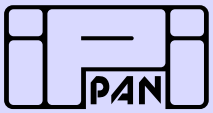
The tools for morphological description of Polish developed & used at IPI PAN

Marcin Woliński



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Outline

1. Morfeusz – a morphological analyser for Polish
2. Dictionary of proper names developed at IPI PAN
3. Development plans for Morfeusz

The task of morphological analysis

Morphological analysis — interpretation of words as grammatical forms.

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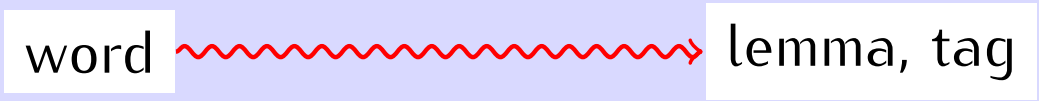

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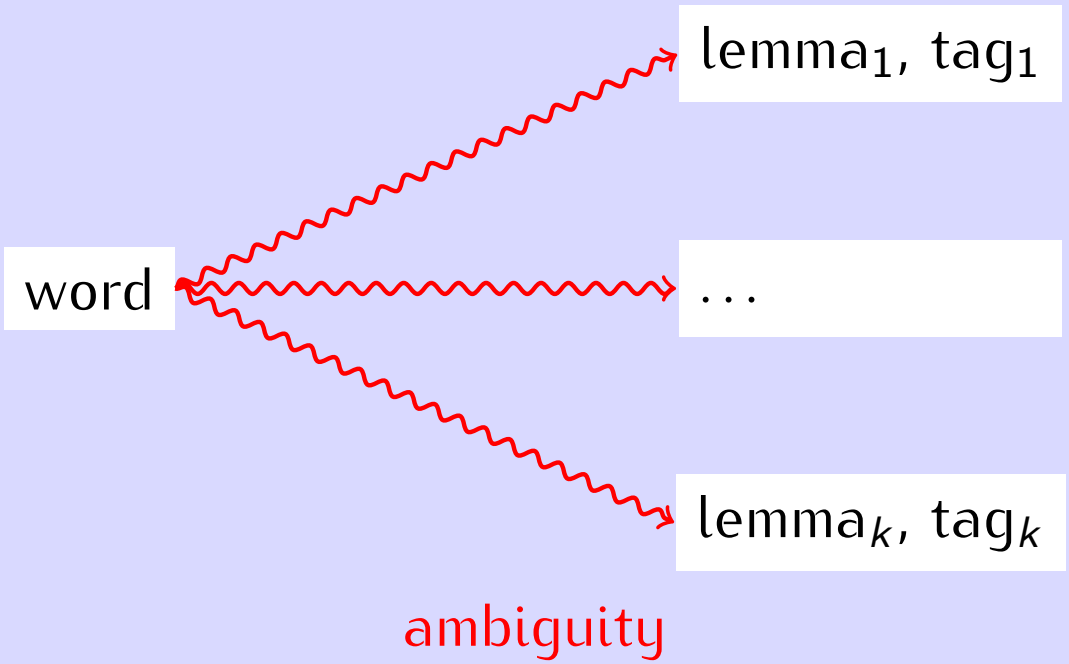
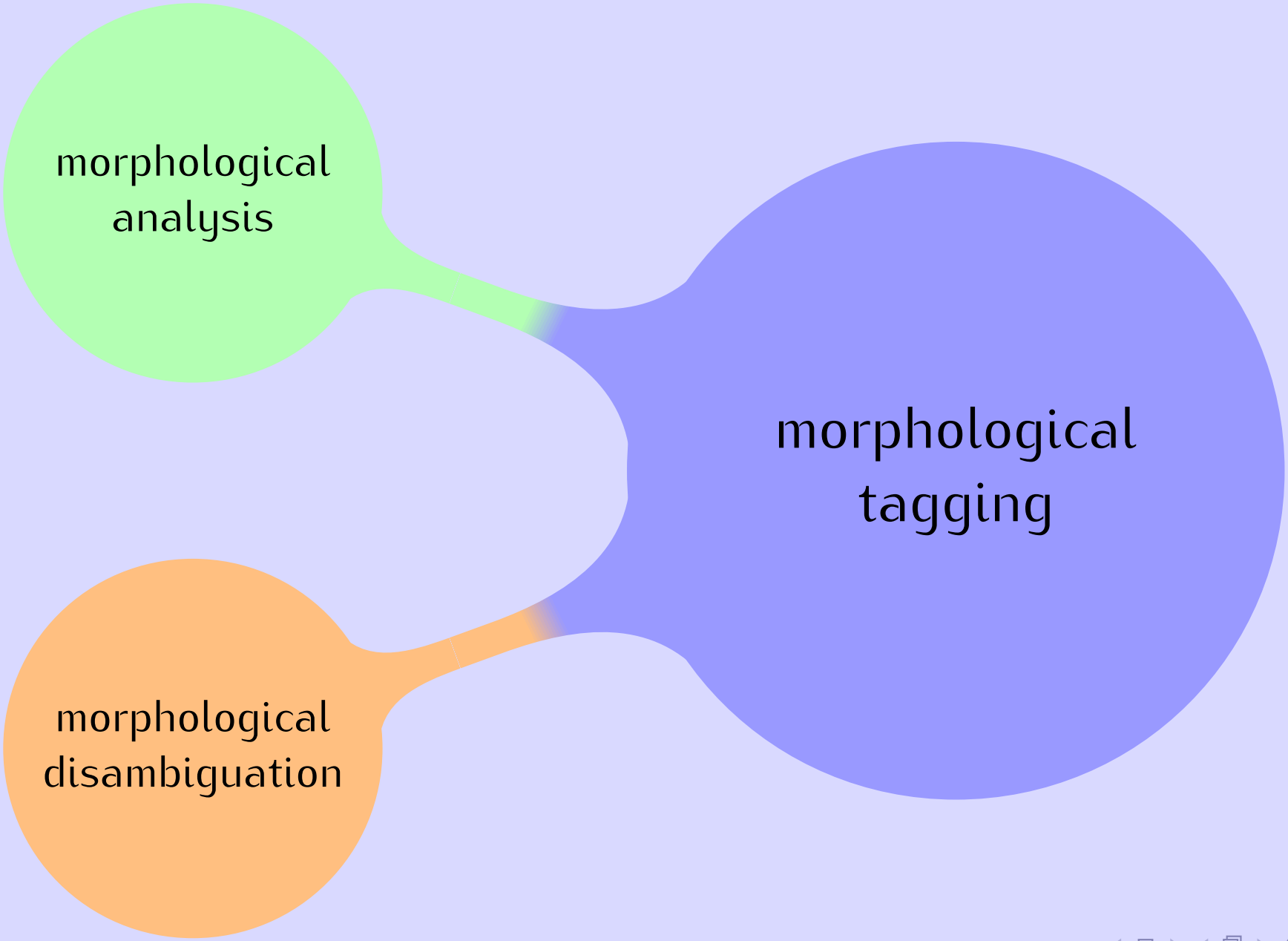
Morphological analysis — interpretation of words as grammatical forms.




morphological analysis
morphological tagging
morphological disambiguation

Morfeusz

Morfeusz is a morphological analyser for Polish developed by Marcin Woliński using linguistic data provided by prof. Zygmunt Saloni.

Morfeusz is available for free for non-commercial and research purposes.

`http://nlp.ipipan.waw.pl/~wolinski/morfeusz/`

The *Morfeusz* library

- *Morfeusz* is provided as Linux shared object file (`.so`) and MS Windows dynamic link library (`.dll`).
- Simple programming interface: a function that takes a piece of text as an argument and returns a table of interpretations.
- The programming interface is in C for portability between compilers.
- Additional modules for using *Morfeusz* in programs written in Perl, SWI Prolog, SICStus Prolog, Java (by Dawid Weiss), and PHP (by Piotr Wilkin).
- Input/output possible in UTF-8, ISO 8859-2, CP1250, and CP852.

Tokarski's description of Polish inflection

Jan Tokarski

Schematyczny indeks a tergo polskich form wyrazowych,
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Sample lemmatisation rules:

-kście	*mIV LV*	-kst	kontekście, tekście, mikście	(6)
-kście	*żIV D*	-ksta	sekście	

An example analysis

Lemmatisation rules matching the word **czystkom**:

-kom	*mIII lD*	-ek	czystek
-kom	*mIII lD*	-k	czystk
-kom	*mIV N*	-kom	czystkom
-kom	*nII lD*	-ko	czystko
-kom	*nVI lD*	-kum	czystkum
-kom	*żIII lD*	-ka	czystka
-kom	*żIII(m) lD*	-ko	czystko
kom	*żIV lG*	koma	czystkoma
-kom	*blp lD*	-ka	czystka
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Tokarski's index in *Morfeusz*

Lemmatisation rules matching the lemma **czystka** *żIII*:

czystka	-tka	*żIII*	*N*	-tka
czystki	-tki	*żIII*	*GlNTV*	-tka
czystce	-tce	*żIII*	*DL*	-tka
czystkę	-kę	*żIII*	*T*	-ka
czystką	-ką	*żIII*	*I*	-ka
czystko	-tko	*żIII*	*V*	-tka
czystek	-tek	*żIII*	*lG*	-tka
czystkom	-kom	*żIII*	*lD*	-ka
czystkami	.ami	*S lI*	⇒ .om	*S lD*

The core dictionary of *Morfeusz*

...		
kontekstu	1	subst:sg:gen:m3
konteksty	1	subst:pl:nom.acc:m3
kontekstów	2	subst:pl:gen:m3
kontekście	4st	subst:sg:loc.voc:m3
kontem	2o	subst:sg:inst:n1.n2
...		

The lemmas in the list are provided implicitly.
E.g., *4st* above means: to get the lemma for *kontekście* strip the last 4 letters and replace them with *st*.

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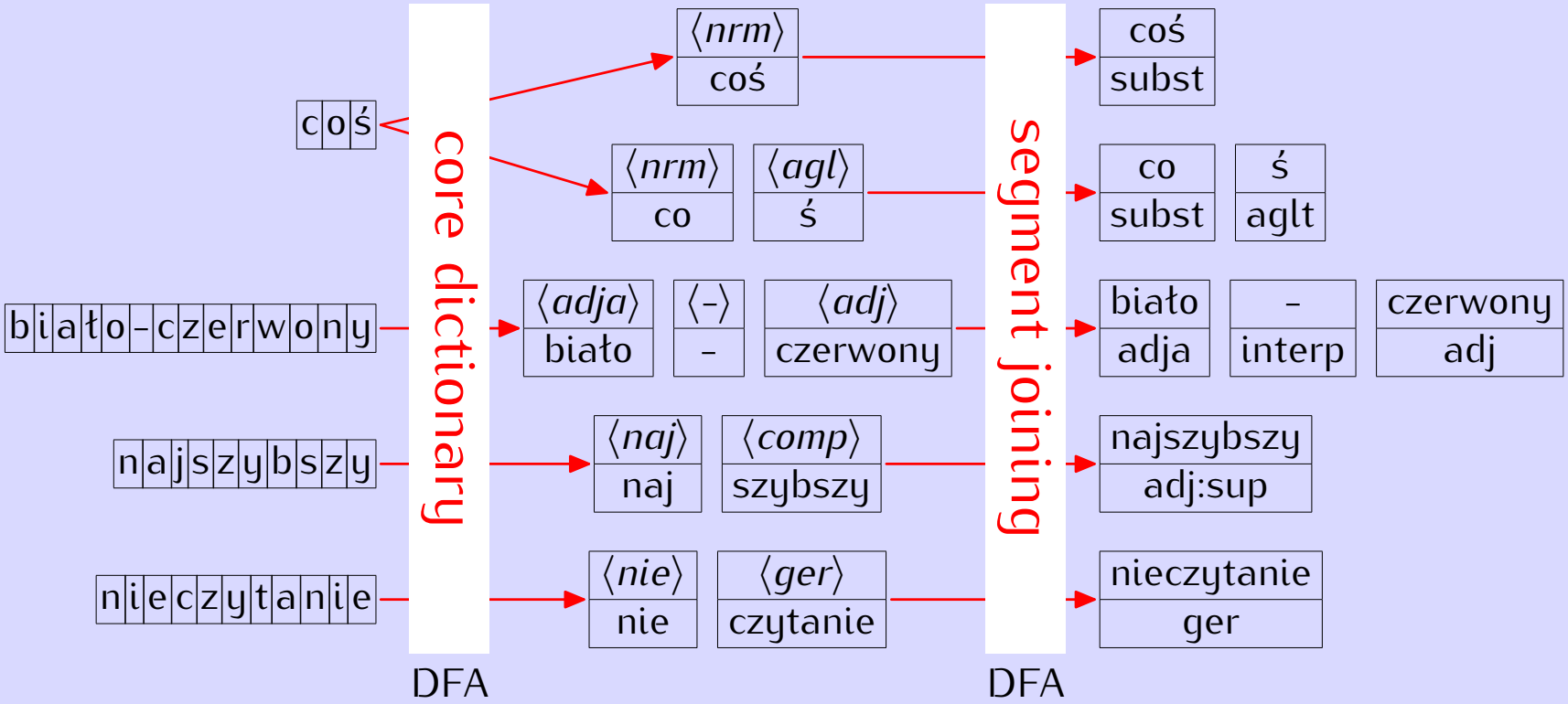
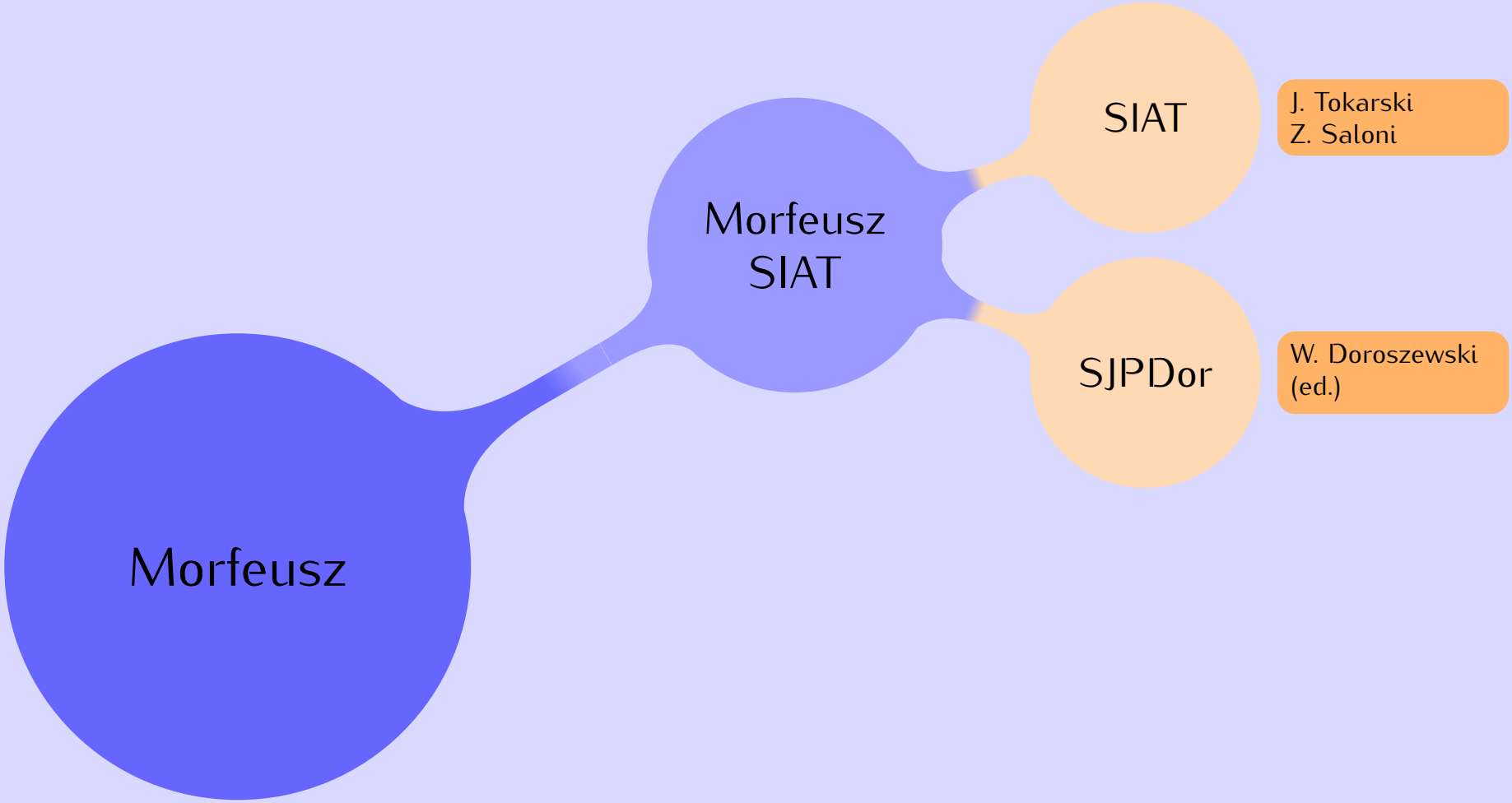
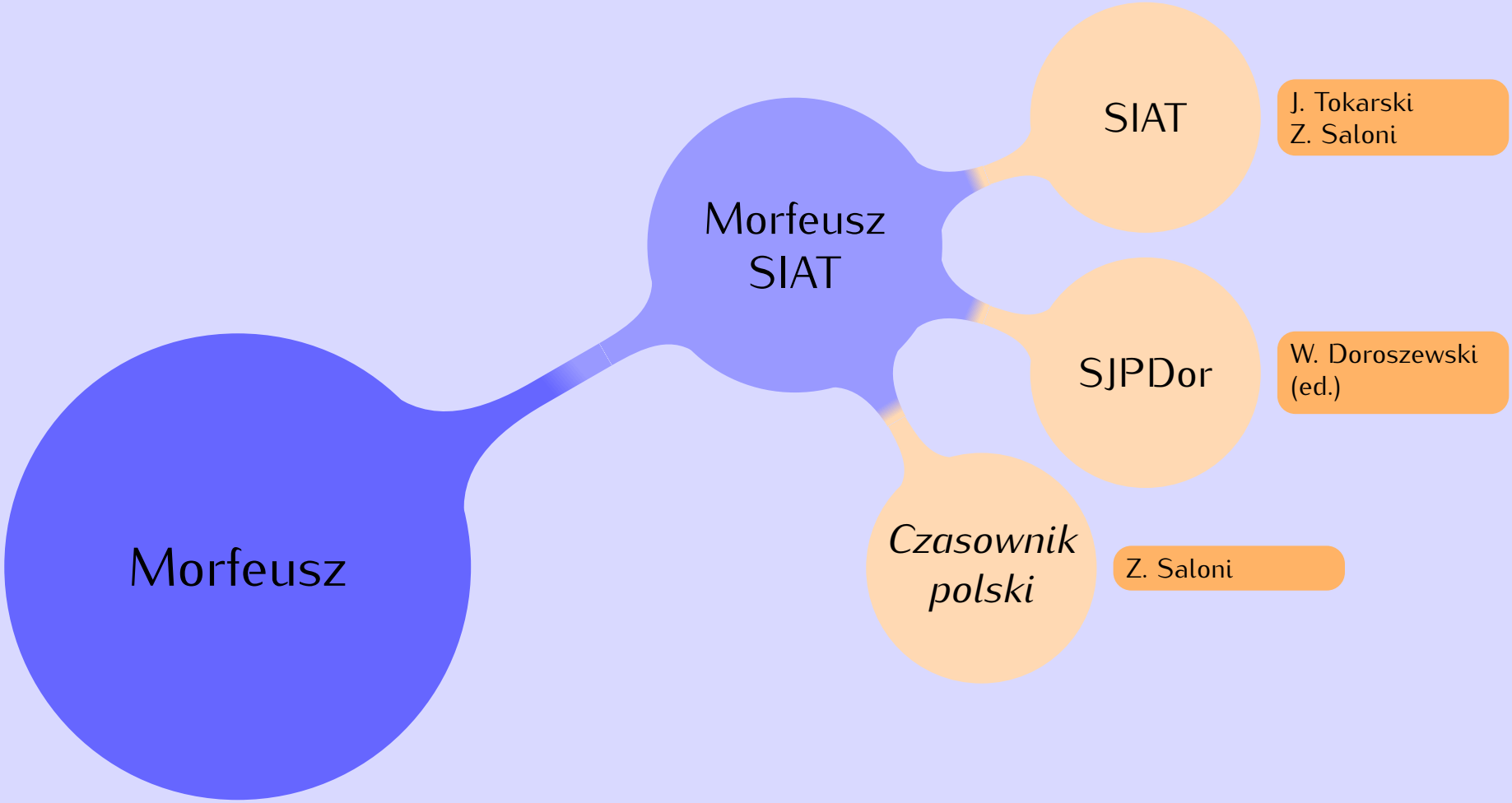
...		

Tags in the dictionary are in accordance with The IPI PAN Tagset developed for annotation of The IPI PAN Corpus.

The representation of the linguistic data in *Morfeusz*




Morfeusz
Morfeusz SIAT
SIAT
J. Tokarski
Z. Saloni
SJPDor
W. Doroszewski
(ed.)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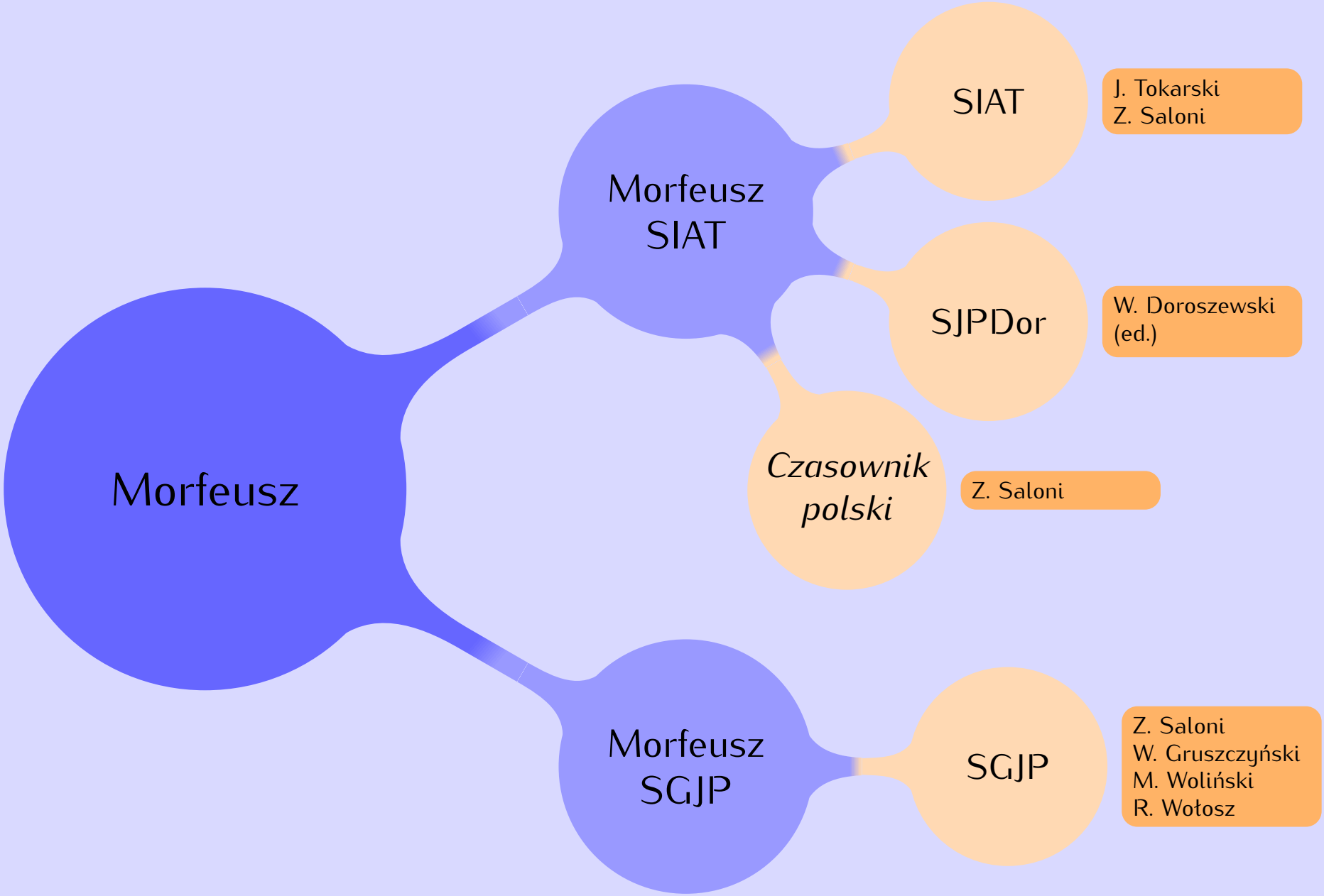
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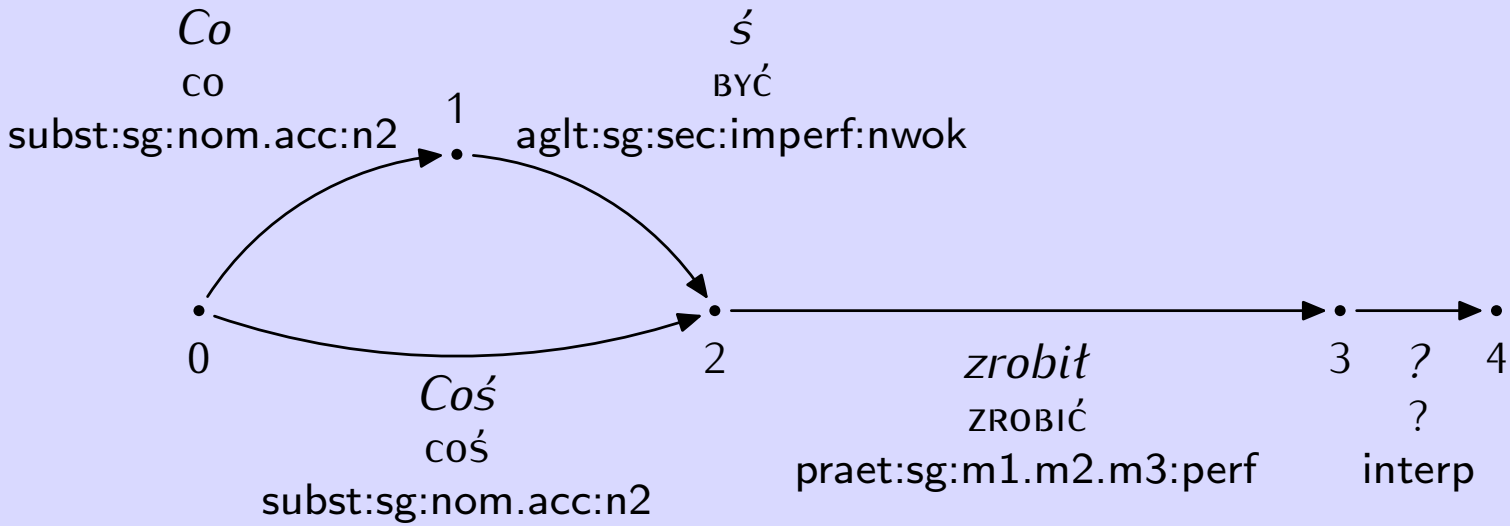
Morfeusz SGJP
SGJP
Z. Saloni
W. Gruszczyński
M. Woliński
R. Wołosz

Morfeusz SIAT in numbers

- about 115,000 lexemes in the dictionary,
- about 1,700,000 different Polish words,
- about 35,000 words per second (on Pentium IV 2GHz),
- recognises

running words	word types	corpus
96.6%	87.0%	Frequency Dictionary of Polish (0.5 Mw)
95.7%	69.0%	The IPI PAN Corpus (v. 1.0, 85 Mw)

The representation of the results of an analysis



- **nodes** — positions in the text (between tokens)
- **edges** labelled with possible token interpretations

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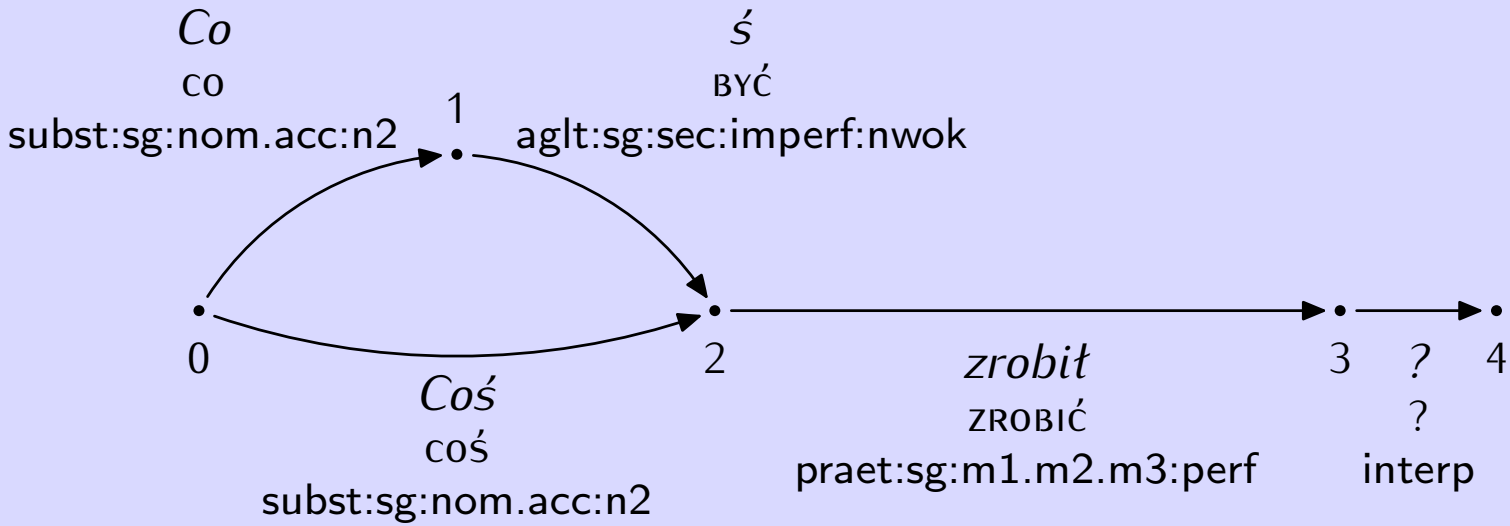

0	1	*Co*	CO	subst:sg:nom.acc:n2
1	2	*ś*	BYĆ	aglt:sg:sec:imperf:nwok
0	2	*Coś*	COŚ	subst:sg:nom.acc:n2
2	3	*zrobił*	ZROBIĆ	praet:sg:m1.m2.m3:perf
3	4	*?*	?	interp

A dictionary of proper names developed at IPI PAN

- Contains words from the IPI PAN Corpus which were unknown to *Morfeusz SIAT*. Most of them are proper names (about 90%).
- For those words complete lexemes are created by a group of lexicographers.
- For cross-validation each word is processed (at least) by two persons.
- About 5000 lexemes already in the dictionary.

Features contained in the dictionary

- grammatical class

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- grammatical class
- gender for nouns, aspect for verbs

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- grammatical class
- gender for nouns, aspect for verbs
- inflection

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- grammatical class
- gender for nouns, aspect for verbs
- inflection
- common or proper
  - common
  - first name
  - last name
  - geographical name
  - name of an institution or organisation
  - other proper name

Features contained in the dictionary

- grammatical class
- gender for nouns, aspect for verbs
- inflection
- common or proper
  - common
  - first name
  - last name
  - geographical name
  - name of an institution or organisation
  - other proper name
- kind of language
  - general
  - archaic
  - local dialect

The tool used

- Web-based application named *Kuźnia leksemów* (*Lexeme forge*).
- Coded in PHP by Daniel Janus.
- Data gathered in an SQL database.
- Inflectional patterns for Polish nouns developed by Włodzimierz Gruszczyński are used to ease entering of inflectional forms.
- Lexicographers answer questions asked by the program.

Development plans for *Morfeusz*

Long needed changes:

- case-sensitivity,
- abbreviations,
- distinguishing of homonyms,
- morphological guesser,
- features of proper names,
- small changes in the tagset: parts of multi-word idioms, a more detailed classification for non-inflecting lexemes, ordinal numerals (?),
- ability to attach additional (special purpose) dictionaries.

Homonyms

- Same lemma, different inflection:
  - BAL (ball, dance): `subst:sg:gen:m3` *balu*
  - BAL (log of wood): `subst:sg:gen:m3` *bala*
- Same lemma, same inflection, different meaning:
  - PARA (pair)
  - PARA (steam)

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Only the first case needs to be distinguished by Morfeusz with homonym numbers: BAL 1 and BAL 2, or perhaps BAL;-U and BAL;-A.

Do we need information on the case of letters?

- Przyszedł Jan Biały.
- Przyszedł Jan biały jak śnieg.

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Proposed values for case: lower, required capital, facultative capital, all caps(?), lower-that-should-be-capital(?), mixed(?).

Features in *Morfeusz*'s output

from	to	word	lemma	tag
0	1	*Co*	CO	subst:sg:nom.acc:n2
1	2	*ś*	BYĆ	aglt:sg:sec:imperf:nwok
0	2	*Coś*	coś	subst:sg:nom.acc:n2
2	3	*zrobił*	ZROBIĆ	praet:sg:m1.m2.m3:perf
3	4	*?*	?	interp

Proposed new set of features in *Morfeusz*'s results

- from
- to
- word
- lemma
- homonym identifier
- tag
- is_proper
- case
- source (main dictionary, guesser, domain dictionary, dialect, archaic, ...)

Bibliography

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In Mieczysław Kłopotek, Sławomir Wierzchoń, and Krzysztof Trojanowski, editors, *Intelligent Information Processing and Web Mining, IIS:IIPWM'06 Proceedings*, pages 503–512. Springer, 2006.