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# Verb-Noun Collocations in PolNet 2.0

## by

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**Our intention is to present the context of our work on Polish verb-noun collocations which is PolNet**

The project (of extending PolNet with predicative synsets) is a part of a **long term program** of designing and implementing a Lexicon Grammar for Polish.

# Lexicon Grammar

**Lexcon Grammar is an idea of semantic grammar introduced by Maurice Gross under the influence of Zellig Harris**

**Maurice Gross started working on LGs in late 1960s**
"…the basic unit of meaning is the elementary sentence rather than the word" therefore
in order to describe a predicative word it is necessary to take into account properties of the class of elementary sentences that one can built using this word as predicate.

Thus:
- the predicative words should be described in terms of syntactic and semantic properties of elementary sentences (valency structure)

Gross implemented the LG for French in form of "syntactic tables".

## Syntactic tables

A fragment of the syntactic table for the class "noms de maladies" /deseases/, after J. Labelle in "Grammaire des noms de maladie", Langue française, No 69, 1986, p. 108-125

J. LABELLE

EXTRAITS DE LA TABLE ANM
ex. : *avoir une bronchite*
(326 expressions)

| DÉTER-MINANTS | | | | Nmal | VERBES SUPPORTS | | | | | | OPÉRATEURS | | | | | | MORPHOLOGIE | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | CAUSATIFS | | CURATIFS | | | | | | | |
| UN + UNE | ATTAQUE DE | LE LA | DU DE LA | | $N_0$ ATTRAPER Nmal | $N_0$ FAIRE Nmal | $N_0$ COUVER Nmal | $N_0$ TRAÎNER Nmal | $N_0$ SE TAPER Nmal | $N_0$ SOUFFRIR DE Nmal | $N_0$ hum DONNER Poss° Nmal à $N_2$ | $N_0$ nr DONNER Nmal à $N_2$ | COLLER+FLANQUER Nmal | $N_0$ GUÉRIR $N_1$ DE Nmal | $N_0$ DÉBARRASSER $N_1$ DE Nmal | $N_0$ SOIGNER $N_1$ POUR Nmal | Nmal =: N pc - SFX | SFX=: | Ê ê ê TRE N - ( a + V pp ) | $N_0$ SFX=: |
| + | + | + | − | APPENDICITE | + | + | + | + | + | + | − | + | + | + | + | + | + | -ite | − | |
| + | + | − | + | BRONCHITE | + | + | + | + | + | + | + | + | + | + | + | + | + | -ite | + | -ique |
| + | − | − | + | CIRRHOSE | + | + | − | + | + | + | − | + | + | + | + | + | − | | + | -ique |
| − | − | − | + | EMPHYSÈME | − | + | − | + | + | + | − | + | + | + | + | + | − | | + | -ateux |
| + | − | − | − | ÉTOURDISSEMENT | − | − | − | − | − | − | − | + | + | − | − | − | − | | − | |
| + | − | − | − | EXTINCTION DE VOIX | + | − | − | + | + | + | − | + | + | + | + | + | − | | − | |
| − | + | + | + | FIÈVRE | + | + | − | + | + | + | − | + | + | + | + | + | − | | + | -eux |
| + | − | − | + | GASTRITE | + | + | − | + | + | + | − | + | + | + | + | + | + | -ite | − | |
| + | − | + | − | GRIPPE | + | + | + | + | + | + | + | + | + | + | + | + | − | | + | -é |
| − | − | − | + | HYPERACIDITÉ | + | + | − | + | + | + | − | + | + | + | + | + | − | | − | |
| − | − | − | + | HYPOGLYCÉMIE | − | + | − | + | + | + | − | − | − | + | + | + | − | | + | -ique |
| + | − | − | − | INDIGESTION | + | + | − | + | + | + | − | + | + | + | + | + | − | | − | |
| − | + | + | − | LÈPRE | + | − | − | − | − | + | + | + | + | + | + | + | − | | + | -eux |
| − | − | + | − | MAL DE L'AIR | + | − | − | + | + | + | − | + | + | + | + | + | − | | + | |
| + | + | + | − | MIGRAINE | + | − | + | + | + | + | − | + | + | + | + | + | − | | + | -eux |
| | | | | ... | | | | | | | | | | | | | | | | |

# Lexicon Grammar – similar approaches

**In 1970s a Polish slavist, Kazimierz Polański, started (independently of Gross) his monumental description of Polish verbs (7,000) according to syntactic-semantic criteria**

Kazimierz Polański (ed.). 1992. *Słownik syntaktyczno-generatywny czasowników polskich* vol. I-IV, Ossolineum, Wrocław,1980-1990, vol. V, Kraków./* Syntactic-generative dictionary of Polish verbs */

**MAMIĆ /* to lead on*/**
**I. 'działać łudząco, bałamucić, zawodzić, tumanić'**
**1. NP1(N) __ NP1(ACC) + (NP(I))**
**2. NP2(N) __ NP2(ACC)**
**NP1(N)** → **[+Hum]**
**NP1(ACC)** → **[+Hum]**
**NP(I)** → **[-Abstr, -Anim][+Abstr]**
**NP2(N)** → **[-Abstr, -Anim][+Abstr]**
**NP2(ACC)** → **[oczy][wzrok][+Hum]**
**/* notation simplified, examples of use omitted*/**

**Semantic features used by Polański**

| | |
|---|---|
| [+Abstr] – abstract | [Fl] – plant |
| [-Abstr] – concrete | [Inf] – information |
| [+Anim] – animate | [Instit] – institution |
| [-Anim] - non-animate | [Instr] – instrument |
| [+Hum] - human | [Liqu] – liquid |
| [-Hum] - non-human | [Mach] – machine |
| [Coll] – collective | [Mat] – material |
| [Elm] – element | [Pars] – part |

------------------------------------------------------------------------------------------------

**Recently: FrameNet (Fillmore, …) and VerbNet (Palmer, …)**

**NOW, in my lab,
we implement the Polish lexicon-grammar
as a wordnet (PolNet)**

# Princeton WordNet (PWN)

**Wordnet technology** started in 1985 with (Princeton) WordNet. It is a lexical database for the **English** language designed in the Cognitive Science Laboratory **(Princeton University, George A. Miller).**

**Organising concepts:**
- synsets (classes of synonyms)
- hierarchical relations (hyponymy/hyperonymy)

**Nowadays: over 200,000 synsets (word-senses)**

**In computer science WordNet (PWN) and similar resources are often used as ontologies**

**Euro WordNet**

EuroWordNet is a system of PWN-inspired wordnets for several European languages, interconnected with interlingual links stored in the ILI (Interlingual Index).(www.illc.uva.nl/EuroWordNet/) (P. Vossen)

**Balknet**

Has produced WordNets for six European languages (Bg, Cz, Gr, R, T and Srb). DEBVisDic client-server wordnet development tool. (D. Christodoulakis, K. Pala, D. Tufis)(www.dblab.upatras.gr/balkanet/)
................

**many other (GermaNet…)**
................

**PolNet (UAM, Poznań) and plWordnet (TU Wrocław)**

PolNet - Polish wordnet developed at the UAM since 2006 (www.amu.edu.pl/~vetulani)

# Inspirations for PolNet 1.0 and 2.0

**Projects:**
PWN (Miller, Fellbaum),
Euro WordNet (Vossen),
Balkanet EU (Pala, Vitas)
FrameNet (Fillmore),
VerbNet (Palmer),
Lexicon-Grammar (Gross).

**Resources and tools:**
Traditional dictionaries of Polish,
″Syntactic-Generative dictionary of Polish Verbs″ (Polański),
Dictionaries of predicative nouns and collocations (Grażyna Vetulani)
DEBVisDic (Pala, Czech Republic))
IPI PAN Corpus for Polish  (Przepiórkowski et al.)

# „PolNet - Polish WordNet" project - PolNet 1.0

PolNet is being developed at the UAM since 2006

- merge model of development (respects original conceptualisation of Polish speakers) (from scratch, no translation from PWN, no automatic generation of synsets)

- first public release (PolNet 1.0) in 2011/2012 (at LTC and GWC), free download for research  e.g. META SHARE (http://metashare.elda.org/repository/search/?q=PolNet)

- development algorithm was first published in 2007 at LTC ( and the revised version in LNAI 5603 of 2009)

- PolNet 1.0.:
  - nouns – 11,700 synsets for 20,300 word-meaning pairs and 12,000 simple nouns,
  - verbs – 1,500 synsets for 2,900 word-meaning pairs and 900 simple verbs

We applied as development tools VisDic and DEBVisDic (Pala), well suited to support verb valency structure and semantic roles.

# Verb Valency Structures and Semantic Roles in PolNet

**Action, Agent, Asset, Benef, Cause, Dest, Exp, Giver, Instr, Loc, Object, Partner, Patient, Product, Proposition, Purpose, Recipient, Source, State, Time, Value**

**(after M. Palmer, 2008)**

In PolNet the **valency structures** are determined by the values of semantic roles associated to the argument positions and by morphosyntactic properties of the arguments.

## Semantic roles:

- the semantic roles are functions (in mathematical sense) associated to the argument positions in the syntactic patterns.
- values of these functions are ontology concepts in form of noun synsets or top-level ontology concepts (SUMO).

See the example below.

## Description of the verbal synset {*pomóc:1, pomagać:1*} /to help/ in PolNet 1.0

```
<SYNSET>
<VALENCY>
<DEF>"to participate in somebody's work in order to make it easier "</DEF>
<SYNONYM>
<FRAME>Agent(N)_Benef(D)</FRAME>
<FRAME>Agent(N)_Benef(D) Action('w'+L)</FRAME>
<FRAME>Agent(N)_Benef(D) Manner</FRAME>
<FRAME>Agent(N)_Benef(D) Action('w'+L) Manner</FRAME>
</VALENCY>
<ILR type="category_domain" link="1356">CITTA:1</ILR>
<ILR type="Agent" link="ENG20-02383992-n">człek:1, człowiek:1, istota ludzka:1, zwierzę:2, ....</ILR>
<ILR type="Benef" link="ENG20-02383992-n">człek:1, człowiek:1, istota ludzka:1, zwierzę:2, ....</ILR>
<ILR type="Action" link="PL_PK-2035015933">czynność:1</ILR>
<ILR type="Manner" link="2214">CECHA_ADVERB_JAKOŚĆ:1</ILR>
<WORD>pomóc</WORD> <WORD>pomagać</WORD>
<LITERAL lnote="U1" sense="1">pomóc</LITERAL>
<LITERAL lnote="U1" sense="1">pomagać</LITERAL>
</SYNONYM>
<ID>3441</ID>
<USAGE>Agent(N)_Benef(D); "Pomogłam jej."</USAGE>
<USAGE>Agent(N)_Benef(D) Action('w'+L); "Pomogłam jej w robieniu lekcji."</USAGE>
<USAGE>Agent(N)_Benef(D) Manner Action('w'+L); "Chętnie pomogłam jej w lekcjach."</USAGE>
<USAGE>Agent(N)_Benef(D) Manner;"Chętnie jej pomagałam."</USAGE>
<CREATED>agav 2010-11-27 18:49:47</CREATED>
<POS>v</POS>
</SYNSET>
```

Gloss

**Both perfective and imperfective forms**

Syntactic patterns

Sem. roles values

Use examples

This development phase consists in the inclusion of **verb-noun collocations** which are very frequent  (and specific) in Polish and many other languages.

**They play the role of compound verbs:**
- support verb (light verb) + predicative noun
- the support verb supplies formal properties while the predicative noun opens argument positions
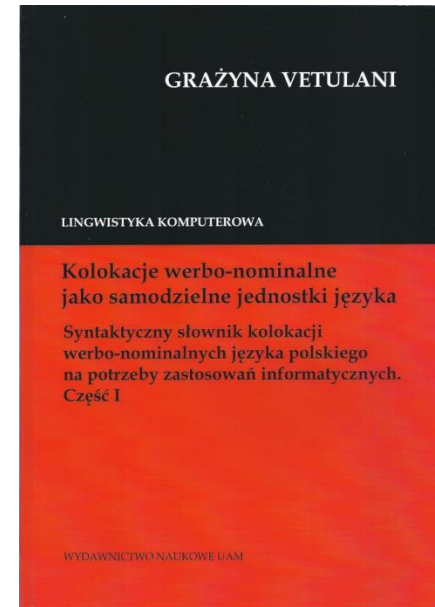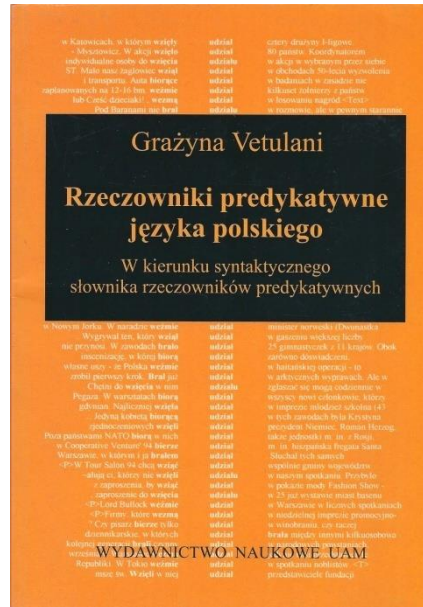
Notce that
- the support verbs in the VN collocations are hardly predicible.

- in Polish some VN collocations do not have simple verbs as equivallents (e.g. *ponieść klęskę* /≈to suffer a defeat/, *mieć nadzieję* /≈to hope/)

# Our initial resource

## Example

ambicja, f/
/* ambition */
    mieć(Acc)/N1(D),
    /* to have an ~ of sth1 */
    mieć(Acc,pl)/MOD,
    /* to have MOD ~s */
    posiadać(Acc,pl)/MOD,
    /* to own MOD ~s */
    ujawniać(Acc,pl)/MOD,
    /* to show MOD ~s */
    zaspokoić(Acc)/N1(Gen),
    /* to fulfill one's ~ of sth */
    zaspokoić(Acc,pl)/MOD,
    /* to fulfill MOD ~s ~*/
    zaspakajać(Acc)/N1(Gen)
    /* to fulfill one's ~ of sth */
    zaspakajać (Acc,pl)/MOD
    /* to fulfill MOD ~s */



**5 classes of predicative nouns:**
- **Class I  (typical) - env. 2862  (env. collocations 16,000 identified in corpora)**
- **Class II (features) – env. 2826**
- **Class III (diseases) – env. 275**
- **Class IV (profession) – env. 1478**
- **Class V (circumstantials) – env. 213**

To be included in PolNet (until end 2014) env. 3600 collocations of classes I and II for env 1200 predicative nouns

# Example (G. Vetulani 2012)
## *kierunek* (direction)

dryfować w **kierunku**/ dryfować w(Ms)/N1(D);MOD,
iść w **kierunku**/ iść w(Ms)/N1(D);MOD,
kontynuować **kierunek**/ kontynuować(B)/MOD/N1(D),
mieć **kierunek**/ mieć(B)/MOD,
nadać **kierunek**/ nadać(B)/MOD/N1(C),
nadawać **kierunek**/ nadawać(B)/MOD/N1(C),
nakreślić **kierunek**/ nakreślić(B)/MOD/N1(D),
obrać **kierunek**/ obrać(B)/MOD/N1(D),
podążać w **kierunku**/ podążać w(Ms)/MOD,
posuwać się w **kierunku**/ posuwać się w(Ms)/MOD,
podtrzymać **kierunek**/ podtrzymać(B)/MOD/N1(D),
pójść w **kierunku**/ pójść w(Ms)/MOD,
przybrać **kierunek**/ przybrać(B)/MOD,
przyjąć **kierunek**/ przyjąć(B)/MOD, przyjmować
**kierunek**/ przyjmować(B)/MOD

realizować **kierunek**/ realizować(B)/MOD/N1(D),
trzymać się **kierunku**/ trzymać
się(D)/MOD/N1(D),
utrzymać **kierunek**/ utrzymać(B)/MOD/N1(D),
wskazać **kierunek**/ wskazać(B)/N1(C),
wskazywać **kierunek**/ wskazywać(B)/N1(C),
wytyczać **kierunek**/ wytyczać(B)/MOD/N1(D),
wytyczyć **kierunek**/ wytyczyć(B)/MOD/N1(D),
wyznaczać **kierunek**/ wyznaczać(B)/MOD/N1(D),
wyznaczyć **kierunek**/ wyznaczyć(B)/MOD/N1(D),
zachować **kierunek**/ zachować(B)/MOD/N1(D),
zdążać w **kierunku**/ zdążać w(Ms)/MOD,
zmierzać w **kierunku**/ zmierzać w(Ms)/MOD,

,

**Syntactic patterns**

# Two main challenges for lexicographers (among many): granularity, attribution of semantic roles

## Problem: No consensus about the concept of synonymy

**Leibnitz approach**: synonyms are to be substituable in all contexts
*small synsets=fine granulation=huge number of synsets*

*In opposition to:*

**Miller and Fellbaum**: synonyms must be substituable in at least one context
*large synsets=coars granulation=low number of synsets*

**(Many intermediate solutions)**

**Why granularity problem is important?**
**Using a wordnet as ontology requires that all elements of a given synset must represent the same concept.**

**In PolNet:** **synonymy → common valency structure**
Synonymous are solely such word/meanings for which
- the given argument position is associated with just one semantic role
- the corresponding semantic roles take the same values
- corresponding arguments have the same morphosyntactic properties
(this condition is necessary but not sufficient for verb synonymy).

**The valency structures for all verbs in the synset must be pairwise compatible, i.e. the same semantic role must be associated with the corresponding syntactic positions**

# Strict application of the definition is difficult – lexicographers make mistakes

<VALENCY> /*fragment*/                                     *(szanować (kogoś)=darzyć szacunkiem (kogo))*
<DEF>To respect sb or sth </DEF>.
<FRAME>Agent(N) _ Benef(Acc)</FRAME> /*Andrzej szanuje Sonię*/  /*Andrew respects Sonia */
<FRAME>Agent(N) _ Benef(Acc) Cause('za'+Acc)</FRAME> /*Andrzej szanuje Sonię za mądrość*/
-------------------------------------------------------------------------------------------------------------------
<FRAME>Agent(N) _ Object(Acc) Cause('za'+Acc)</FRAME> /*Andrzej szanuje prawo za ład i porządek*/ /*Andrew respects public order */
   </VALENCY>                                     *(szanować (coś)= mieć w poszanowaniu (coś)*
                                                  *=have a good opinion about (sth))*

<STAMP>artusia 2014-03-05 23:04:35</STAMP>

Fig.1. Fragment of the PolNet 1.0 code for the synset {szanować:1} with the gloss <DEF>To respect sb or sth </DEF>.

**This simple example illustrates at least two dilemmas:**

**1) about granularity (why not two different synsets: for „to respect somebody" or „to respect something"?)**

**2) about te choice of the semantic roles in the first two frames („Benef" or (more neutral) „Object" ?)**

# Example of a problem (typical mistakes)

Another meaning {*szanować:3*} is close to the English *to protect , preserve* (e.g. nature). It corresponds to another synset defined as follows (fragment) («chronić coś (przed zniszczeniem lub nadmiernym zużyciem)/to protect sth (against sth)»)

```
<VALENCY> /*fragment*/
<DEF> To protect sth</DEF>
<FRAME>Agent(N) _ Object(Acc)</FRAME> /*Wise people protect nature*/
</VALENCY>
<STAMP>artusia 2014-03-05 22:49:26</STAMP>
```

# Transformations.
# A collocations' proper granularity dilemma

The above observed granularity problem for *szanować* is formally solvable **on the basis of glosses to capture the meaning variation.** In case of collocations this may be impossible.

*Piotr* <u>*upoważnił*</u> ***adwokata*** *do zakupu* = Peter <u>authorized</u> the advocate to buy

"*Piotr* <u>*upoważnił*</u> ***adwokata(Acc)*** *do zakupu*" /\*upoważnić=authorize\*/
<VALENCY>
<FRAME>Agent(N) _ **Patient(Acc)** Purpose('do'+G)
</FRAME>
</VALENCY>

*Piotr* <u>*dał pełnomocnictwo*</u> *do zakupu* ***adwokatowi*** = Peter <u>gave</u> advocate <u>enablement</u> to buy

"*Piotr* <u>*dał pełnomocnictwo*</u> *do zakupu* ***adwokatowi(D)***"
<VALENCY>
<FRAME>Agent(N) _ **Patient(D)** Purpose('do'+G)
</FRAME>
</VALENCY>

<DEF>*Nadać/nadawać komuś prawo do reprezentowania siebie celem wykonywania pewnych czynności*<DEF>

**SOLUTION: to consider two different synsets with the same gloss:** <DEF>to entitle sb else to represent the concerned person to do sth </DEF>.

and to relate the two synsets by a relation describing the case transformation e.g. TRANS_CASE_PATIENT(Acc,D)

# To be continued…

# THANK YOU

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**Weźmie** w nim    **udział**    6 wozów ciężarowych, które

.      W spotkaniu tym **wzięli**    **udział**    przedstawiciele: władz Tczewa,

również może **wziąć** w nim    **udział**    ...<P>Prezydent Gintowt-

<P>Niemiecki gość **weźmie**    **udział**    w polsko-niemiecko-rosyjskim

- Nie zostawimy. Nie **bierzemy**    **udziału**    !<P>- O, pan kurator! Prosimy do

Łużkow.<P> Rosja nie **weźmie**    **udziału**    w III wojnie światowej tylko

startem ligi **weźmiemy** jeszcze    **udział**    w turnieju, organizowanym przez

Oprócz tego **wzięli** oczywiście    **udział**    w oficjalnym treningu, na który

w Katowicach, w którym **wzięły**    **udział**    cztery drużyny I-ligowe.

- Mysztowicz. W akcji **wzięło**    **udział**    80 państw. Koordynatorem

indywidualne osoby do **wzięcia**    **udziału**    w akcji w wybranym przez siebie

ST. Malo nasz żaglowiec **wziął**    **udział**    w obchodach 50-lecia wyzwolenia

i transportu. Auta **biorące**    **udział**    w badaniach w zasadzie nie

planowanych na 12-16 bm. **weźmie**    **udział**    kilkuset żołnierzy z państw

Pod Baranami nie **brał**    **udziału**    w rozmowie, ale w pewnym starannie

*Vsup* : **brać / wziąć**