

# Using Praat and ELAN for the functional annotation and query of spoken discourse markers

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# Corpus material

## **Multimodal HuComTech corpus** (Hungarian only)

- the corpus was originally designed to study the interrelation of the multimodal aspects (prosody, visual signals, etc.) of spontaneous human-human interaction
- audio and video material with aligned speech transcript and multi-level annotation (50 hours of video and audio recordings of 111 formal and 111 informal dialogues, wordcount = approx. 450.000 tokens), a web-based SQL database (metadata in Metashare and a few files in the Language Archive)

DM annotated parts of the corpus:

- 22 casual conversations + 22 simulated job interviewees

22 Praat textgrids (involving audio and automatic prosodic annotation) and

22 eaf files (involving audio, video, pragmatic, DM, and automatic prosodic annotation)

Number of tokens of DMs segmented:

- *Mondjuk (~say)*: 208
- *Ugye (~is that so?)*: 121
- *Amúgy (~otherwise)*: 87

# Examples of (peripheral) multifunctional DMs/ PMs – *ugye* (~is that so?)

- High frequency of (peripheral) DMs in our corpus with multiple functions (such as *well, let's say, you know, of course* in English) →
- “*BA-s hallgató vagyok **ugye** ezt a 3 éves képzést csinálom*”. (*evidentiality m.*)  
(‘I’m a BA student **DM<sup>ugye</sup>** I do this three-year course.’) (HuComTech, 006\_I);
- “*Pestre fogsz költözni, **ugye?*** “  
(‘You’re moving to Pest, **DM<sup>ugye</sup>** ?’) (HuComTech, 085\_I) (*checking info.*)
- “*Boldog élmény volt, mikor elhoztuk, **ugye** egy <egy> sharpeiról van szó, {b} és hát ilyen kis pici {l} volt*”  
(*It was a happy memory when we took him (the dog) home, it's **DM\_ugye** a shar pei, and so he was tiny like that*) (HuComTech 016\_I) (*background info, inserted comment, voice break*)

# Examples of (peripheral) multifunctional DMs/ PMs – *mondjuk* ('let's say')

- markers of **lexical search or approximation** as **own speech management functions** (can be glossed as *about, like*):

„gyorsan megy a motorom **mondjuk** 120–140-nel”

( ‘*my bike is really fast, it can do **DM<sup>mondjuk</sup>** 120–140 kmphs*’ ) (HuComTech, 017\_I)

- markers of **concession** (can be glossed as *although, but*):

„szeretek a belvárosban élni **mondjuk** elég nagy a szmog”

( ‘*I like living in the city centre **DM<sup>mondjuk</sup>** the air is polluted*’ ) (HuComTech, 019\_I)

- “Problem” of multifunctionality → need for disambiguation →
- Disambiguation of the actual function of the DM/PM is possible using multimodal contextual cues

# Research questions and queries

Can we distinguish different functions relying on multimodal (nonverbal, non-lexical) contextual cues?

Research questions that can be answered using multilayer queries in ELAN:

Is there a significant relation/correspondence between the discourse-pragmatic function of a DM/PM and

1. The simultaneous manual gesticulation/hand movements of the speaker
2. Gaze direction of the speaker (eye contact or diverted gaze)
3. Duration of the DM
4. Pause preceding the DM (phonological independence)
5. Prosodic features of the DM and its host unit
6. Facial expression (Ekman-Friesen taxonomy)

Hypothesis: the actual function of a multifunctional DM/PM can be predicted based on its position in the turn, duration, prosodic features, and the nonverbal behaviour of the speaker (gaze direction, hand movements)

# Methods

- **Segmentation** of the selected words in the speech transcript
- **Tagging** discourse-pragmatic functions
- Low-level prosodic features and temporal features (durations, pitch movements and preceding pauses) were extracted from the segmented sound files (.wav) using **Praat and Prosogram scripts**, and the results were later **exported into ELAN** for querying.
- The nonverbal-visual features (gaze direction, facial expression, hand gestures) of the speaker's behaviour were extracted from the manually-performed video annotations of the recordings and can be automatically queried using the **ELAN** software.
- The queries on the relation of each functions and each nonverbal features were run separately and were ultimately joined in contingency tables for **statistical analysis**.

# User interface of DM segmentation in ELAN

The screenshot displays the ELAN software interface for a file named "ELAN - 006mc22\_1.eaf". The interface is divided into several sections:

- Video View:** Shows a video of a man in a red shirt sitting and speaking. The current time is 00:05:36.805.
- Annotation Panel:** Located on the right, it shows a list of annotation classes and their corresponding values for the selected time segment (00:05:36.805 - 00:05:37.000). The selected class is "A\_speaker wordseg" with the value "ugye". Other visible classes include "A\_speaker\_text" (ugye ahol %a először találkozott mindenki mindenkivel), "V\_handshapeClass" (left-open-flat+right-open-flat), and "P\_pitchmovements" (stagnant).
- Audio Waveform:** A black waveform representing the audio signal, with a vertical red line indicating the current time position.
- Timeline and Controls:** A horizontal timeline at the bottom shows the duration of the file. Above it are playback controls including play, stop, and seek buttons, as well as checkboxes for "Selection Mode" and "Loop Mode".
- Annotation List:** On the left side, a list of annotation classes is visible, including "V\_handshapeClass", "V\_postureClass", "V\_emblemsClass", "A\_speaker\_text", "A\_speaker wordseg", and "A\_speaker Speech M".

## **Criteria that a functional DM annotation model should meet:**

- it should be comprehensive and **multi-layered covering all domains of discourse**
- the **subcategories** (labels) within the layers should be clear-cut, easily **distinguishable and mutually exclusive**

The **annotation tool, ELAN 4.6.1** (Brugman-Russel 2004) enables **tagging multiple functions to a single DM**, which is necessary because most spoken DMs simultaneously perform multiple functions.

# Our functional DM annotation taxonomy

In our framework, a single DM can be described in several domains of discourse along the following aspects of interaction:

- **Own Speech Management:** *lexical search, reformulation, giving example, explanation*
- **Attitude Marking:** *approximation, emphasis, PFM\_booster, PFM\_hedge, rhetorical question*
- **Interpersonal Functions:** *agreement, emphasis, asking for reassurance, expressing sympathy*
- **Structural Conversation Management:** *turn-take (distinction of preferred and dispreferred second pair parts), turn-keep, turn-give (end-of-turn), (listener's) backchannel*
- **Thematic Control:** *introducing topic initiation, topic elaboration, topic change, marking concession*
- **Information Management:** *signalling new information, evidentiality marker*

# Methods: Editing the controlled vocabulary for annotation in ELAN 4.5.1

The screenshot displays the ELAN 4.5.1 software interface. The main window shows a video frame of a speaker, a text transcription, and an audio waveform. The text transcription includes the sentence: "mondjuk %o az-- azóta kicsit kezdtem rövidélni az egész %o %o dolgokat vele kapcsolatban,". The audio waveform shows a corresponding sound wave. The 'Edit Controlled Vocabulary' dialog box is open, showing the current CV's (Attitudinal\_F-cv), CV Name (Attitudinal\_F-cv), and Description (Attitudinal Functions of DMs: DMs expressing and performing attitudinal functions mark the attitude of the speaker towards the current topic and may modify the force of the host utterance.). The dialog box also shows a list of entries (approx, PFM\_booster, PFM\_hedge, emphasis, rhetorical question) and a table of entry values (PFM\_hedge, mitigating device (usually softens an FTA), ISO Data Category, Add, Change, Delete, More Options...). The main window also shows a list of entries (approx, PFM\_booster, PFM\_hedge, emphasis, rhetorical question) and a table of entry values (PFM\_hedge, mitigating device (usually softens an FTA), ISO Data Category, Add, Change, Delete, More Options...).

ELAN - 006mc22\_1.eaf

File Edit Annotation Tier Type Search View Options Window Help

Grid Text Subtitles Lexicon Audio Recognizer Video Recognizer Metadata Controls

A\_speaker\_text

### Edit Controlled Vocabulary

Controlled Vocabulary

Current CV's: Attitudinal\_F-cv

CV Name: Attitudinal\_F-cv

Description: Attitudinal Functions of DMs: DMs expressing and performing attitudinal functions mark the attitude of the speaker towards the current topic and may modify the force of the host utterance.

Buttons: Add, Change, Delete, Import, External CV

### Entries

Entry value	Entry description	ISO Data Category
approx		
PFM_booster		
PFM_hedge		
emphasis		
rhetorical question		

Buttons: Add, Change, Delete, More Options...

Buttons: Sort A-Z, Sort Z-A

Selection Mode Loop Mode

00:10:43.000 00:10:43.500 00:10:44.000 00:10:44.500 00:10:45.000 00:10:45.500

mondjuk %o az-- azóta kicsit kezdtem rövidélni az egész %o %o dolgokat vele kapcsolatban,

mondjuk

elaborate

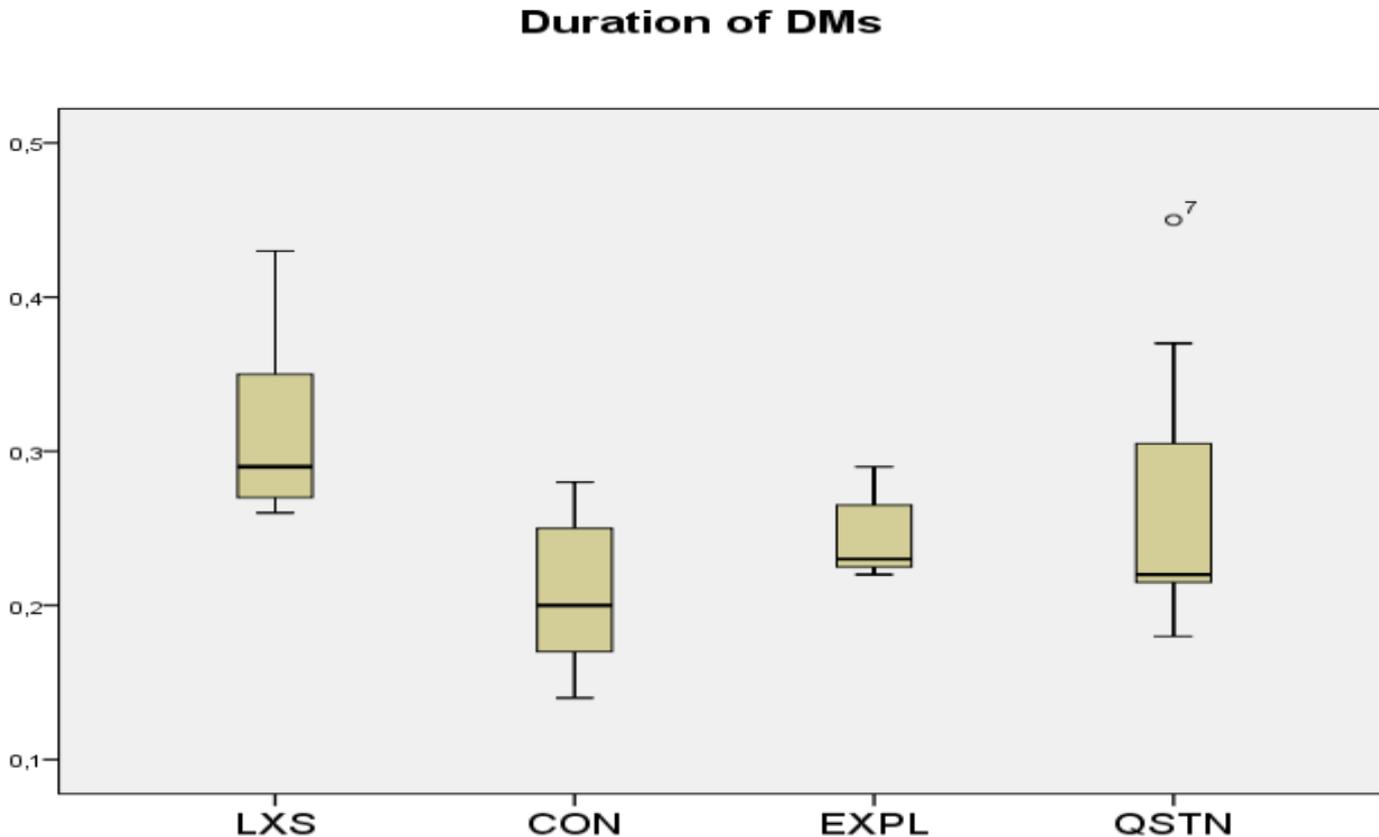
cons

# Querying the relation of duration and discourse function

Our hypothesis about the duration of the various functions of the DM *mondjuk* (*let's say*):

- Tokens of *mondjuk* (*let's say*) expressing *lexical search and approximation* is expected to be realized longer than tokens of *mondjuk* expressing *concession*

# Distribution of the duration of DMS with different functions



independent samples t-test on *mondjuk* (say): significant

independent samples t-test on *ugye* (is that so?): not significant

# Automatic silence annotation in Praat

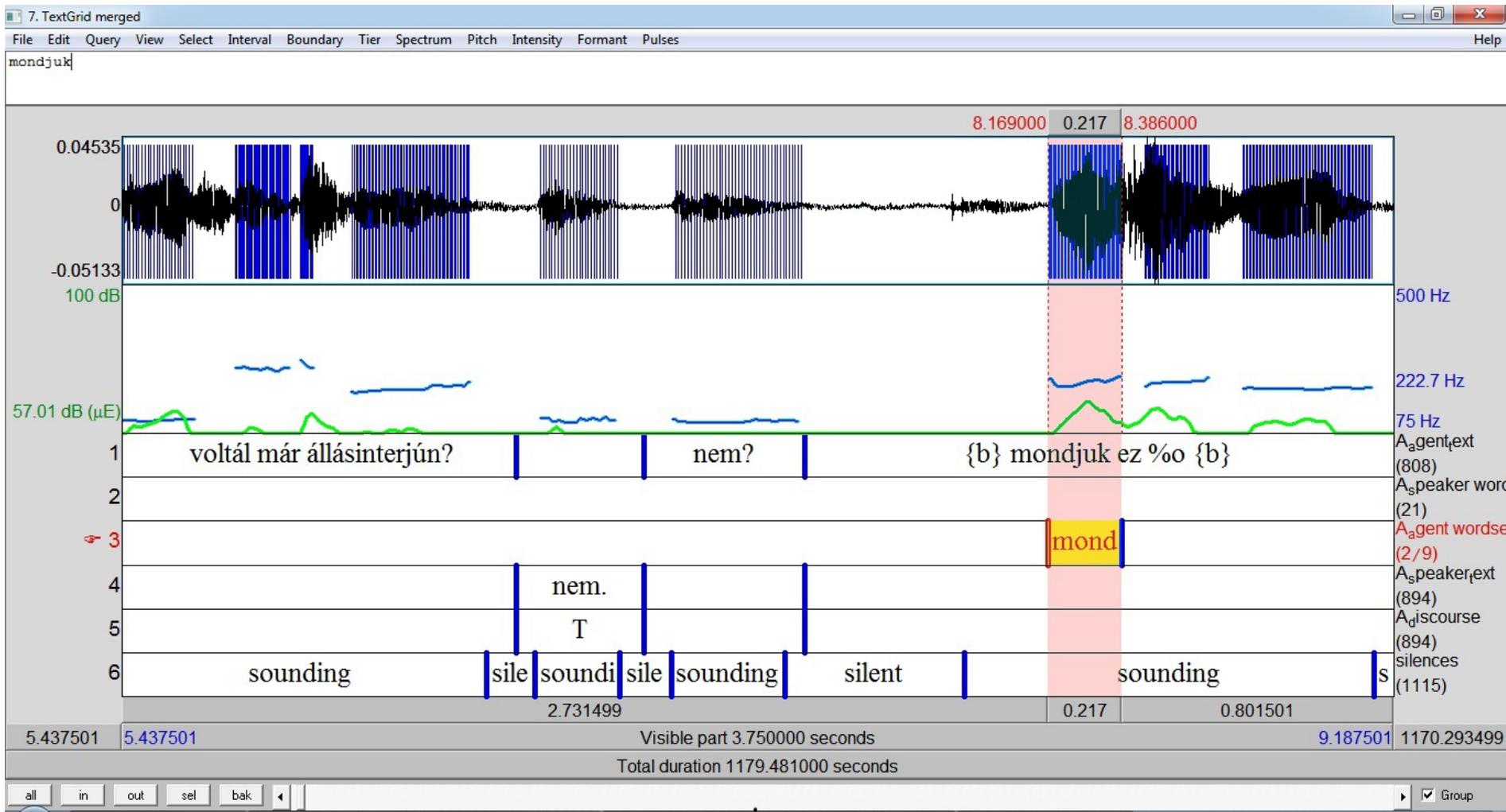
Silence annotation was performed following the segmentation of DMs with the aim to test the hypothesis if DMs are predominantly separated by pauses (as they are often described in the literature).

The phonetic parameters set for automatic silence annotation were as follows:

- minimum pitch: 100 Hz (subtract mean)
- time step: automatic (0,01 s)
- silence threshold: - 45 dB
- minimum silent interval duration: 0,2 s
- minimum sounding interval duration: 0,05 s

As a result, **the recordings were segmented into sounding and silent segments.**

# Automatic annotation into silent and sounding parts in Praat



# Querying results in ELAN – to see if *DM ugye* is preceded by pause/silence or not

The screenshot shows the ELAN Search interface with the following elements:

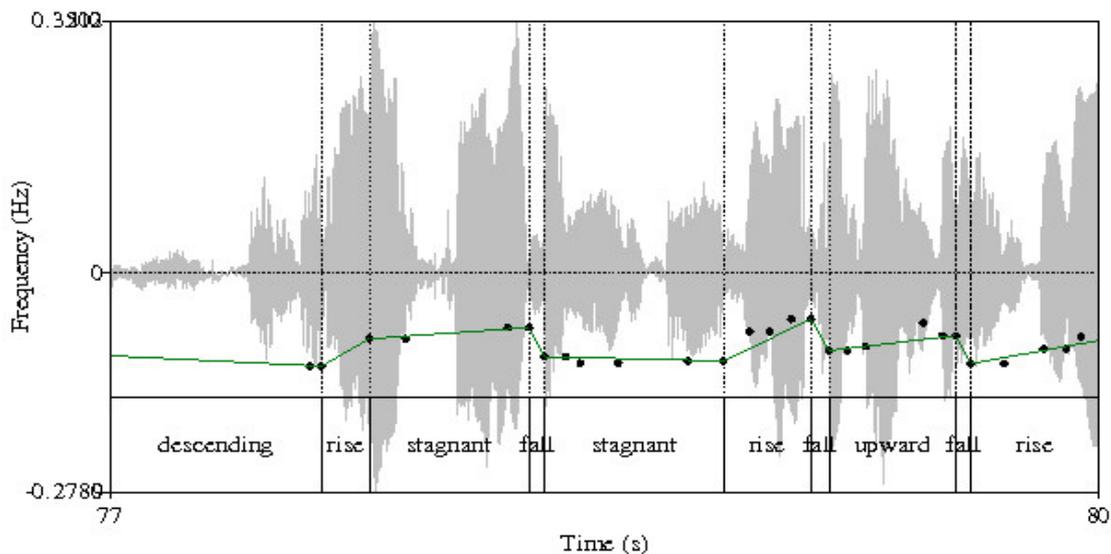
- Search eaf files** window title.
- Search tabs: **Substring Search**, **Single Layer Search**, **Multiple Layer Search**.
- Domain:** 22 eaf files (with **Define Domain** button).
- Query History:** < > New Query.
- Mode:** case insensitive (dropdown), regular expression (dropdown), Clear button.
- Filter buttons: Minimal Duration, Maximal Duration, Begin After, End Before.
- Search term: **ugye** (text input).
- Tier Name: **A\_speaker wordseg** (dropdown).
- Match type: **Surrounding** (dropdown).
- Constraint: **Must be in same file** (dropdown).
- Tier Name: **A\_speaker\_text** (dropdown).
- Buttons: Fewer Columns, More Columns, Fewer Layers, **More Layers** (circled).
- Status bar: Ready.
- Results list (circled):
  - begin time - begin time = X msec
  - begin time - begin time < X msec**
  - begin time - begin time > X msec
  - begin time - end time = X msec
  - begin time - end time < X msec
  - begin time - end time > X msec
  - end time - begin time = X msec
  - end time - begin time < X msec
  - end time - begin time > X msec
  - end time - end time = X msec
  - end time - end time < X msec
  - end time - end time > X msec
  - No constraint
- Search results (circled):

```
#1 |ugye| #2 |ugye ebben az új három éves képzésben, {b}|
#1 |ugye| #2 |úgyhogy az is ugye angol nyelven,|
#1 |ugye| #2 |{b} %o plusz ugye amhogy mondtam,|
#1 |ugye| #2 |mivel ugye budapesti cégről van szó,|
#1 |ugye| #2 |csak %o hát ugye még nem volt. |
#1 |ugye| #2 |én ugye hatosztályosba jártam,|
#1 |ugye| #2 |am%i tehát ilyen ugye három napos előiskola volt,|
#1 |ugye| #2 |ugye ahol %a először találkozott mindenki mindenkivel,|
#1 |ugye| #2 |és <és> ugye ki lettem közösítv%e,|
#1 |ugye| #2 |most ugye vége lesz a ~B ~A képzésnek,|
#1 |ugye| #2 |ugye sajnos értettem angolul,|
```

## Extracting prosodic features - Automatic prosodic annotation

We use a modified version of **Prosogram** (Mertens 2004) called **ProsoTool** (Hunyadi & al. 2012):

- ProsoTool uses dynamic, **speaker-dependent pitch range**
- it extracts F0 data and uses a **stylization method** to calculate more holistic trend-lines to describe the movement of pitch
- **pitch movement can be segmented along trend-lines (point to point) into blocks** for labelling
- the standard deviation of the pitch values is used as a threshold to classify the **pitch movement progress** using five simple categories:  
*rise, fall, upward, descending and stagnant*



# Two-layer search in ELAN

The screenshot shows the 'Search eaf files' window in ELAN. The 'Multiple Layer Search' tab is active. The search domain is '48 eaf files'. The search mode is 'case insensitive' and the search type is 'regular expression'. The search criteria are: 'amúgy' (Tier Type: wordseg) and '.+' (Tier Name: P\_pitchmovements). The search results are displayed in a list, showing 55 hits in 55 annotations. The first hit is highlighted, showing the search results for the first annotation.

Domain: 48 eaf files Define Domain

Query History: < > New Query

Mode: case insensitive regular expression Clear

Minimal Duration Maximal Duration Begin After End Before

Tier Type: wordseg

Overlap Must be in same file

Tier Name: P\_pitchmovements

Find Fewer Columns More Columns Fewer Layers More Layers

Found 55 hits in 55 annotations (of 244971) Ready Cancel

> Hit 1 - 11 of 55

```
#1 |amúgy| #2 |stagnant|
#1 |amúgy| #2 |stagnant|
#1 |amúgy| #2 |fall|
#1 |amúgy| #2 |rise|
#1 |amúgy| #2 |fall|
#1 |amúgy| #2 |stagnant|
#1 |amúgy| #2 |rise|
#1 |amúgy| #2 |stagnant|
```

# Three-layer searches in ELAN

Search eaf files

Substring Search | Single Layer Search | **Multiple Layer Search**

Domain: 48 eaf files Define Domain

Query History: < > New Query

Mode: case insensitive | **regular expression** Clear

Minimal Duration | Maximal Duration | Begin After | End Before

mondjuk | Tier Name: A\_speaker wordseg

Overlap | Must be in same file

T | Tier Name: A\_discourse

Overlap | Must be in same file

.+ | Tier Name: P\_pitchmovements

Find Fewer Columns More Columns Fewer Layers **More Layers**

Found 87 hits in 87 annotations (of 244971) Ready Cancel

< > Hit 33 - 40 of 87

- Show Frequency view
- Show Frequency view (by frequency)**
- Show hit in transcription
- Show info balloons
- Context Size
- Font
- Save hits
- Save hit statistics**

#1 |mondjuk| #2 |T| #3 |stagnant|  
#1 |mondjuk| #2 |T| #3 |fall|  
#1 |mondjuk| #2 |T| #3 |stagnant|  
#1 |mondjuk| #2 |T| #3 |rise|  
#1 |mondjuk| #2 |T| #3 |stagnant|

Domain: 22 eaf files Define Domain

Query History: < > New Query

Mode: case insensitive | regular expression Clear

Minimal Duration | Maximal Duration | Begin After | End Before

mondjuk  
 Overlap  
 .+  
 Overlap  
 T

Tier Type: wordseg  
 Must be in same file  
 Tier Name: P\_pitchmovements  
 Must be in same file  
 Tier Name: A\_discourse

Find Fewer Columns | More Columns | Fewer Layers | More Layers

Found 39 hits in 39 annotations (of 103522) Ready | Cancel

> Frequency 1 - 7 of 10

Percentage	Count
25,64%	10
15,38%	6
12,82%	5
10,26%	4
10,26%	4
7,69%	3
7,69%	3

**Annotation**

- #1 |mondjuk| #2 |stagnant| #3 |T|
- #1 |mondjuk| #2 |stagnant| #3 |T\_K|
- #1 |mondjuk| #2 |stagnant| #3 |T\_G|
- #1 |mondjuk| #2 |rise| #3 |T|
- #1 |mondjuk| #2 |stagnant| #3 |K\_T|
- #1 |mondjuk| #2 |rise| #3 |K\_T|
- #1 |mondjuk| #2 |rise| #3 |T\_K|

# Single layer search in ELAN using regular expressions (concordance view)

The screenshot shows the 'Search eaf files' window in ELAN. The 'Single Layer Search' tab is selected. The domain is set to '48 eaf files'. The query history shows a 'New Query'. The search mode is 'N-gram within annotation', the search is 'case insensitive', and the search type is 'regular expression'. The search query is '# mondjuk'. The search results show 'Found 284 hits in 279 annotations (of 244971)'. The first hit is displayed in a concordance view, showing the search results for the query '# mondjuk' across multiple tiers of the annotation.

Domain: 48 eaf files

Query History: < > New Query

Mode: N-gram within annotation case insensitive regular expression

Find # mondjuk All Tiers

Found 284 hits in 279 annotations (of 244971) Ready Cancel

> Hit 1 - 18 of 284

%s vágom de- {b} %o bárhonnán? hát mondjuk sertéstelepen nem {} szívesen dolgoznék. {b} de végülis so- <sok> mindent megtudok csinálni bár a  
ír \*papírgyárba. nem- egyszerűen azt nem bírok állni. és akkor egyfolytában egy dolgot csinálni. {b} mondjuk a szellemi monoton munka is más azért szerintem, de- az még megy. %s {b} hát szívesen %o -- %  
%s {p} %s [] %s {p} mondjuk szí- %o (()) konkrétan ez a rendszergazdai állás ez- sze- <szerezném> csinálni, ez tetszik nekem,  
ilyen, %s konkrétan olyan %o {b} pozícióba, hogyha szólnak, akkor én megyek és megcsinálom. bár mondjuk %o vegyük számítástechnikai problémát. %s egy az, hogy nyugis. ha nincs probléma,  
nem vagyok az a típus. {b} é% s ezt én %o egyáltalán nem szeretem, mikor valaki így %o {b} akar, mondjuk %o pozíciót feljebb váltani. vagyis előléptetést szerezni ezzel, hogy- m% nem szeretem általában  
szív módon természetesen de - {b} eleinte csak figyelmeztetek hogyha %s olyan az ember. vagy ha mondjuk vele% m %m. szemetek azt én nem szeretem {b} először figyelmeztetek, hogy fejezték be de ,ho  
%s természetesen megfogadom. %s azt úgy csinálom ahogy ő akarja de mondjuk hogyha tudom, hogy igazam van, mondjuk hogy egy problémát így kell megoldani és akkor %a be ke  
azzal jární ó egyébként kicsi, ötven köbcentis de mondjuk apa, <apa> akar venni majd egy nagy motort azt majd- tehát úgy hogy apának meg nekem, egyet  
[] %s ilyen nagyon <nagyon> na- %sz- szomorú- %s na mondjuk akkor mondjuk azt amikor nagyon kicsi voltam még vegyük azt ,amikor ha- hát- nagyon kicsi voltam  
[] %s ilyen nagyon <nagyon> na- %sz- szomorú- %s na mondjuk akkor mondjuk azt amikor nagyon kicsi voltam még vegyük azt ,amikor ha- hát- nagyon kicsi voltam még. %s ak  
hogy a szememet ki ne vigye a talicska lába [] %s úgy hogy ez -- e e <ez> volt eddig a {b} mondjuk megnéztem volna magamat hogy o <hogy> akkor mit vágtam le %s %s  
%s ibrányi úgyhogy ő volt osztálytársam, vele járunk el. bulizni mondjuk- tegnap is úgy volt, hogy megyünk bulizni csak hát- végülis nem volt kedvünk. mert, szobatársaim  
én nevelkedtünk de azok jobban tetszenek ezek a coco jumbo michael jackon meg ezek a az új számok mondjuk nekem még mindig az tetszik de azok jobban tetszenek. mondjuk ezek a [English: Coco Jumbo], [  
%s {p} hát ami, a \*mer akkor emlékeznek rá %s {b} hát mondjuk volt egy érdekes. mikor egyszer aludtam {b} és úgy elfeküdtem \*asziszemem a jobb karomat, hogy :  
{b} azt aki- én nem hiszek benne azt akiben nem hiszünk isteniten%i könyörögni hozzá. {b} mondjuk, csináltunk egy két érdekes dolgot a templomba amikor haverom hozta a nagyképernyős telefonját és akk  
{b} mesélj nekem a legboldogabb emlékedről! %s %s hát vagy e- hát ami mondjuk a legelevenebben él ben- %s na. milyen motor?  
tudom ő azt tudom hogy hát az izét a rutint azt ilyen százhuszonöt köbcentis MZ-vel kellett csinálni hát mondjuk a kettő ötvenes amivel viszont gyakoroltunk az kettő ötvenes volt és azok között voltak ilyen tragacs é  
nt> azt ilyen százhuszonöt köbcentis %o %s 'MZ'-vel kellett {} csinálni {} {b} az még jó vol- {b} h%át mondjuk a kettőötvenes tehát ,ami <amivel> viszont gyakoroltunk az kettőötvenes volt. {b} és azok között v

# Frequency view of the search '# mondjuk' by frequency in decreasing order

The screenshot shows the 'Search eaf files' application interface. The search query is '# mondjuk'. The results are displayed in a table with columns for Percentage, Count, and Annotation. The results are sorted by frequency in decreasing order.

Domain: 22 eaf files

Query History: < > New Query

Mode: N-gram within annotation case insensitive regular expression

Find # mondjuk All Tiers

Found 110 hits in 107 annotations (of 103522) Ready Cancel

> Frequency 1 - 16 of 58

Percentage	Count	Annotation
12,15%	13	{b} mondjuk
10,28%	11	de mondjuk
10,28%	11	hát mondjuk
5,61%	6	tehát mondjuk
3,74%	4	az mondjuk
3,74%	4	meg mondjuk
1,87%	2	%o mondjuk
1,87%	2	<az> mondjuk
1,87%	2	alatt mondjuk
1,87%	2	hogy mondjuk
1,87%	2	hogyha mondjuk
1,87%	2	{p} mondjuk
0,93%	1	%o +mondjuk
0,93%	1	(()) mondjuk
0,93%	1	((kök)) ((mondjuk))
0,93%	1	*mer mondjuk

# Single layer search in ELAN using regular expressions (concordance view)

The screenshot displays the ELAN search interface. At the top, there are three tabs: "Substring Search", "Single Layer Search" (which is selected), and "Multiple Layer Search". Below the tabs, the "Domain" is set to "48 eaf files". The "Query History" section shows a "New Query" button and navigation arrows. The "Mode" section includes a dropdown menu set to "N-gram within annotation", a "case insensitive" checkbox, and a dropdown menu set to "regular expression". The search input field contains "mondjuk #" and is circled in red. To its right, the "Tier Name" dropdown is set to "A\_agent\_text" and is also circled in red. Below the search bar, a status bar indicates "Found 187 hits in 183 annotations (of 244971)". A "Ready" progress bar is visible. The main area shows a concordance view with a list of search results. The first result is highlighted, and a context menu is open over it. The menu options are: "Show Frequency view", "Show Frequency view (by frequency)" (circled in red), "Show hit in transcription", "Show info balloons", "Context Size", "Font", "Save hits", and "Save hit statistics". The search results text includes various Hungarian sentences with the search term "mondjuk" highlighted in bold.

# Frequency view of the search 'mondjuk #' by frequency in decreasing order

Search eaf files

Substring Search | Single Layer Search | Multiple Layer Search

Domain: 48 eaf files Define Domain

Query History: < > New Query

Mode: N-gram within annotation | case insensitive | regular expression

Find: mondjuk # Tier Name: A\_agent\_text

Found 187 hits in 183 annotations (of 244971) Ready Cancel

> Frequency 1 - 17 of 98

Percentage	Count	Annotation
6,56%	12	mondjuk a
6,01%	11	mondjuk egy
5,46%	10	mondjuk én
4,37%	8	mondjuk ez
4,37%	8	mondjuk így
3,83%	7	mondjuk az
3,83%	7	mondjuk nem
3,28%	6	mondjuk %o
2,73%	5	mondjuk nekem
2,73%	5	mondjuk ott
2,19%	4	mondjuk ha
1,64%	3	mondjuk {b}
1,64%	3	mondjuk úgy
1,09%	2	mondjuk *azér
1,09%	2	mondjuk ezek
1,09%	2	mondjuk hát
1,09%	2	mondjuk igen,

## After the queries:

### statistical tests were performed on the data in SPSS 19.0

**Descriptive and inferential statistical tests**, including Pearson's chi-square test, Fischer's exact test, Crosstabs test, independent samples t-test, paired t-test, and drawing box plot graphs.

Descriptive statistical tests simply measured the **frequency** of the use of the selected items based on gender, speaker role (interviewer or interviewee) and situation type (job interview or job interview).

Pearson's chi-square test, Fischer's exact test and Crosstabs test were performed to decide if there is a **relationship** between two categorical variables (e.g. between thematic role and pitch movement, utterance position and pitch movement, discourse function and hand movement, etc.).

Conclusions: The results of a multiple layer search: prototypical sets of features of the canonical uses of *mondjuk* (say) performing its two different functions

	Lexical search, approximation	Concession
HAND GESTURES	no	yes
GAZE DIRECTION	upwards	other than upwards
FACIAL EXPRESSION	recall	other than recall
DURATION	> 250 ms	< 250 ms
PRECEDING PAUSE	< 150 ms	> 150 ms

Conclusions: prototypical sets of features of the canonical uses of *ugye* (*is that so?*) expressing two different functions

	Evidentiality marking in explanations	Tag question use: asking for reassurance
HAND GESTURES	yes	no
GAZE DIRECTION	shifting gaze, more often averted	forwards, eye contact
PITCH MOVEMENT (in the clause)	non-rising	rising
POSITION	non-turn-final	turn-final
F0 range (during uttering the word)	< 30 Hz	> 30 Hz

These findings should be tested on larger data sources and may serve as a springboard for further theoretical modelling (such as organizing features into decision trees to semi-automatically distinguish different senses of words).

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Thank you for your attention.

