

Denominal adjectives with multiple interpretation

Morpho-semantic properties: first results

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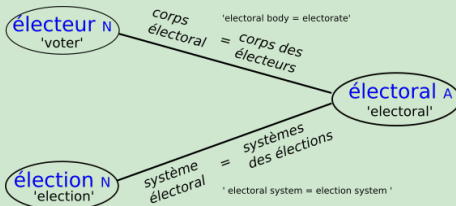


Outline

- 1 Introduction**
- 2 Context, methodology
- 3 First step
- 4 Second step
- 5 Conclusion

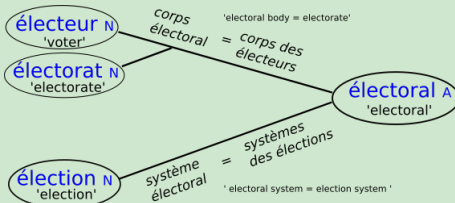
Starting point

- Denominal adjectives sometimes have more than one interpretation.
 - ▶ they share the semantic content of the noun they derive from.
 - ▶ they share the semantic content of (an)other noun(s) belonging to the derivational family.
- Under what conditions does this polysemy occur?



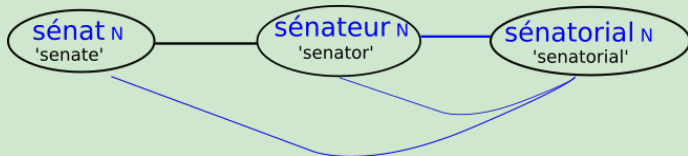
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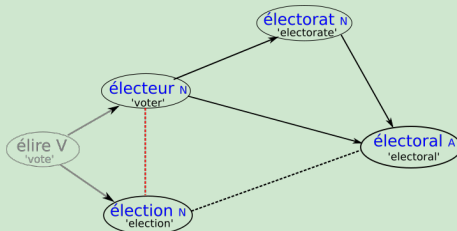
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- (Strnadová 2014, 2015) : constraints on the base noun (adjectival affix value, noun length)
 - ▶ Role of noun complexity : **derivation chain** (but also indirect relations)
 - ▶ Briefly addresses semantic relation between the nouns involved: agent and event
 - ▶ “Principle of economy” (Roché, 2009): uselessness of ‘électionnel’
- adjectival polysemy cannot be accounted for with binary relationships
 - ▶ paradigmatic model required (cumulative pattern: Bochner, 1993)



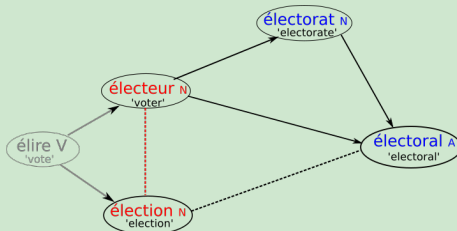
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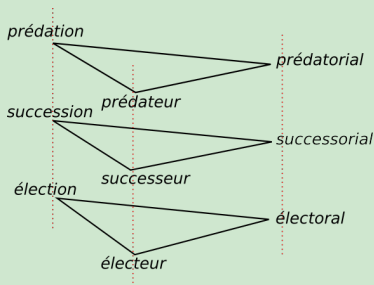
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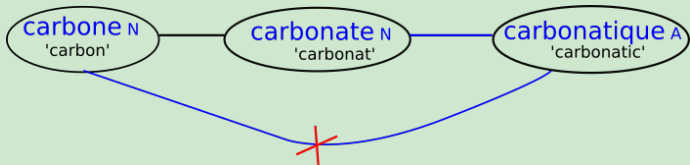
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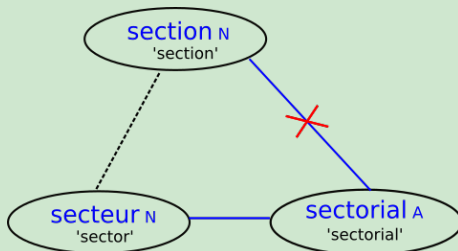
Issues

- are these constraints sufficient to predict multiple interpretation for denominal adjectives?
 - ▶ counterexamples: $N \rightarrow N$ derivational chain is only half the battle
 - ▶ economy principle does not always apply (*carbone* and *carbonate* : two distinct adjectives; *section*: no adjective;)
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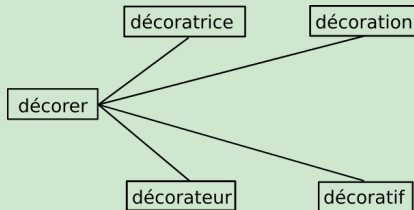


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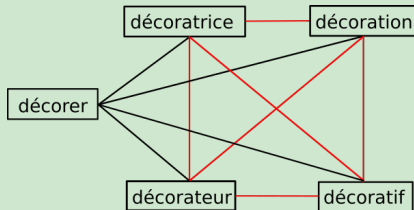
Context: Demonext project

- Démonette, large-size, extensive coverage derivational DB for French.
- each entry (= a W1-W2 relation) labelled with morphological, phonological and semantic descriptions
- describe **derivational families** in terms of the relations between their members
- several sources supply the database.
 - ▶ Content is uniformized, new information is computed.
 - ▶ Derivational families are extended by additional relations and members



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Context: the Denom database

- (Strnadová 2014) Denom: 15,505 adjectives
- Investigation field: 2,995 Xique and 592 Xa1 regularly derived from a noun
 - ▶ Encoded with more than one interpretation: 123 Xique and 26 Xa1.

112	Lex		Tifi	contradictoire	oire	sfx	contredire/contradiction	V/N	/ion	comp/V	
8809	Lex	DALcorp		antipodaire	aire	sfx	antipode	N	anti	comp sav	sav
8217	Lex	DALlex	Tifi	articulaire	aire	sfx	articulation	N	ion	V	der V
1337	Lex	DALlex	Tifi	autoritaire	aire	sfx	autorité	N	té	s	s
5301	Lex	DALlex	Tifi	caniculaire	aire	sfx	canicule	N	ule	s	s
10714	Lex	DALlex	Tifi	capsulaire	aire	sfx	capsule	N	ule	s	s
7729	Lex	DALlex	Tifi	cédulaire	aire	sfx	cédule	N	ule	s	s
2408	Lex	DALlex	Tifi	cellulaire	aire	sfx	cellule	N	ule	s	s
780	Lex	DALlex	Tifi	avantageux	eux	sfx	avantager/avantage	N/V	/age	/Prep	/autre
3412	Lex	DALlex	Tifi	communautaire	aire	sfx	communauté	N	té	A	der A
9822	Lex	DALlex	Tifi	ganglionnaire	aire	sfx	ganglion	N	ion	s	s
5903	Lex	DALlex	Tifi	glaciaire	aire	sfx	glacier/glaciation	N/N	ier/ion	N/	der N/
7538	Lex	DALlex	Tifi	gestionnaire	aire	sfx	gestion	N	ion	V	der V
4668	Lex	DALlex	Tifi	glandulaire	aire	sfx	glande/glandule	N/N	/ule	s/N	s/derN

Two steps

The semantic analysis involves two steps.

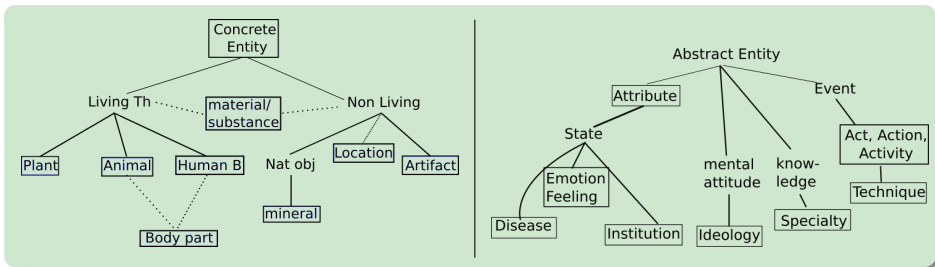
- Determine the semantic content of the noun pairs (triplets) connected to each of the 149 polysemous adjectives (with Victoria Meneghel, BA, Un. Nancy)
 - ▶ Is there semantic regularity?
 - ▶ Does the semantic content confirm/complete/restrict the constraints on derivational chain?
- Are there other polysemous adjectives ?
 - ▶ Is adjectival polysemy predictable?
 - ▶ Are derivational families in Denom likely to be regularly extended with new relations?

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Semantic description of the Denom polysemous adjectives

- Assign a semantic class to the nouns connected to the 149 polysemous adjectives.
 - Use categories from **WordNet Unique Beginners** (Miller 1995)



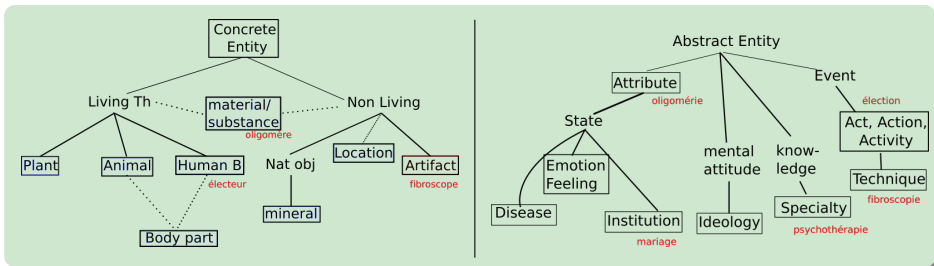
Semantic description of the Denom polysemous adjectives

- Assign a semantic class to the nouns connected to the 149 polysemous adjectives.
 - retrieve the nouns' **hypernyms** into WordNet (BabelNet (Navigli & Ponzetto, 2012) / WoNeF (Pradet et al., 2013) if needed)

Noun	Inherited hypernyms
électeur	citizen / national, subject / <i>person</i> - human being
élection	choice, selection / action / <i>act,action,activity</i>
mariage	legal status / status position / institution / <i>state</i>
psychothérapie	medical science / ... / science / discipline - specialty / <i>knowledge domain</i>
fibroscope	machine / device / instrumentation / <i>artifact</i>
fibroscopie	imaging / representation / technical activity / activity / <i>act,action,activity</i>
oligomère	chemical substance / <i>material</i>
oligomérie	consistency / <i>property</i>

Semantic description of the Denom polysemous adjectives

- Assign a semantic class to the nouns connected to the 149 polysemous adjectives.
 - match them with categories from WordNet Unique Beginners



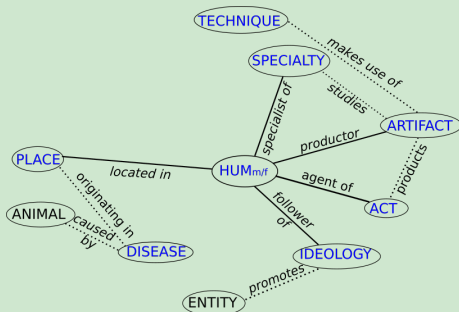
Semantic description of the Denom polysemous adjectives

- Identify the **semantic relations** between the nouns connected to each adjective with multi-interpretation.

Relation	Cat1/Cat2
agent/activity	cyclotouriste _{Human.B} /cyclotourisme _{Activity} , automobiliste _{Human.B} / automobile _{Artifact} , calorimètre _{Artifact} /calorimétrie _{Technique}
exp(?) / state	pape _{Human.B} /papauté _{Institution} , artiste _{Human.B} /autisme _{Disease} , isotope _{Material} /isotopie _{Property}
member/collection	lecteur _{Human.B} /lectorat _{groupxHuman.B}
Similarity	ellipse _{Shape} /ellipsoïde _{Shape}
...	...

Provisional results

- event- (situation-)rooted, human-centered relations (Fradin, 2017, to appear)
- in case of technical activity the human being is represented by the artefact used as an instrument
- marginal: disease-source (*faune paludique* : *palude*; *virus paludique* : *paludisme*)
- exceptions: collection-member (*organe/organisme* > *organique*), "sort-of" (*plasmodie/plasmode* < *plasmodique*, *trapèze/trapézoïde* < *trapézoïdal*), material-property (*agame/agamie* > *agamique*)



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Discovering new polysemous adjectives

What about the 3,438 other denominal adjectives in *-ique* and *-al* ?

- if A derives from a human noun N_{HUM} , is there a morphologically related noun N_{SIT} denoting any situation (that may involve a human being) such as A can be semantically motivated by N_{SIT} ?
- if A derives from a noun N_{SIT} denoting an *Activity*, a *Disease*, a *Specialty*, an *Ideology*, is there a morphologically related human noun N_{HUM} such as A can be semantically motivated by N_{HUM} ?
- if A derives from a concrete noun N_{ART} denoting an *Artifact* is there a morphologically related activity noun N_{TECH} denoting a technique such as A can be semantically motivated by N_{TECH} ?
 - ▶ and vice-versa?
- Does the multiple interpretation A occur for nouns belonging to other human-centered semantic categories?
- Are there polysemous A connected to nouns related to each other by non-situation-rooted relations?

Method (1)

- Examine each adjective $A_{[Ni]}$ in the context of a noun phrase
- $\text{Det } N_{Hi} A_{[Ni]} = \text{Det } N_{Hi} [\text{de Det } Ni]$
- the argument of the head noun N_{Hi} is Ni contained in the PP_{de}
- N_{Hi} must be able to specifically select the semantic properties of Ni , for each Ni the multi-interpreted A is connected to
 - ▶ *corps électoral* → *corps* selects a collective human noun (*électoral* = 'électorat')
 - ▶ *population électorale* → *corps* selects a human noun (*électoral* = 'électeur')
 - ▶ *résultat électoral* → *système* selects an abstract noun (*électoral* = 'élection')

$\text{Det } N_{Hi} A_{[Ni]} = \text{Det } N_{Hi} [\text{de Det } Ni]$

$\text{les}_{Det} \text{résultats}_{NH_i} \text{électoraux}_{AN_i} = \text{les}_{Det} \text{résultats}_{NH_i} \text{de l'}_{Det} \text{élection}_{Ni}$

$\text{le}_{Det} \text{corps}_{NH_i} \text{électoral}_{AN_i} = \text{le}_{Det} \text{corps}_{NH_i} \text{de l'}_{Det} \text{électorat}_{Ni}$

$\text{la}_{Det} \text{population}_{NH_i} \text{électorale}_{AN_i} = \text{la}_{Det} \text{population}_{NH_i} \text{des}_{Det} \text{électeurs}_{Ni}$

Method (1)

Two-phased process

- Collect a set of possible head nouns N_{Hi} specifically selecting: humans, activities, diseases, mental states, ideologies, techniques, artifacts, etc
- Insert each Denom A in 'Det N_{Hi} A $_{[Ni]}$ ', according to the possible value of N_i in A's derivational family

Method (2): Collecting N_{Hi} s

$N1$ is recorded as A's base in Denom, can A be also interpreted wrt $N2$?

- *Les Voisins de le monde / Les voisins de Wikipédia* lexical databases (F. Sajous, CLLE-ERSS): allow to retrieve pred/arg relations.
- Query $N2$: labelled as "Argument".
- List of relevant N_{H2} , such as **Det** N_{H2} [*de Det* $N2$]
- N_{H2} as selective as possible for the concept expressed by $N2$
- The list of N_{H2} is completed by new queries with other $N2'$ belonging to the same semantic category

Concept $_{N2}$	Human B	Artifact	Specialty	Disease	Place
N_{H2}	collectif, communauté, groupe, équipe, personnel, syndicat, société, association, carrière, passé, académie, interlocuteur	fil, câble, lentille, pince, composant, onde, tracé, enregistrement, reproduction, signal, courbe, signal, aiguille, station, tracé	conférence, études, spécialisation, réflexion, raisonnement	diagnostic, épidémiologie, mortalité, épidémie, symptôme, parasite, virus	frontières, étendue, surface

Method (3): Is Det N_{H2} $A_{[N2]}$ attested?

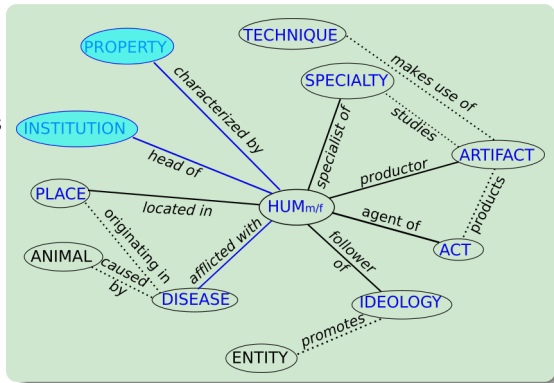
Is A_{N2} attested? Google 'Det N_{H2} $A_{[N2]}$ '

- positive results confirm the interpretation $A=N2$

Adjective	N_{H1}	interpretation	N_{H1}	Interpretation
cartographique	<i>activité</i>	cartographie (Tech)	<i>carrière</i>	cartographe (Hum)
électrothermique	<i>principe</i>	électrothermie (Tech)	<i>tête</i>	électrotherme (Art)
ducal	<i>famille</i>	duc (Hum)	<i>territoire</i>	duché (Place)
notarial	<i>équipe</i>	notaire (Hum)	<i>histoire</i>	notariat (Act)
patriarcal	<i>moeurs</i>	patriarche (Hum)	<i>système</i>	patriarcat (Inst)

Results

- 50 new XAL and 867 new XIQUE
- improvement of the initial semantic network.
- confirmation of the already observed conceptual relations
- other concepts compatible with humans: *Institution* and *Property*
- other human-centered semantic relations: *Institution/Chief* and *Property/Experiencer*
- non-situation-rooted relations: very low frequency



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Conclusion

- (Strnadová 2015) morphological constraints drive adjectival multi-interpretation: N1 \rightarrow N2 derivational chain
 - ▶ not sufficient: semantic constraint on N1,N2 and the relation between them
 - ▶ not necessary: N1 and N2 may be indirectly related
- Semantic analysis corroborates and refines these results
- Situation-related semantic paradigms helps predicting adjectival multi-interpretation
- Soundness of this hypothesis? examine the 2,451 other denominal adjectives in Denom
 - ▶ among them: 556 Xaire, 113 Xé, 418 Xel, 115 Xesque, 576 Xeux, 209 Xien, 256 Xier

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