТҮҮ [show]. Environment: Thing, Animal and the line with little holebetween them. Condition: Thing, the hole and Animal are in line.
Command: Топту коёнго КӨРСӨТ! [Show the ball to the hare!].

5. Extended mathematical models of verbs

Let КОРОО [Yard] be a circle with some colored gates.
Example 17. ЧЫГУУ [go out]. Environment: Yard and Avatar within Yard.
Command: Жашыл дарбаза аркылуу ЧЫК! [Come out the green gate!] Example 18.
КИРҮҮ [come in]. Environment: Yard and Avatar out of Yard. Command: Сары дарбаза аркылуу КИР! [Enter the yellow gate!]
Example 19. ӨТҮҮ [pass]. Environment: Yard and Avatar. Command:
Сары дарбазадан жана Кызыл дарбазадан ӨТ!
Example 20. ТҮРТҮҮ [push]. Environment: Thing, Place and Avatar out of Yard.
Command: Чарчыны сууга ТҮРТ! [Push the square into water!].

6. Goal setting verbs

Example 21. ТАБУУ* [find]. Environment: Many colored Things-1, Thing-2 under one of them(invisible), Place.
Command: Жашыл баракчаларды жылдырып, калемди ТААП, аны тактага кой! [Shift greensheets, find a pen and put it onto the desk!]
To fulfill such a command the user is to make Shift many times.
Example 22. КУЮУ [pour in]. Environment: Tape with red spot and colored Bowls (not under it).
Command: Сары идишке жана кызыл идишке КУЙ! [Pour in the yellow bowl and in the red bowl].
To fulfill such a command the user is “to put a bowl” and “to shift a bowl” some times.

7. What verbs are necessary in a language?

There is the following list in Internet. To be; have; do; say; get; make; go; know. But this list is not substantiated. Theory of sets, Definitions 2 and 3 and their implementations yield such capacity. We propose:

7.1. $(M \cap F = \varnothing)$; $(M \subset F)$: КОЙ [put].

7.2. Environment: $F_1 \cap F_2 = \varnothing$. $(M \subset F_1)$; $(M \subset F_2)$:АЛЫП-КОЙ [transfer].

7.3. A general goal setting verb ӨЗГӨРТҮҮ [transform].

Verbs that mean existence of another affectable object (subject):

7.4. Let the object be sensed by the subject. As a partial case, with eyesight: КӨРСӨТҮҮ [show].We propose to develop and implement such a list.

8. Conclusion

This paper is a next contribution to our general project of developing mathematical models of various notions for independent presentation of natural languages. We hope that such software would be interesting and useful for people to learn languages.

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