

THE VERB ARGUMENT BROWSER

ARGUMENT FRAMES IN THE HUNGARIAN NATIONAL CORPUS

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PREVIEW

- Verb Argument Browser – a corpus query tool for investigating argument structure of verbs.
- original version:
 - for Hungarian
 - based on the old version of the Hungarian National Corpus
 - not just arguments
 - all* NP and PP dependents of verbs
 - subjects, objects, complements, adjuncts included
 - investigating
 - verb subcategorization frames, institutionalized phrases, light verb constructions, idiomatic verbal expressions, figures of speech . . .
 - common property: verb + some NP/PP dependents
 - *examples*
- language independence



- 1 SENTENCE MODEL
- 2 VERB PHRASE CONSTRUCTIONS AS COLLOCATIONS
- 3 USAGE & EXAMPLES
- 4 APPLICATIONS
- 5 LANGUAGE INDEPENDENCE



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SENTENCE MODEL

- *Basic unit*: simple sentence or clause.

A lány váll-at von.
the girl shoulder-ACC pull.
'The girl shrugs her shoulder.'

- clause = verb + set of NP/PP dependents → verb frame

verb=von NOM=lány ACC=váll
verb=shrug SUBJ=girl OBJ=shoulder

- *Dependent types*: defined syntactically / morphologically
in English: word order, prepositions
in Hungarian: case markers, postpositions



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EXAMPLES

Az emberek az időjárás-ról beszélnek.
the people the weather-DEL talk.
'People talk about the weather.'

verb=beszél *NOM=ember* *DEL=időjárás*
verb=talk *SUBJ=people* *ABOUT=weather*

Péter fél az ismeretlen-től.
Peter fear the unknown-ABL.
'Peter fears of the unknown.'

verb=fél *NOM=Péter* *ABL=ismeretlen*
verb=fear *SUBJ=Peter* *OF=unknown*



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FIXED AND FREE DEPENDENTS

Hogy jöttek lét-re az első csillagok?
how came existence-SUB the first stars?
'How the first stars came into existence?'

verb=jön SUB=lét NOM=csillag
verb=come INTO=existence SUBJ=star

- *fixed dependent:*
cannot change the content word
without changing the meaning of the VPC
- *free dependent:*
can change the content word
without changing the meaning of the VPC



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MULTI-WORD VERBS

- *multi-word verb*: verb stem + some fixed dependent(s)

lét-re jön
existence-SUB come
'come into existence'

Multi-word verbs have. . .

- separate meaning
- own argument structure

rész-t vesz bAn
part-ACC take INE
'take part in SOMETHING'

Typical units to be investigated using the VAB.



SENTENCE MODEL

sentence = verb + set of dependents
dependent = type + content word

i.e.

<i>verb=jön</i>	<i>SUB=lét</i>	<i>NOM=csillag</i>
<i>verb=come</i>	<i>INTO=existence</i>	<i>SUBJ=star</i>

In this way we can investigate VPCs independently from the particular word order in which they appear in the corpus.



CORPUS PREPARATION

Input: Hungarian National Corpus
(POS-tagged and disambiguated)

- clause boundary detection
 - regexps based on conjunction and punctuation patterns
- verb normalization
 - e.g. separated verbal prefixes attached
- noun phrase chunking
 - case and lemma of the head of dependent phrases

→ representation according to the model



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VERB PHRASE CONSTRUCTIONS AS COLLOCATIONS

A specific kind of VPCs:

'take part in SOMETHING'

- fixed dependent (object) + free dependent (*in*-phrase)
- multi-word verb with argument structure

These kind of expressions are

- ① subcategorization frames
and
- ② collocations
at the same time.

The idea behind the VAB is: **treat VPCs as collocations.**



VERB PHRASE CONSTRUCTIONS AS COLLOCATIONS

We search for collocations in the space of these structures:

<i>verb=jön</i>	<i>SUB=lét</i>	<i>NOM=csillag</i>
<i>verb=come</i>	<i>INTO=existence</i>	<i>SUBJ=star</i>

IDEA

Apply an association measure (designed for bigrams) taking . . .

- the content word of a particular dependent – as one unit,
- *all other* parts of the verb frame – as the other unit

of the collocation.



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If we choose the subject's content word as the first unit,



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of the collocation.

If we choose the subject's content word as the first unit, we will query the most important or usual subjects of this construction, namely *what* is used to come into existence.



VERB PHRASE CONSTRUCTIONS AS COLLOCATIONS

The Verb Argument Browser can answer the following typical research question:

- What are the salient words which can appear as a particular dependent of a given verb frame?
- What are the most important collocates of a given verb (or verb frame) as a particular dependent?

Association measure: *salience* (adjusted mutual information)

$$S(x, y) = \log_2 f(x) \cdot \log_2 N \frac{f(x, y)}{f(x) \cdot f(y)}$$



VERB PHRASE CONSTRUCTIONS AS COLLOCATIONS

Consequence:

The Verb Argument Browser can treat not just a single word but a whole verb frame (a verb together with some dependents) as one unit in collocation extraction.

It can collect . . .

- salient subjects of a verb,
- salient objects of a given verb–subject pair,
- salient locatives of a given verb–subject–object triplet . . .



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USAGE

- *corpus*: Hungarian National Corpus
(old version, 187 M words)
- *response times*: a few seconds



Corpus:

Verb:

No: ☐ Case/postposition: No: ☐ Argument lemma:

No: ☐ Case/postposition: No: ☐ Argument lemma:

No: ☐ String:

Full sentence coverage: ☐


Distribution:



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- *corpus*: Hungarian National Corpus
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Corpus: 

Verb:

No: <input type="checkbox"/>	Case/postposition: <input type="text" value="ACC"/>	No: <input type="checkbox"/>	Argument lemma: <input type="text"/>
No: <input type="checkbox"/>	Case/postposition: <input type="text" value="ABL"/>	No: <input type="checkbox"/>	Argument lemma: <input type="text"/>
No: <input type="checkbox"/>	String: <input type="text"/>		

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USAGE

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Corpus: Hungarian National Corpus


Verb: kér

No: ☐ Case/postposition: ACC No: ☐ Argument lemma:

No: ☐ Case/postposition: ABL No: ☐ Argument lemma:

No: ☐ String:

Full sentence coverage: ☐

Distribution: 



Verb Argument Browser - investigating argument structure of verbs - Mozilla Firefox

Fájl Szerkesztés Nézet Előzmények Könyvjelzők Eszközök Súgó

http://corpus.nytd.hu/cgi-bin/mazsola/mazsola_eng.pl

Google Magyar Katolikus Eg... OTP Google: archetipus ... EER Ut Tarra

Google A keresés eredm... webforditas.hu ... webforditas.hu ... Verb Argument ... twelve clock - "twel...

Corpus: HNC: Magyar Nemzet newspaper

Verb: kér

No: ☐ Case/postposition: ACC No: ☐ Argument lemma:

No: ☐ Case/postposition: ABL No: ☐ Argument lemma:

No: ☐ String:

Full sentence coverage: ☐

Distribution:

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adat

Az információk ellenőrzésére persze a körháztól kér adatokat.
Feladatai teljesítéséhez adatokat kérhet a bíróságtól, az ügyészségtől, a nemzetbiztonsági szolgálatoktól, a társadalombiztosítási igazgatási szervektől.
ha maximum öt főről kér adatot a hivataltól.
hogy a rendőrség az adatkabozástól, telefonszolgálatoktól, bankoktól ügyérsi jóváhagyás nélkül kérjen adatokat.
hogy kérje tőlük a művelődési tárca a bérfejlesztéshez szükséges adatokat.

adatgyűjtés

hanes Orbán Viktor és Deutch Tamás ellen is adatgyűjtést kértek az ügyben érintett magánnyomozótól.

adózás

anely szerint a gépkocsi átíratásakor adóigazolást kértek a polgároktól.

adókedvezmény

Korábban Budapest és a vidéki nagyvárosok különféle adókedvezményeket is kértek az előző kabinettől.

adósán

Ha a bérbeadó magánszemély, akkor adósságot kell kéri az APER-től.
ha a magánszemély adósságot kér az APER-től

aggregátor

A hadseregétől kértek aggregátort.

ajánlat

A helyreállítással megbízott Szabolcs-Szatmár-Bereg Megyei Közműkezelő Rht. tíz vállalkozótól másfél milliárd forintot felújítási munkára kért a közelmúltban kivétel
Az eredménytelen pályázatok után a bizottság új ajánlatot kért a pályázóktól.
en cserébe a pályázóktól - meghatározott műszaki paraméterekkel rendelkező - új kocsikra kért ajánlatot.
hogy az MTK vezetői már ajánlatokat kértek néhány légitársaságtól a norvégiai repülőtérről kapcsolatosan.

Aláírás

Kész

QUERY: 2 FREE DEPENDENTS

kér -t -tól
ask ACC ABL

'ask for SOMETHING from SOMEBODY'

verb=kér ACC=? ABL=?
verb=ask for=? from=?



QUERY: 2 FREE DEPENDENTS

kér -t -tól
ask ACC ABL

'ask for SOMETHING from SOMEBODY'

verb=kér ACC=? ABL=?

verb=ask for=? from=?

Result: (Most salient objects:)

- bocsánat – 'forgiveness'
- segítség – 'help'
- elnézés – also 'forgiveness'
- engedély – 'permission'
- ...



QUERY: 1 FIXED + 1 FREE DEPENDENT

vesz figyelem-bA -t
 take consideration-ILL ACC
 'take SOMETHING into consideration'

verb=vesz ILL=figyelem ACC=?
 verb=take INTO=consideration OBJ=?



Corpus: HNC: Magyar Nemzet newspaper

Verb: vesz

No: ☐ Case/postposition: ILL No: ☐ Argument lemma: figyelem

No: ☐ Case/postposition: ACC No: ☐ Argument lemma:

No: ☐ String:

Full sentence coverage: ☐

Distribution:



QUERY: 1 FIXED + 1 FREE DEPENDENT

vesz figyelem-bA -t
take consideration-ILL ACC
'take SOMETHING into consideration'

verb=vesz *ILL*=figyelem *ACC*=?
verb=take *INTO*=consideration *OBJ*=?

Result: (Most salient direct objects:)

- szempont – 'point of view'
- érdek – 'interest'
- vélemény – 'opinion'
- ...



A TRICK: QUERYING THE VERB

Korpusz:

Igető:

Nem: ☐ Eset/névutó: Nem: ☐ Vonzattó:

Nem: ☐ Eset/névutó: Nem: ☐ Vonzattó:

Nem: ☐ Eset/névutó: Nem: ☐ Vonzattó:

Nem: ☐ Szó:

Teljes mondatlefedés: ☐

Eloszlás:

☒

☐

☐

☐

☐

A konkrét igeet nem tartalmazó lekérdezések lefuttatása akár 2-3 percig is tarthat.

44 találat. [tesz](#) [21] [emel](#) [10] [helyez](#) [8]

állít

Elvégre a lécet éppen a mlinek állították olyan magasra,
majd menet közben aztán eldől, érdemes -e változtatni és magasabbra állítani a lécet.

áttesz

hogy a múltkorinál még magasabbra tegyük a lécet - és át

emel

A szerző szerint azonban az új tagok teljesítménye magasabbra emelte a lécet:

és nem emeli egyre magasabbra a lécet -

hogy a tiltakozók most magasabbra emelték a lécet, a tavalyinál

- Magasra emelte a lécet a Városháza,

mert Antall József egy nagyon nehéz időszakban rendkívül magasra emelte a lécet.

mert Bécs a többi EU-tagállamtól eltérően túlzottan magasra akarta emelni a lécet a jövődöbéli tagok előtt az atomerőművek biztonsága terén.

mint ellenzék, magasra emelte a lécet a működő kormányokkal szemben.

Olyan magasra kell emelni a lécet,

Sem a szerepe, sem a körítés nem emelte olyan magasra a lécet,

Szász János fantasztikus atmoszférájú filmje talán még magasabbra ' emeli a lécet '.

helyez

ha a Nyugat szándékosan magasabbra helyezné a lécet Szlovákia előtt,

hogy nemcsak magasra helyezi a lécet,

Ilyen magasra azért nem kellett volna helyezni a lécet!

Már nagyon magasra helyezte a lécet.

milyen magasra helyezik ott Brüsszelben a lécet.

Müller Péter és Kapás Dezső azonban már 1965-ben is az elődöknél magasabbra helyezték önmaguk előtt a lécet:

nagyon magasra helyezte a lécet.

sőt a lécet talán magasabbra is helyezi, az utóbbi néhány GENESIS album populáris hangvételű opuszainál...

lök

És ha már, akkor lökjük a legmagasabbra a lécet,

tesz

A SIMPLE QUERY: 1 FREE DEPENDENT

ad -t
give ACC
'give SOMETHING'

verb=ad *ACC*=?
verb=give *OBJ*=?



A SIMPLE QUERY: 1 FREE DEPENDENT

ad -t
give ACC
'give SOMETHING'

verb=ad ACC=?
verb=give OBJ=?

Result: (Most salient direct objects:)

- hang – 'voice' → 'to give voice to SOMETHING'
- hír – 'news' → to give news ~ 'to report'
- igaz – 'true' → to give true ~ 'to take sy's side'
- ...

→ **multi-word verbs**



COLLECTING MWVs

Important property of the Verb Argument Browser:

For any specific dependent, the tool provides constructions where *this dependent is fixed*, if there is any such construction.

(e.g. light verb constructions, idiomatic verbal expressions, figures of speech)

- + 'take' + into → 'consideration', 'account' ...
- 'eat' + OBJ → just some kinds of food
in this case we obtain frequent words with literal meaning,
often forming a semantically coherent class



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often forming a semantically coherent class

Warning: VPCs with fixed dependent(s) are **frequent**.

They are not to be ignored, it is necessary to deal with them.

E.g. when doing something with verbs, do not forget about multi-word verbs.



CORPUS SIZE \leftrightarrow ANNOTATION RICHNESS

- compared to . . .
 - large raw or POS-tagged corpora (\sim big data)
 - small syntactically annotated corpora (\sim rich information)
- a VAB uses (and works well with) corpora which are big enough + have “some” syntactic information annotated
- using this approach
 - corpus-driven information can be gathered about some “*higher level*” phenomena (i.e. the predicate-argument structure in our case) based on querying a quite *large* piece of text
- a big corpus (size \gg treebanks) with *some shallow* syntactic annotation can be a valuable resource. :)



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APPLICATIONS

Past...

- lexical database development of a Hungarian to English machine translation system – handling MWVs
- searching for MWVs to include them into the Hungarian WordNet
- lexicography:
Hungarian Verb Phrase Construction Dictionary

Future...

- language teaching
- linguistic research
 - studying verb synonyms
 - classifying verbs based on argument structure similarities
 - studying selectional preferences of verbs



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LANGUAGE INDEPENDENCE

Claim: the approach is language independent.

- To extend the methodology to other languages all we need is a corpus represented according to our sentence model.
- Can we create such a representation?
- Essentially, the representation relies on the very fact that there are *some kind of predicate-argument structure* in the languages.
- All we should do is segment the text into sentences/clauses (containing a verb and its dependents) and specify the relationship between the verb and the particular dependents.



A PILOT VAB FOR SERBIAN

Just to show that the approach works. :)

Serbian: dependents are defined by
case markers *or* case marker + preposition combinations.

- much smaller corpus (Intera)
- much simpler (pre)processing
 - ❶ clause boundary detection = just split at punctuations
 - ❷ verb identification = take the last verb + attach *se* if occurs
 - ❸ noun phrase chunking = extract PPs according to this simple pattern: *a preposition + possible not-nouns + a noun*
 - ❹ no case information:
all NPs without preposition
go to a big class (called ANYCASE)



REPRESENTATION OF A SERBIAN CLAUSE

Example clause from the corpus:

Svako ima pravo na rad.
Everyone has right to/for work.
'Everyone has the right to work.'

Representation of the example clause:

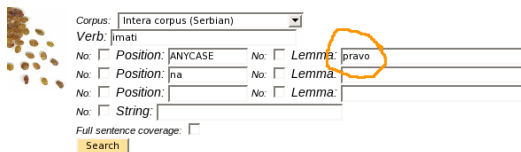
verb=imati *ANYCASE*=pravo *na*=rad
verb=have *OBJ*=right *to/for*=work



EXAMPLE: A MULTIWORD VERB

Query:

'imati pravo na' ('have right to/for')



Corpus: Intera corpus (Serbian)

Verb: imati

No: ☐ Position: ANYCASE No: ☐ Lemma: pravo

No: ☐ Position: na No: ☐ Lemma:

No: ☐ Position: No: ☐ Lemma:

No: ☐ String:

Full sentence coverage: ☐

Distribution:



184 hits. [sloboda](#) [27] [zaštita](#) [23] [naknada](#) [13] [jezik](#) [7] [odsustvo](#) [5] [lek](#) [4] [poštovanje](#) [4] [podrška](#) [4] [život](#) [4]

freedom, protection, compensation, language ...



EXAMPLE: DISCOVERING MULTIWORD VERBS

Query:

'ići u' ('go in')



Corpus:

Verb:

No: ☐ Position:

No: ☐

Lemma:

No: ☐ Position:

No: ☐

Lemma:

No: ☐ Position:

No: ☐

Lemma:

No: ☐ String:

Full sentence coverage: ☐

Distribution:



35 hits. [prilog](#) [5] [škola](#) [8] [pravac](#) [4]

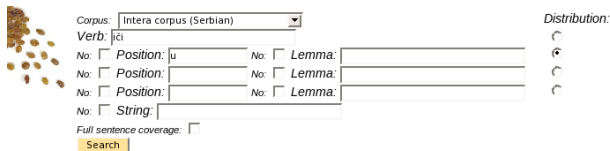
benefit, school, direction



EXAMPLE: DISCOVERING MULTIWORD VERBS

Query:

'ići u' ('go in')



Corpus: Intera corpus (Serbian)

Verb: 'ići

No: ☐ Position: u No: ☐ Lemma:

No: ☐ Position: No: ☐ Lemma:

No: ☐ Position: No: ☐ Lemma:

No: ☐ String:

Full sentence coverage: ☐

Search

Distribution:

35 hits. [prilog](#) [5] [škola](#) [8] [pravac](#) [4]

benefit, school, direction

prilog **does not fit** into this little semantic class.

→ This phenomenon is a good indicator of being a MWV!

'ići u *prilog*' is a MWV.

Meaning: ~ *support* – literally: 'go in benefit'



LANGUAGE INDEPENDENCE

The methodology can be extended to other languages,
and a fully functioning VAB can be created
if a shallow parsed, adequately processed corpus is available.



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We experimented with Serbian, Danish, Dutch, French.



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→ Chinese?



AVAILABILITY

Available for you:

- Hungarian version:

```
http://corpus.nytud.hu/vab
```

- Serbian version:

```
http://corpus.nytud.hu/vabs
```

username: lingcass

password: vab



AVAILABILITY

Available for you:

- Hungarian version:

```
http://corpus.nytud.hu/vab
```

- Serbian version:

```
http://corpus.nytud.hu/vabs
```

username: lingcass

password: vab

Thank you for your attention!

