Roles and the compositional semantics of role-denoting relational adjectives
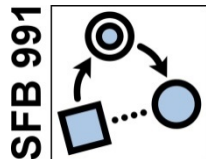
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0. Introduction

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

  the presidential desk   a presidential advisor   (only 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 adjective use

Non-relational: Property use

Semantics of A+N: The adjective defines a property of its argument;
if combined with a noun, the property by composition is attributed to the noun referent.

- Many property adjectives (i.e. adjectives with adnominal property use) define a class in their own right 'the A ones'.

- Property adjectives can be used predicatively.

- Subclasses:
  (non-gradable) adjectives of color, shape, material: *green   round   wooden*

  (gradable) one-dimensional adjectives that specify their argument with respect to a particular dimension / attribute: *big   short   expensive   old   hot*

  (gradable) multidimensional adjectives (cf. Sassoon 2013),   *good   healthy   intelligent*

1.1 Variants of adnominal 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

Most relational adjectives are either derived from, or semantically related, to a noun N_A

motherly	*mother*
papal	*> pope*
senatorial	*senator*
royal	*> king, queen*
presidential	*president*
semantic	*semantics*

German

ärztlich	*Arzt* ('[medical] doctor')
studentisch	*Student* ('college/university student')
fachmännisch	*Fachmann* ('specialist, expert')

1.2 Relational adjectives proper

Relational A+N compositionally result 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	*presidential visit*	–	*prezident$_N$-skij$_A$ visit*
NN compound	–	*Präsidentenbesuch*	–
possessive N N	*president's visit*	*Besuch des Präsidenten*	*visit prezident$_N$-a$_{GEN}$*
deNA + N	*Ukrainian crisis*	–	–
NN compound	–	*Ukraine$_N$krise*	–
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 semantics.

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*)

- 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.

    $$[\![architect]\!] = \lambda x_k \lambda y_o [R(x_k, y_o) \wedge \textbf{architect}(x_k)]$$

- RAs are properties of kinds.

    $$[\![technical]\!] = \lambda x_k [\textbf{technical}(x_k)]$$

- Intersective modification via the kind argument.

    $$[\![technical\ architect]\!] = \lambda y_o \exists x_k [R(x_k, y_o) \wedge \textbf{architect}(x_k) \wedge \textbf{technical}(x_k)]$$

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**.

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

- 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 and a location. There are, however, many possible relations involved with *presidential*.

presidential election	election with the aim of determining the next president$_{incumbent}$	("thematic")
presidential office (1)	the office of president$_{role}$	
presidential office (2)	office for certain types of official action by the president	
presidential advisor	advisor to the president for official action	
presidential visit (1)	visit by the president as the president	("thematic")
presidential visit (2)	visit to the president as the president	("thematic")
presidential order	order by the president as part of executing presidential rights	("thematic")
presidential motorcade	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, implement 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.

Figure 1: Office and role level
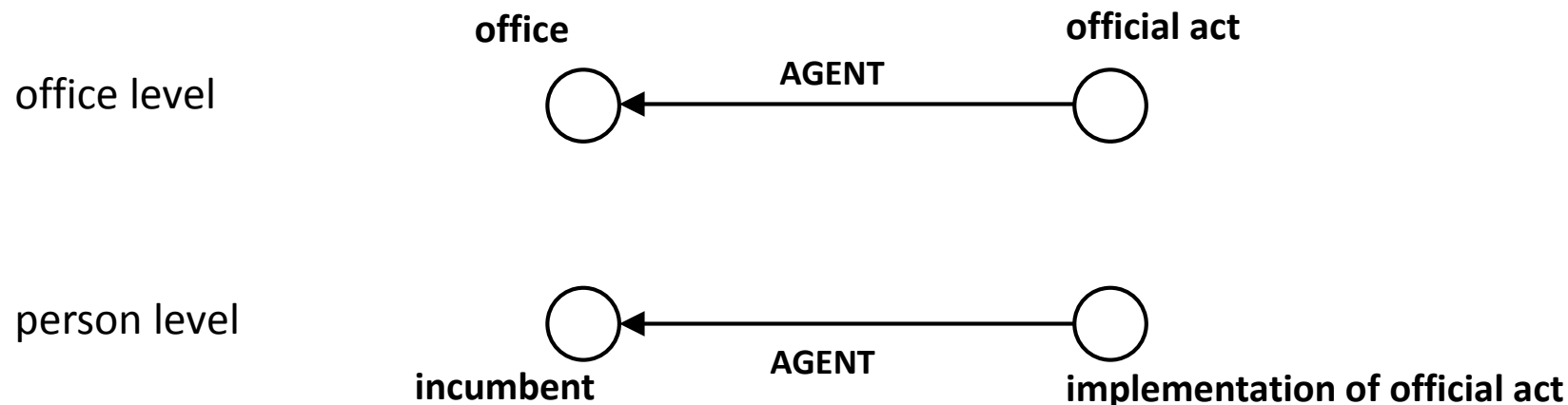
3.3   Connections between levels

- 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.
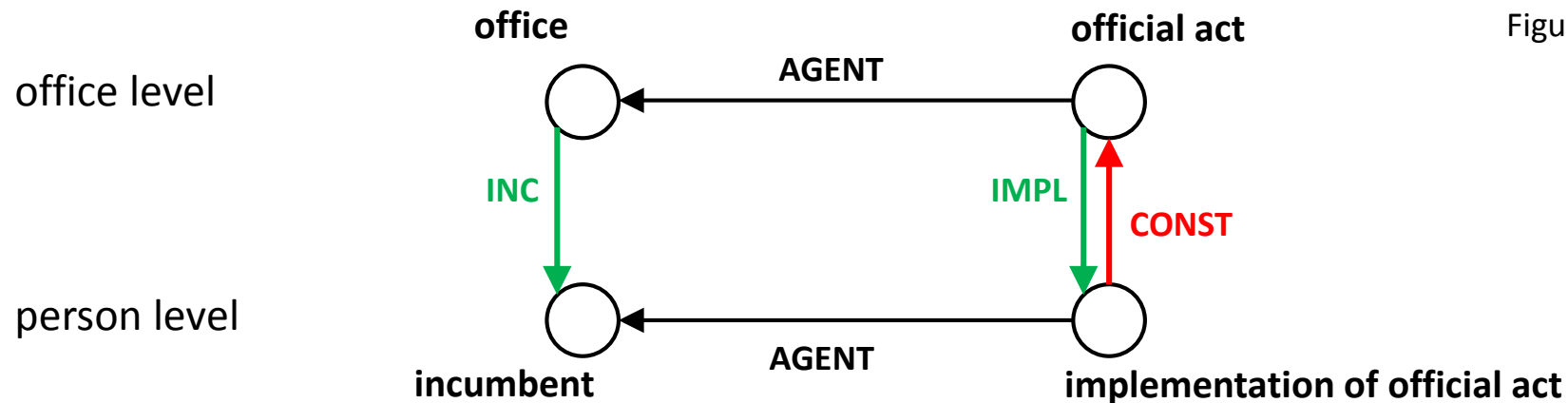 This relation is Goldman's (1970) "level-generation".

Figure 2: Office and role level relations

3.3   A note on notation

- Analysis uses a version of frame semantics formalized by Petersen (2007) and Löbner (2014).

- Frame is a recursive attribute–value structure.

- Model lexical and world-knowledge within the same representation.

- Attributes in this theory 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.
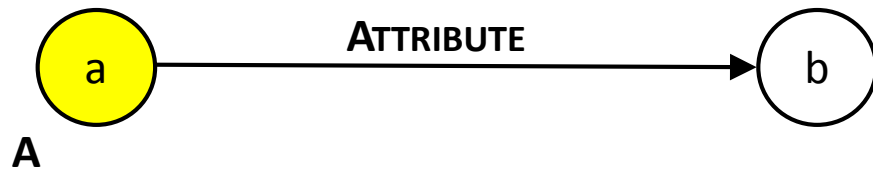
$$\lambda a.\, \mathbf{A}(a) \,\wedge\, \textsc{Attribute}(a) = b$$

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.
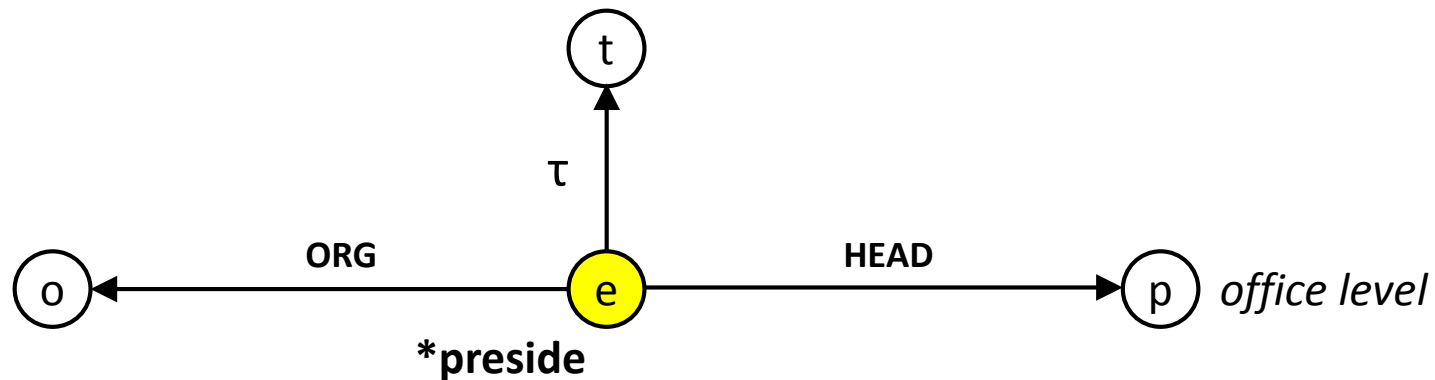

Figure 3: *presidency* and *preside*

λe (*preside(e) ∧ HEAD(e)=p ∧ ORG(e)=o ∧ τ(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 the head or incumbent.

- Assumption: For every time t, every organization o, there is at most one presidency obtaining.
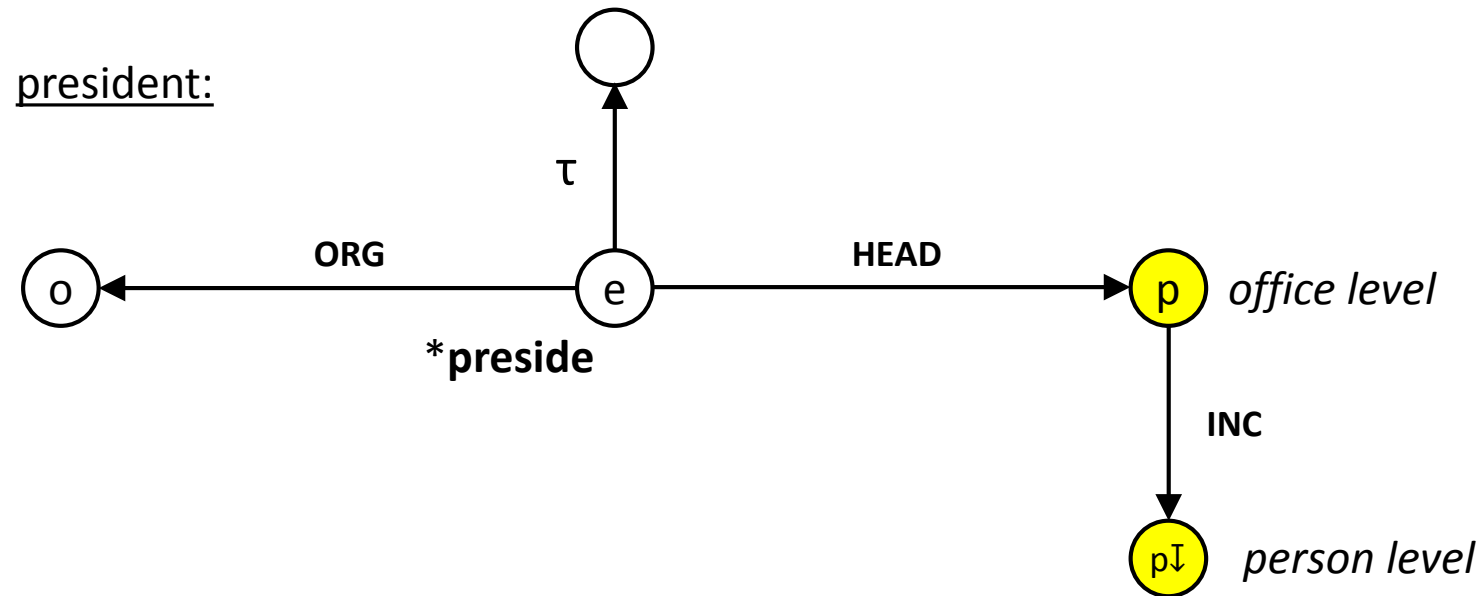
president:

Figure 4: *president*

$$president_{office}(t, o) \quad =_{def} \quad HEAD\ (\iota e\ (*preside(e) \land t\ in\ \tau(e) \land ORG(e)=o)$$

$$president_{person}(t, o) \quad =_{def} \quad INC\ (HEAD\ (\iota e\ (*preside(e) \land t\ in\ \tau(e) \land ORG(e)=o))$$

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.
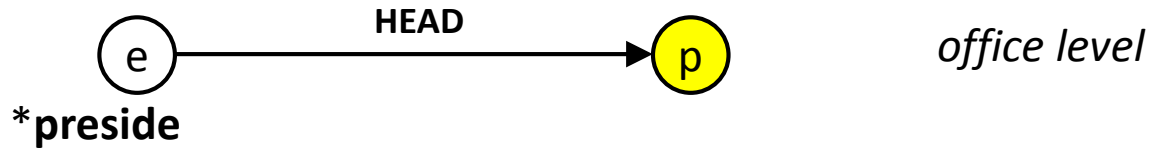
presidential:

Figure 5: *presidential*

5. Compositional analysis

5.1 Reminder: Possible readings for visiting-president constructions

		official reading	**personal reading**
(1)	*The US president visits the Russian president.*	available*	available
(2)	*Trump visits Putin.*	world knowledge: available	available
(3)	*Trump visits his son.*	world knowledge: not available	available
(4)	*presidential visit*	available	**not available**
(5)	*the president's visit*	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
  presidential advisor   regular advisor for official presidential matters
      vs.
  president's advisor   advisor of the president in arbitrary matters,
                                                                including such unrelated to president's office

  presidential desk   desk for the president for his official use
      vs.
  president's desk   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 on 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 visit$_{official}$ by visitor in office to host in some office.

- **visit$_{official}$** 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.
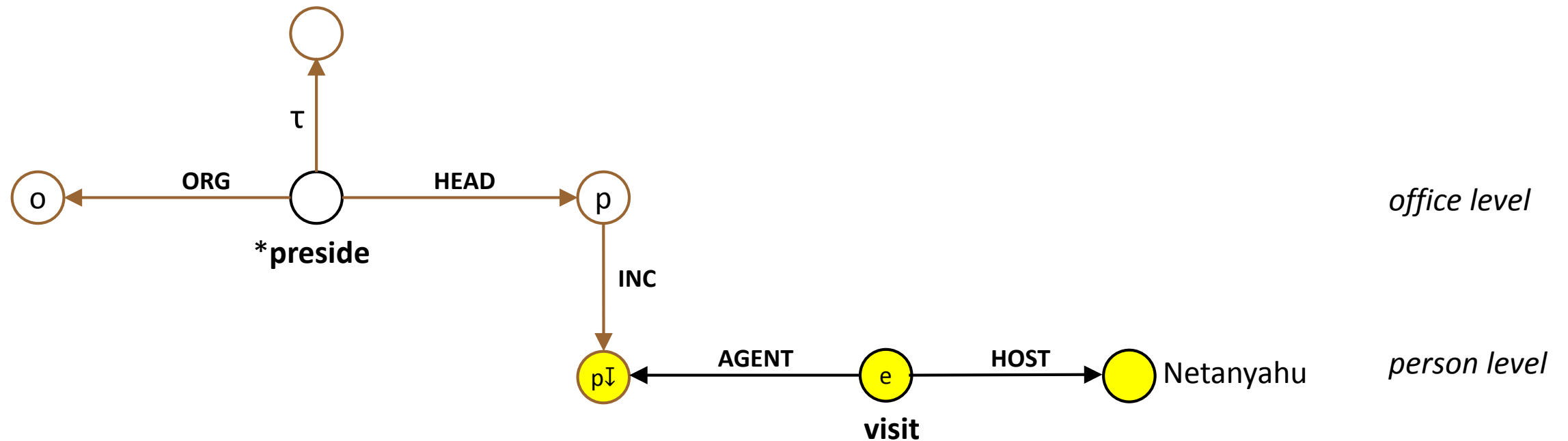- Reference to the person of Netanyahu necessitates elaboration of the personal level.
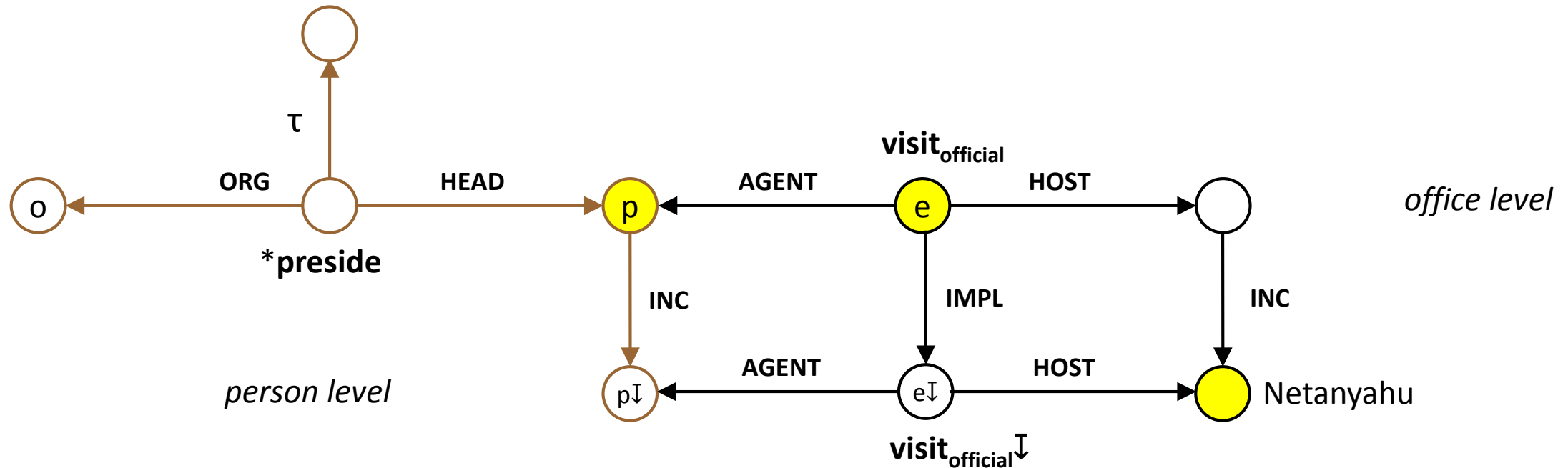
5.4 Personal visit

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

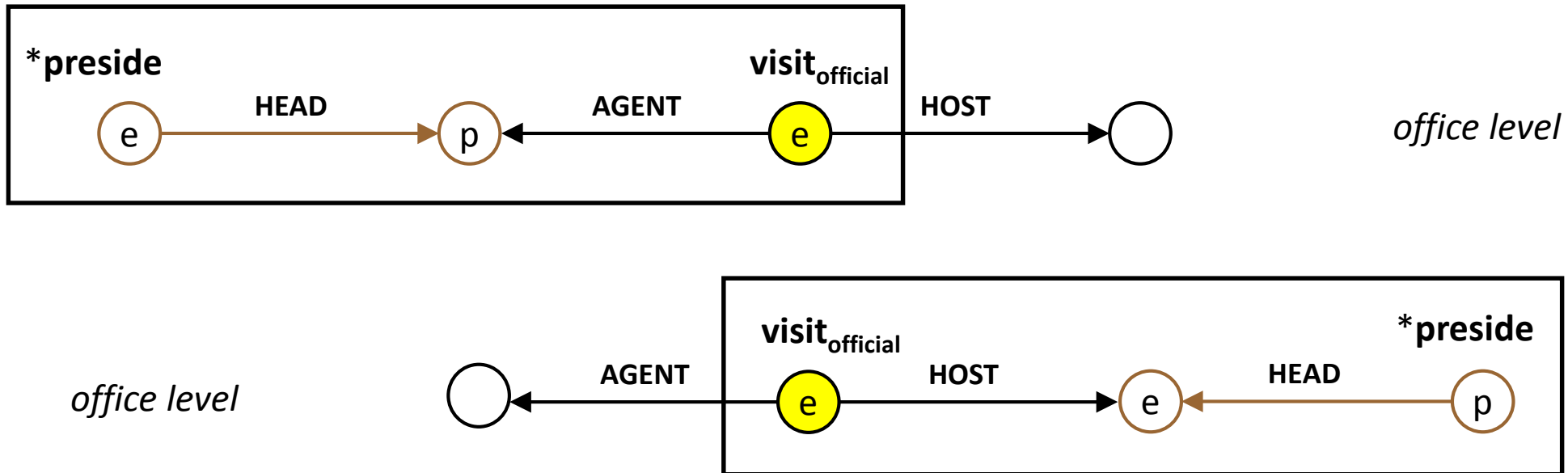- The **agent** node unifies with the **incumbent** node of the *president* frame.

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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