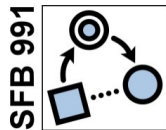


Roles and the compositional semantics of role-denoting relational adjectives

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(Slides also at bit.ly/2xrZTpp)



0. Introduction

0.1 The project

- Some nominals such as *president* show an ambiguity between readings related to an **official** role, and to readings on a **personal** level.

The president visited his mother. (personal visit preferred)

The president visited Netanyahu. (official visit preferred)

- These readings are driven in large part by our understanding of social roles in the world: heads of state are visited in the course of official duties of leading a country, while parents are not.
- **Puzzle:** these same nominals admit for **only** a role-related reading when used as adjectives.

The president visited his mother.

Does not entail: There was a presidential visit to the president's mother.

- Find that distinction arises not just with verbal predication, but possessives as well.

the presidential desk a presidential advisor (only official)

the president's desk the president's advisor (personal or official)

0.1 The project

- *Presidential* (in this example) is a relational adjective (RAs). Other examples:
Ukrainian crisis, technical architect, nuclear war, dental care, semantics conference
- In this talk, we call *presidential* (and other like adjectives) role-denoting relational adjectives. Examples:
president :: presidential mayor :: mayoral senator :: senatorial pope :: papal
- These role-denoting relational adjectives form a (semi-)productive subclass of RAs in English.
- Often derived from a noun, but in some cases this is only apparent diachronically (e.g., *royal* from Lat. *rex* 'king')

0.1 The project

Questions addressed today

1. How are relational adjectives, especially those of the *presidential*-type, represented?
2. How are roles semantically represented and distinguished from ordinary individuals?

0.1 The project

Our answer

- Enrich ontology with **levels of action** (official and personal)
- Lexically decompose role-denoting nouns. They encode an event at an official level of action.
- Role-denoting RAs relate meaning of modified nominal to the official actions encoded in the adjective.
- Roles are derived from thematic roles of events at an official level of action.

Big picture

- How adjectives compose with the nouns that they modify
- How world knowledge and context interact with lexical meaning
- How our natural language ontology is organized, and what kinds of things we find in it (e.g. the project of natural language metaphysics)

0.2 Roadmap for this talk

- Section 1: Basic data on relational adjectives
- Section 2: Previous accounts of RAs and some critiques
- Section 3: Ontological background for roles
- Section 4: Analysis of *presidency, president, presidential*
- Section 5: Expanding on the analysis
- Section 6: Discussion and conclusion

Note:

- We focus on *presidential* as the best and clearest example case in our analysis.
- But the basic analysis can be extended to other examples of these role-denoting RAs.

1. Relational adjectives

1.1 Variants of adnominal non-property adjective use

Classificatory use

Semantics of A+N: Modifying a noun with a classificatory adjective yields an expression for a subclass of the class denoted by the modified noun alone.

- Examples: *nuclear war musical instrument dental care pediatric conference public university*
- Most classificatory adjectives are denominal, or there is a semantically related noun
musical – music pediatric – pediatrics public – public dental – teeth
- Classificatory adjectives are not gradable.
- Property adjectives can usually not be used predicatively, but exceptions are possible
#the care was dental
#this instrument is musical
??this conference is pediatric
this university is public
- Out of context, classificatory adjectives do not define a class in their own right.

1.1 Variants of adnominal adjective use

Thematic use

The adjective is denominal or otherwise lexically corresponding to a noun N_A .

Semantics of A+N: Modifying a noun with a thematic adjective amounts to the **characterization of an event argument of the head noun as a case of N_A** .

- Examples: *presidential visit* *French policy* *semantics workshop*
- Thematic adjectives are not gradable.
- Thematic adjectives can usually not be used predicatively
#this visit is presidential
#this policy is French
??this workshop is semantics
- Out of context, thematic adjectives do not define a class in their own right.

1.2 Relational adjectives proper

Relational A+N compositionally results in a sense that relates the sense of N to N_A .

There are three near-equivalent ways of semantically joining two N senses:

	English	German	Russian
deNA + N	<i>presidential visit</i>	–	<i>prezident_N-skij_A visit</i>
NN compound	–	<i>Präsidentenbesuch</i>	–
possessive N N	<i>president's visit</i>	<i>Besuch des Präsidenten</i>	<i>visit prezident_N-a_{GEN}</i>
deNA + N	<i>Ukrainian crisis</i>	–	–
NN compound	–	<i>Ukraine_Nkrise</i>	–
possessive N N	–	–	–

2. Previous accounts

2.1 Previous accounts I: Recoverable predicates, thematic and classificatory adjectives

- **Levi (1978)** analyses compounds and RAs as being transformationally derived from predications that make use of a set of abstract “Recoverably Deletable Predicates.”

CAUSE, HAVE, MAKE, USE, BE, IN, FOR, FROM, ABOUT

stress caused by heat -> heat stress -> thermal stress

- Raises questions of where these predicates come from, and why only these predicates.
- Previous syntactic accounts (Bosque and Picallo 1996, Alexiadou and Stavrou 2011, a.o.) assume a distinction between **thematic** and **classificatory** uses of RAs.
- In these accounts, thematic RAs **syntactically** saturate an argument position. Classificatory RAs are true adjectives (in many accounts) and not argument-saturating.
- **Arsenijevic et al. (2014)** provide arguments against this view and for a view that RAs are always true adjectives without syntactic argument-saturating behavior.
- Argument-saturating behavior is only apparent. Product of semantic composition.

2.2 Previous accounts II

McNally and Boleda (2004) argue that relational adjectives are properties of kinds and not individuals.

- Propose an intersective analysis of RAs, adapting Larson's (1998) analysis of certain event-related adjectives (e.g. *beautiful dancer*, *skillful surgeon*), successfully capturing entailment patterns.
- Assume that common nouns have an argument for a Carlsonian kind x_k in addition to an argument for an ordinary individual y_o . Ordinary individual and kind related via Carlson's *R(ealization)* relation.

$$\llbracket \textit{architect} \rrbracket = \lambda x_k \lambda y_o [R(x_k, y_o) \wedge \mathbf{architect}(x_k)]$$

- RAs are properties of kinds.

$$\llbracket \textit{technical} \rrbracket = \lambda x_k [\mathbf{technical}(x_k)]$$

- Intersective modification via the kind argument.

$$\llbracket \textit{technical architect} \rrbracket = \lambda y_o \exists x_k [R(x_k, y_o) \wedge \mathbf{architect}(x_k) \wedge \mathbf{technical}(x_k)]$$

2.3 Objection: Paraphrases with *kind*

- Given a kind-based analyses, we might expect **paraphrases with *kind*** to be possible with role adjectives (e.g. *an A kind of N*).
- Generally, paraphrases of this sort are **not possible** with role adjectives or **don't capture the role-related meaning**.

<i>presidential election</i>	election of the president (THEME)	<i>#presidential kind of election</i>
<i>presidential office</i>	office [position] of being president	<i>#presidential kind of office</i>
<i>presidential office</i>	office [room] used by the president	<i>#presidential kind of office</i>
<i>presidential desk</i>	desk used by the president	<i>#presidential kind of desk</i>
<i>presidential advisor</i>	advisor of the president (GOAL)	<i>#presidential kind of advisor</i>
<i>presidential visit (1)</i>	visit by the president	<i>#presidential kind of visit</i>
<i>presidential visit (2)</i>	visit to the president	<i>#presidential kind of visit</i>
<i>presidential order</i>	order issued by the president (AGENT)	<i>#presidential kind of order</i>
<i>presidential motorcade</i>	motorcade escorting the president	<i>#presidential kind of motorcade</i>

- This suggests that kinds are not the ontological sort relevant for an analysis of adjectives like *presidential*.

2.4 Objection: Relations encoded in the adjective

- Arsenijević et al. (2014) propose that certain adjectives (*French, Danish*) do more than simple intersective modification, but also encode an **Origin** relation, relating a kind to a location.
- But, there are many possible relations involved with *presidential*.

<i>presidential election</i>	election with the aim of determining the next president _{incumbent}	(“thematic”)
<i>presidential office (1)</i>	the office of president _{role}	
<i>presidential office (2)</i>	office for certain types of official action by the president	
<i>presidential advisor</i>	advisor to the president for official action	
<i>presidential visit (1)</i>	visit by the president as the president	(“thematic”)
<i>presidential visit (2)</i>	visit to the president as the president	(“thematic”)
<i>presidential order</i>	order by the president as part of executing presidential rights	(“thematic”)
<i>presidential motorcade</i>	motorcade [for] escorting the president on official travel	

- Encoding the relation within the adjective is too strong. Not a general strategy for role-denoting RAs.
- The relation must come from the modified noun and/or a bridging relation provided by context.

2.5 Objection: Predications with relational adjectives

- The account of relational adjectives as properties of kinds predicts that they should be able to take kind-denoting DPs as arguments (such as BPs or kind-denoting indefinites) when used predicatively.

This is possible, though not always so.

For women concerned about their future fertility for reasons that are medical, social or financial...

Doctors/*A doctor can be **medical.*

- Additionally, RAs used predicatively can sometimes predicate of non-kind-denoting DPs, which should result in a type mismatch.

*This university is **public**, but private universities and colleges are also on the island.*

*An early goal of diagnosis is to determine whether the condition is **viral or bacterial**.*

- This distribution isn't straightforwardly predicted by RAs as predicates of kinds; other pragmatic and semantic properties must be involved.

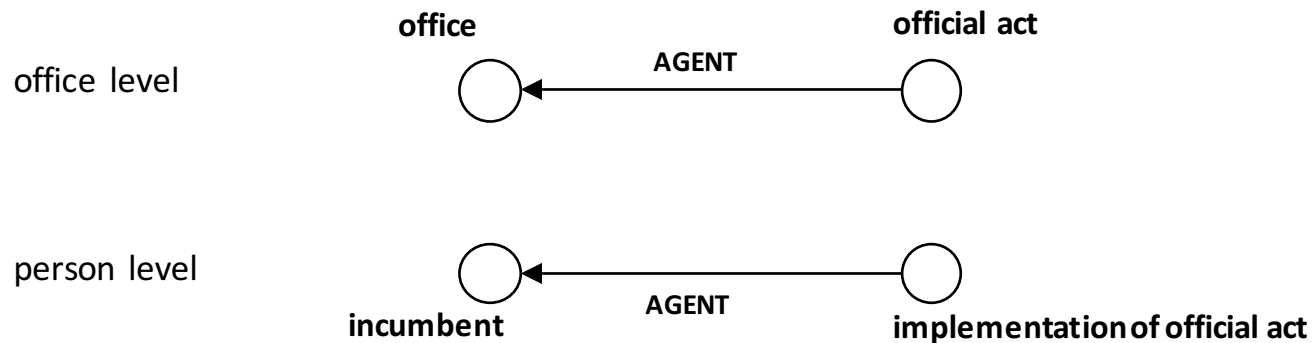
3. Ontological background

3.1 Social ontology

- A social ontology provides for social entities such as persons and institutions, roles, offices, functions, and actions by social agents (e.g. voters, politicians, police, parents, spouses, teachers, etc.).
- Essential to the social ontology are social acts performed by social agents that produce social facts by acting, implementing social roles, etc.
- Entities in the social ontology are (ultimately) implemented by entities in a physical ontology: persons are implemented by human animals, and social acts are implemented by doings that under appropriate circumstances *count as* particular social acts (Searle 1995).
- The social ontology of our world is in itself multi-level.
For example, persons are social entities that may take in social roles (a higher level).
- The social ontology is grounded by and dependent on the physical ontology.

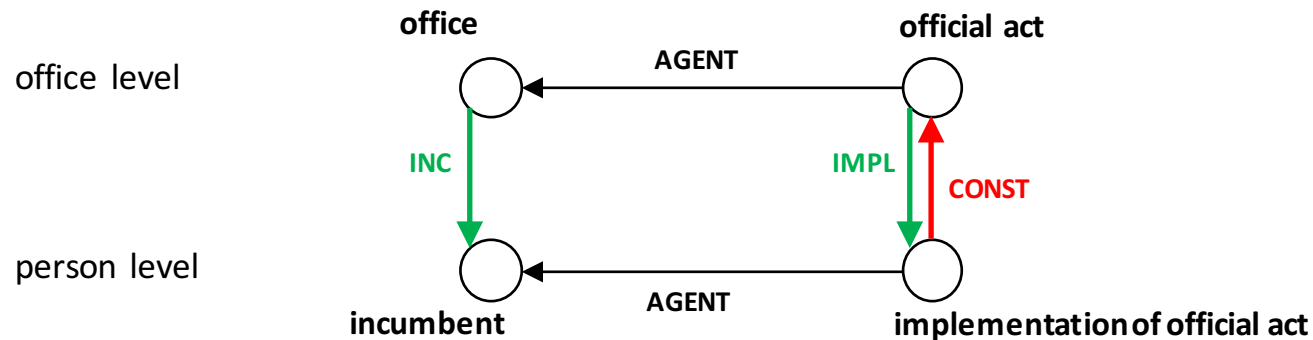
3.2 Office and person levels of action

- A social office, like ‘president of the US’, is defined at a non-basic, abstract level of social ontology. There is an incumbent of the office, a person.
- Certain types of acts are considered acts by the office (rather than the individual).
- Being an abstract institution, the office cannot execute the act.
- Official acts have to be implemented by the person in office.
- What office-holders do when they *implement* an official act is *not* the official act because the official act is an act by the office, not by its incumbent.



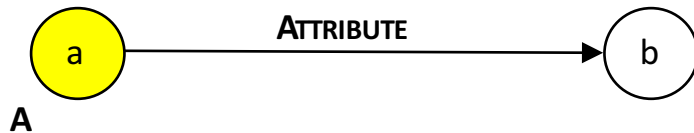
3.3 Connections between levels

- There is a function **INC** that returns the incumbent for the office.
- There is a function **IMPL** that returns the implementing act $A\downarrow$ for the official act A .
 A and $A\downarrow$ have the same temporal extension τ .
- There is a (partial function) **CONST** that returns the implemented act $A\uparrow$ for the implementary act.
 This relation is Goldman's (1970) "level-generation".



3.3 A note on notation

- Frame Semantics as formalized by Petersen (2007) and Löbner (2014).
- Frame is a recursive attribute–value structure.
- Model lexical and world-knowledge within the same representation.
- Frame attributes are functions.
- We move back and forth between using first-order formalizations of frames and graph-theoretic frame diagrams. But, nothing crucial is gained or lost with either formalization.
- Arcs represent attributes, nodes represent values.
- Distinguished node (in yellow) represents the referential argument of the frame.

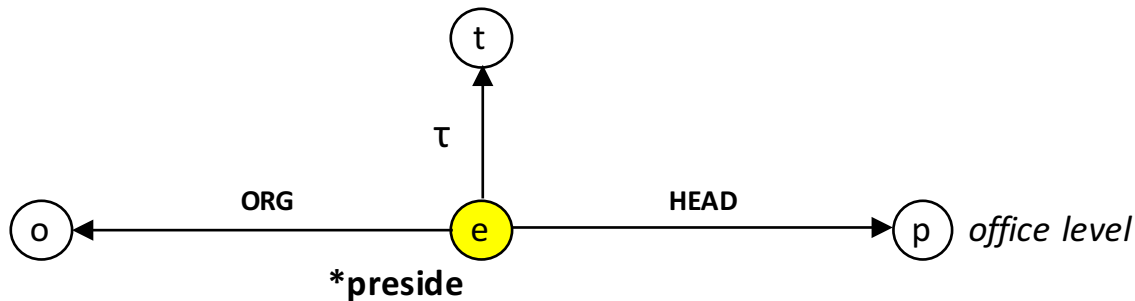


$$\lambda a. \mathbf{A}(a) \wedge \text{ATTRIBUTE}(a) = b$$

4. *Presidency – president – presidential*

4.1 **Preside and presidency*

- The notions of ‘president’ and ‘presidency’ are defined (by social regulation) at the office level.
- We assume that the basic notion is the one of ‘presidency’.
- A presidency is an event with two arguments, an ORG[ANIZATION] and a HEAD. We introduce a hypothetical verb **preside* for this type of event.
- Like for any event, there is a temporal extension τ for every presidency. We assume that presidencies are temporally uninterrupted.



$$\lambda e (*preside(e) \wedge HEAD(e)=p \wedge ORG(e)=o \wedge \tau(e)=t)$$

4.1 **Preside* and *presidency*

- Evidence for an event ***preside** from derivational morphology.
- *president* -> *presidency*. Shift from president individual at the office or personal level to the ***preside** event at the office level.

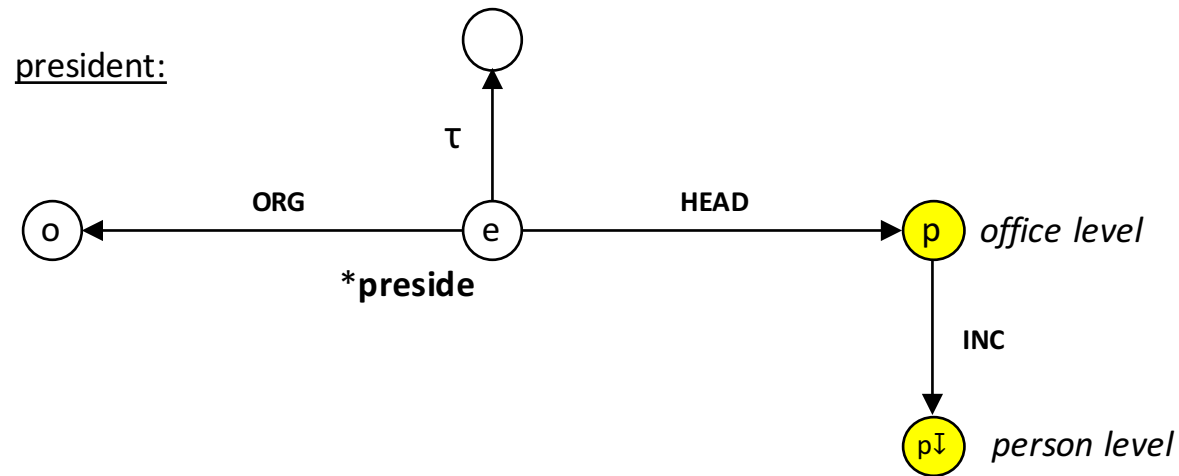
Barack Obama's presidency lasted eight years.

Because his presidency occurred between those of Grover Cleveland and Theodore Roosevelt, McKinley's accomplishments have often been overlooked.

- Note: Not crucial for our analysis that *presidency* itself denote an event.
- But, we do need an event incorporated into the meaning of *president*.
- Similar move is made by Larson (1998) for nouns like *king* that also do not obviously have an event.

4.2 *President*

- The noun *president* is indiscriminately used at the office and the person level.
- We derive its meaning from the ***preside** frame, as either the head or incumbent.
- Assumption: For every time t , every organization o , there is at most one presidency obtaining.



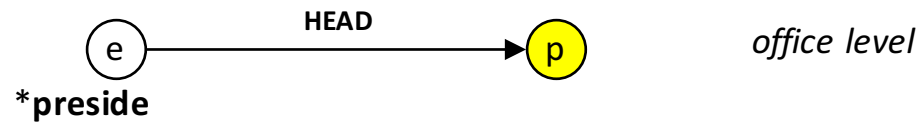
$\text{president}_{\text{office}}(t, o) =_{\text{def}} \text{HEAD} (\text{Ie} (*\text{preside}(e) \wedge t \text{ in } \tau(e) \wedge \text{ORG}(e)=o)$

$\text{president}_{\text{person}}(t, o) =_{\text{def}} \text{INC} (\text{HEAD} (\text{Ie} (*\text{preside}(e) \wedge t \text{ in } \tau(e) \wedge \text{ORG}(e)=o)$

4.3 *Presidential*

- The adjective *presidential*, in the meaning underlying its RA use, relates to the office level.
- It is also based on the concept ***preside**.
- It appears to lack the ORG and the τ arguments.

presidential:



5. Compositional analysis

5.1 Reminder: Possible readings for visiting-president constructions

	official reading	personal reading
(1) <i>The US president visits the Russian president.</i>	available*	available
(2) <i>Trump visits Putin.</i>	world knowledge: available	available
(3) <i>Trump visits his son.</i>	world knowledge: not available	available
(4) <i>presidential visit</i>	available	not available
(5) <i>the president's visit</i>	available	available

Note

The “official” reading is also possible with arbitrary denotations of the office-holders *if supported by world knowledge* (cf. (2) and (3)).

5.1 Possible readings for vising-presidents constructions

Note

- Only the N_{poss} N variant allows for both the person reading and the office reading.
- The N_{poss} N variant is the only one where the first **N** refers.
- N roots of denominal words do not refer.
- Compare

<i>presidential advisor</i>	regular advisor for official presidential matters
vs.	
<i>president's advisor</i>	advisor of the president in arbitrary matters (including such unrelated to president's office)
<i>presidential desk</i>	desk for the president for his official use
vs.	
<i>president's desk</i>	desk used by the president for any purpose (possibly unrelated to president's office)

5.2 General assumptions on composition

We assume that...

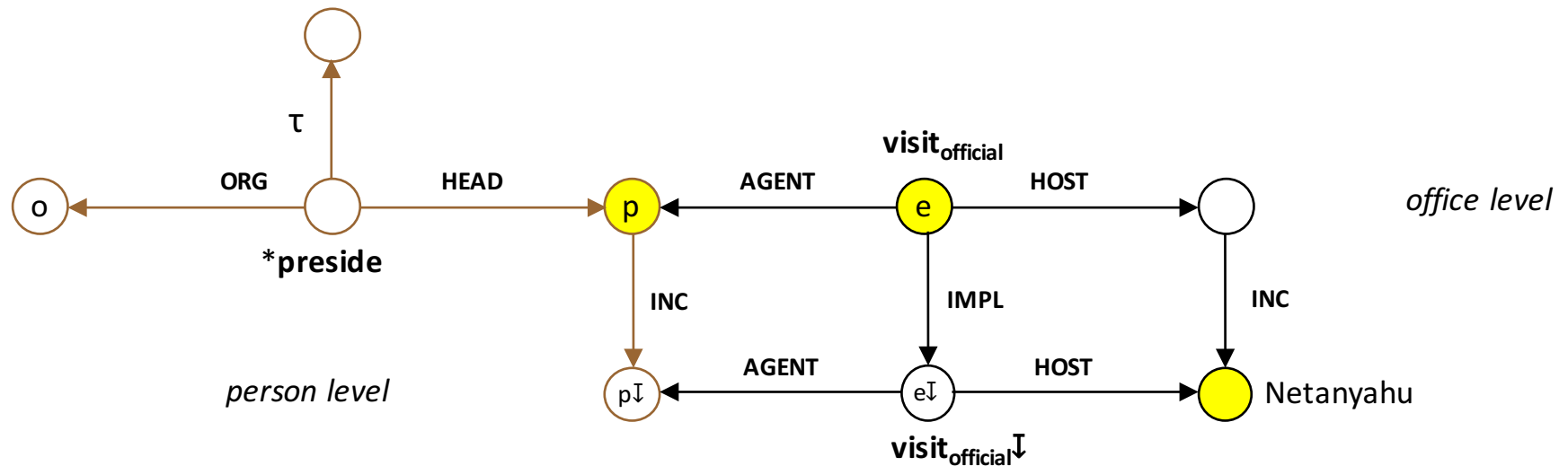
- The basic mechanism of composition is **unification**, rather than function application.
- When two meanings are unified, there may be more than one possibility for unification.
Composition is not necessarily deterministic.
- Expressions with multi-level denotation lend themselves for unification at all levels involved.
- Semantic concepts are based on, and embedded in, our general ontology and knowledge of the world.
- Contextual knowledge may enable or prevent particular choices for unification.

5.3 Official visit

The president visited Netanyahu.

Reading 1: Official $\text{visit}_{\text{official}}$ by visitor in office to host in some office.

- $\text{visit}_{\text{official}}$ requires agent and host at the office level
- **The agent node unifies with the office-level node of the ‘president’ frame.**
- The office of corresponding to Netanyahu comes from world knowledge.
- Reference to the person of Netanyahu necessitates elaboration of the personal level.

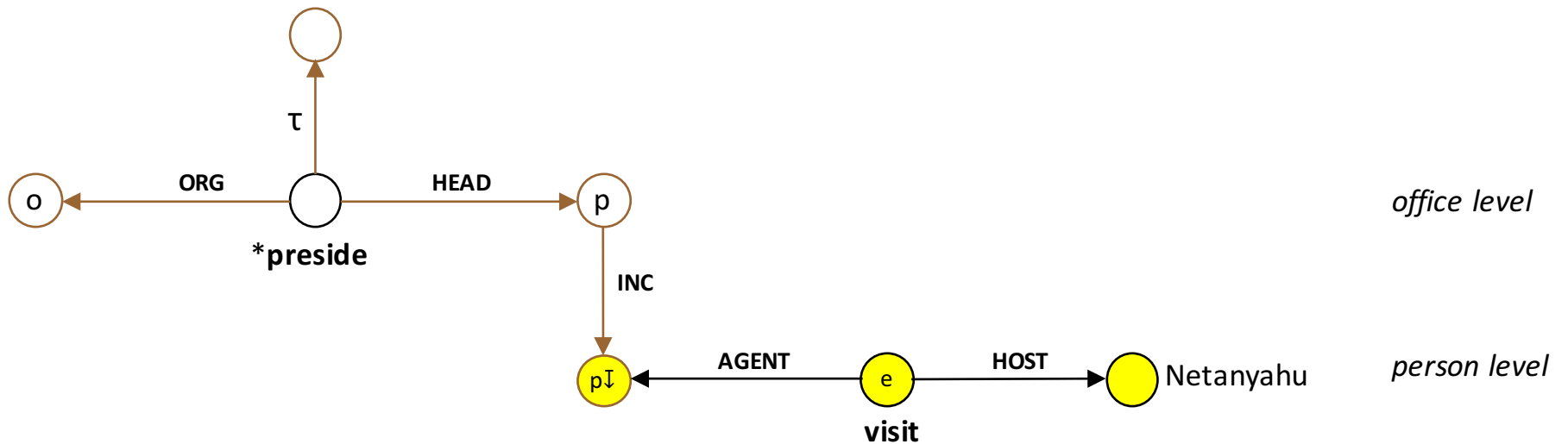


5.4 Personal visit

The president visits Netanyahu.

Reading 2: Personal visit.

- **visit** as a verb of non-institutional personal action requires agent and host at the personal level
- The **agent** node unifies with the **incumbent** node of the *president* frame.

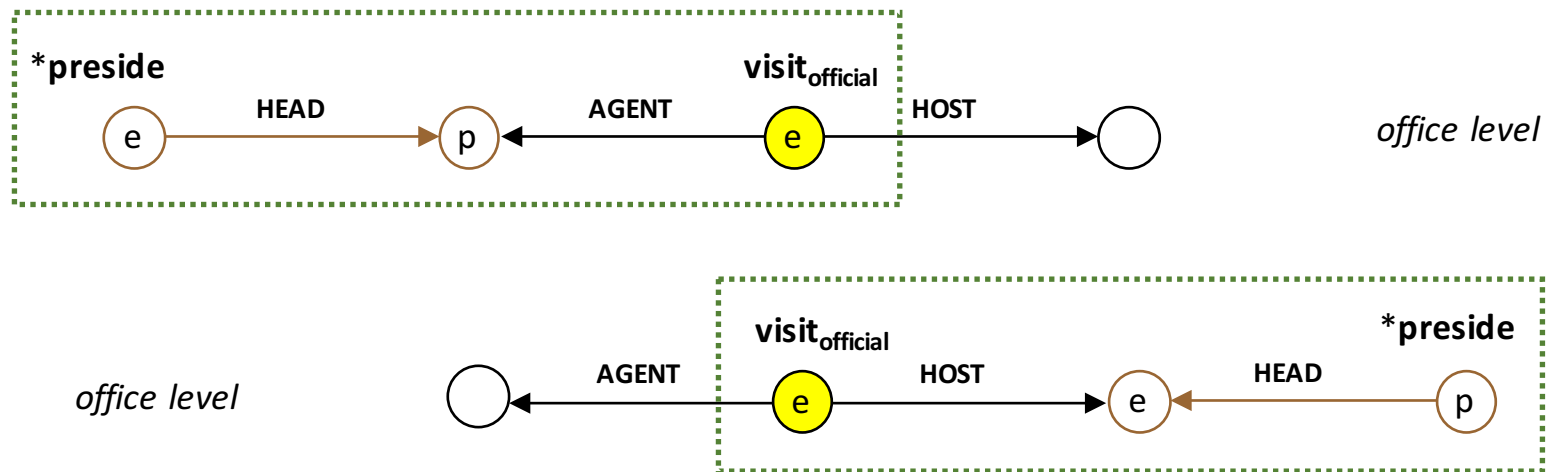


5.5 Presidential visit

presidential visit

- The frame for *presidential* does not provide nodes at the person level.
- The only target for unification is the **office-level** president node.

Possible unifications: The 'president' node can unify with **either** the agent or the host node of 'visit'.



6. Conclusions

6.1 Social ontology

- The analysis of role-denoting adnominal adjectives requires a **rich ontology** that includes a social ontology and is able to distinguish between levels that constitute, or implement each others.
- Roles, at least some, can be derived from **events of role-incumbency** at an appropriate level in the social ontology. They are **thematic roles** in this type of event.
- Roles as abstract entities in the social ontology are linked by the **incumbent** relation to entities at the level of persons in the social ontology.
- The ontology level of roles and offices provides for role and **office acts** by agents at this level. These acts are level-generated (Goldman 1970) by doings of agents at lower levels.
- Reference to acts at office level necessarily requires lower level **implementary action** by the incumbent of the office.
- There is no commitment to 'kinds' or 'roles' as primitive ontological types. Kinds are not involved. Roles are thematic roles of incumbency events.

6.2 Compositional analysis

- A frame-based lexical semantics allows the application of **unification** as the basic mechanism of composition.
- Composition allows for **multiple readings** from the same lexical input, if unification is possible in more than one way. Thus composition is not necessarily deterministic.
- The ontology connects lexical concepts to world knowledge.
- Some lexical concepts involve more than one ontological level.
- Composition requires **level-selection** for unification.

Thank you!

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Selected References

- Alexiadou, Artemis & Melita Stavrou. (2011). Ethnic adjectives as pseudo- adjectives: a case study on syntax–morphology interaction and the structure of DP. *Studia Linguistica* 65(2). 117–146.
- Arsenijević, Boban, Gemma Boleda, Berit Gehrke & Louise McNally. (2014). Ethnic adjectives are proper adjectives. In *Proceedings of the Chicago Linguistics Society* 46. 17–30.
- Bosque, Ignacio and Carme Picallo. (1996). Postnominal adjectives in Spanish DPs. *Journal of Linguistics* 32. 349–386.
- Goldman, Alvin I. (1970). *A Theory of Human Action*. Prentice Hall. London.
- Kawaletz, Lea & Ingo Plag. (2015). Predicting the semantics of English nominalizations: A frame-based analysis of *-ment* suffixation. In Laurie Bauer, Livia Körtvélyessy & Pavol Stekauer (eds.), *Semantics of complex words*, 289–319. Springer.
- Larson, Richard K. (1998). Events and modification in nominals. In Devon Strolovitch & Aaron Lawson (eds.), *Proceedings of Semantics and Linguistic Theory*, vol. 8, 145–168.
- Löbner, Sebastian. 2014. Evidence for frames from human language. In Thomas Gamerschlag, Doris Gerland, Rainer Osswald & Wiebke Petersen (eds.), *Frames and concept types*, 23–67. Springer.
- McNally, Louise & Gemma Boleda. (2004). Relational adjectives as properties of kinds. In O. Bonami & P. Cabredo Hofherr (eds.), *Empirical issues in formal syntax and semantics* 5. 179–196.
- Moltmann, Friederike (2017). Natural Language Ontology. *Oxford Research Encyclopedia of Linguistics*, <http://linguistics.oxfordre.com/>.
- Petersen, Wiebke. 2007. Representation of concepts as frames. *The Baltic International Yearbook of Cognition, Logic and Communication* 2. 151–170.
- Sassoon, Galit W. (2013). *Vagueness, gradability, and typicality: The interpretation of adjectives and nouns*. Brill.
- Searle, John R. (1995). *The Construction of Social Reality*. Penguin. London.