Don't scope your universal quantifier over negation!

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FASL 22
May 4, 2013

Problem

- Two logical operators in one natural language sentence usually lead to an ambiguity.

(1) John hasn't seen two Jarmusch movies. $2 > \neg \,/\, \neg > 2$

- But negation and universal quantifier (*all*) differ: observed by Jackendoff (1972), Büring 1997, Kadmon 2001.

(2) John hasn't seen all Jarmusch movies. $\neg > \forall \,/\, ???\forall > \neg$

- SYN2010: representative corpus of contemporary Czech
- cca 1000 negated sentences with universal quantifier (lemma *všechen*)
- three factors: **linearization, bare/modified status of NP, interpretation**
- 2 linearizations:
  - (1) subject ($\forall$) neg-V ($\neg$)
  - (2) neg-V ($\neg$) subject ($\forall$)

	Int. 1: $\forall > \neg$	Int. 1: $\forall > \neg$	Int. 2: $\neg > \forall$	Int. 2: $\neg > \forall$
Lin.	Bare NP	Modified NP	Bare NP	Modified NP
S neg-V	Type 1: 22%	Type 2: 87%	Type 5: 78%	Type 6: 13%
neg-V S	Type 3: 0	Type 4: 100 %	Type 7: 100%	Type 8: 0

Examples from Corpus

- Type 5: bare NP, lin. *všichni* neg-V, interpretation $\neg > \forall$

(3) Všichni pacienti si   ale   protilátky nevytvářejí.
     All   patiens REFL though antidotes not-create
     'All patiens don't create antidotes though.'

- Type 2: mod. NP, lin. *všichni* neg-V, interpretation $\forall > \neg$

(4) Všichni ti   muži nesouhlasili se   Šengovou politikou –
     All   the men not-agree   with Šeng's   policy   -
     někteří otevřeně, jiní   opatrně.
     some   openly   others cautiosly
     'All the men din't agree with Šeng's policy – some of them
     openly, the others cautiously. '

Examples from Corpus

- Type 7: bare NP, lin. neg-V *všichni*, interpretation $\neg > \forall$

(5) Zatím tu   ještě nejsou všichni, ale zbývající hosti
     so_far here yet   not-are all   but other   guests
     jistě   dorazí   co nevidět.
     certainly arrive-they soon
     'All are not here yet but the other guests will certainly
     arrive soon.'

- Type 4: mod. NP, lin. neg-V *všichni*, interpretation $\forall > \neg$

(6) A   mě před nimi nedokáží uchránit ani všechny
     And me before them cannot   save   not all
     špatné anglické zákony dohromady.
     bad   English laws   together
     'And all the bad English laws together cannot save me from
     them.'

- the linearization (information structure) isn't the decisive factor: both S neg-V and neg-V S linear order show nearly the same percentage of relative scope
- the correlation is between the interpretation and bare / modified status of NP
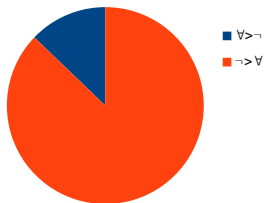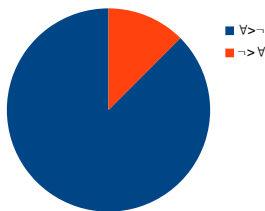
Figure 2: interpretation of bare NPs

Figure 5: interpretation of modified NPs

■ ∀>¬
■ ¬>∀

Contributions

- Hypothesis: despite Type 1, Type 2 and Type 4 we claim that the relative scope of $\forall$ and $\neg$ is always fixed:

(7)   Universal quantifier (of the *all* type) in natural language is always interpreted under the scope of negation ($\neg > \forall$).

- This holds irrespectively of the information structure (contra proposals of Jackendoff 1972, Büring 1997, Kadmon 2001).
- Ingredients:
  - (1) competition in grammar
  - (2) illusion of scope

Proposal

- The scope $\forall > \neg$ is never realized by *všechno . . . ne*-V, as there is more economical way to materialize that meaning – by the negative word *žádný* (*no*). Generally it's a result of the competition in the grammar: see Horn (1989), Hoeksema (1998), Percus (2006), Reinhart (2006).

(8) Všichni pacienti si   ale   protilátky nevytvářejí.
    All   patiens REFL though antidotes not-create
    'All patiens don't create antidotes though.'

   a. *$\forall x[patient(x) \rightarrow \neg create\_antidotes(x)]$
   b. $\neg\forall x[patient(x) \rightarrow create\_antidotes(x)]$

(9) Žádní pacienti si   ale   protilátky nevytvářejí.
    No   patiens REFL though antidotes not-create
    'No patiens don't create antidotes though.'

   a. $\forall x[patient(x) \rightarrow \neg create\_antidotes(x)]$
   b. *$\neg\forall x[patient(x) \rightarrow create\_antidotes(x)]$

Two big problems

- formalization: Horn scales for negated verb n-words and universal NPs form a scale and asserting the logically weaker implicates negation of the logically stronger

  (1) universal NPs, negative words

Two problems

(1) Type 1 (22% out of 100%): bare NP linearized S neg-V and interpreted $\forall > \neg$

(2) Type 2 (87% out of 100%): modified NP linearized S neg-V with the interpretation $\forall > \neg$

Problem one

- 22 % of sentences with bare NPs interpreted with $\forall > \neg$ scope (Type 1)
- half of the sentences contain verbs which are negated only apparently, so universal NPs and n-words are not on the Horn scale (the problem of relevance)

(10) pokračoval tak tichounce, že všichni ani
      continued_he so quietly that all not_even
      nedutali
      whispered_they
      'He continued so quietly that all of them keep silent.'

(11) Všechny dominantní ženy nesnáší ostatní
      all dominant women neg-stand other
      dominantní ženy
      dominant women
      'All dominant women hate all other dominant women.'

Problem one

- in other cases the subject isn't directly competing with n-words (partitive? *nikdo z nás* 'nobody from us')

(12) "Ale všichni/*nikdo se   přece mýlit
      but all/*no_one   REFL surely mislead-to
      nemůžeme." "Samozřejmě že   můžete."
      cannot-we of_course   that can-you-pl"
      'But we all cannot be mislead.' 'Of course you all can.'

Problem two

- the generalization holds only as far, as the universal quantifier and n-words really compete
- but they are not exchangeable salva veritate in all contexts

(13)

	specific	collective/distributive
n-words	*	✓
všechno 'all'	✓	✓

- n-word are extremely unspecific in Czech, they cannot combine with specificity markers as *certain* – see (14) vs. (15).

(14) *Žádný jistý   námořník nepřišel.
      no   certain sailor   not-came
      'No certain sailor came.'

(15) Všichni jistí   námořníci nepřišli.
      all   certain sailors   not-came
      'All certain sailors didn't come.'

- All examples of Type 2 are marked as specific (*Všichni ti muži* 'all the men'), so *žádný* isn't concurrent for them: the specific NPs express the meaning unavailable for the Czech n-words.
- That still doesn't explain why the specific Type 2 is interpreted with the scope $\forall > \neg$, the 50%/50% interpretation would be expected

Proposal

- It's an illusion of scope which comes from the homogeneity presupposition illustrated in (16) from Löbner (2000):

(16)   The cow is not black.

- (16) in isolation is interpreted only as conveying that the cow is all not black

- other examples of the homogeneity presupposition (from Beck 2001):

(17) The women don't know the men.
     a. $\forall x[x \in WOMEN \rightarrow \forall y[y \in MEN \rightarrow \neg KNOW(x,y)]]$
     b. $*\neg\forall x[x \in WOMEN \rightarrow \forall y[y \in MEN \rightarrow KNOW(x,y)]]$

- even in cases where the negation is uncontroversially scoping over the universal quantifier:

(18) It's not the case that the children are asleep.
     a. $\forall x[x \in CHILDREN \rightarrow \neg SLEEP(x)]]$
     b. $*\neg\forall x[x \in CHILDREN \rightarrow SLEEP(x)]]$

Illusion of Scope

- Beck's (2001) formulation of the **homogeneity presupposition** is in (19).

(19) *P(A) =
   a.   1 iff $\forall x[x \in A \to P(x)]$ and
   b.   0 iff $\forall x[x \in A \to \neg P(x)]$

Figure: Presupposition of homogeneity
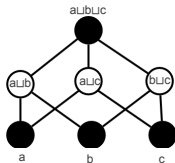
Figure 8: Presuppositon homogeneity

- Structurally the negation still scopes over ∀.
- But due to the homogeneity presupposition we have an **illusion of the opposite scope**.
- But the presupposition can be explicitly canceled (from Loebner 2000):

(20)   The cow is not black, it's black and white.

- This is also explanation of the 13 % of modified NPs interpreted with the ¬ > ∀ – Type 6 .

(21)   Úplně všechno se   neztratilo. Všechno ne.
        totally all   REFL neg-lost_it. All   not.
        'Totally all wasn't lost. All not.'

- $\forall > \neg$ interpretation of *všechno* ... *neg*-V arises only for specific NPs. This supports Kadmon's (1990, 2001) analysis of definite NPs as requiring both maximality (from the semantics of *all*) and familiarity.
- ingredients both from the Russell/Sharvy and Heim's frameworks (scenario with Leif having 10 indistinguishable chairs):

(22) a. Leif has a chair. It's not so comfortable, though.
      b. Leif has four chairs. They are not so comfortable, though.

Predictions

- Examples of the familiarity marking strategies (the most common types of modification in Type 2):

(1) demonstrative:

    (23)   Všechny ty škody nemohly mít jiný účel . . .
               'The purpose of all the damages was nothing else . . .

(2) relative clause:

    (24)   Pokud ovšem všechno, co jste prohlásila, není lež.
               'If all, what you told us, isn't a lie.'

- Conjunction *a* 'and' in Czech act similarly to *všechno* 'all', as $\forall$ and $\wedge$ are logically equivalent, see also Szabolcsi & Haddican (2004).
- Consequently the conjunction of two specific NPs has the reading: $\wedge > \neg$ but the conjunction of two indefinite NPs has both readings $\wedge > \neg$ and $\neg > \wedge$

(25)   Petr nepřečetl Temno   a   Babičku.
       Petr neg-read Darkness and Grandmother
       'Petr didn't read The Darkness and The Grandmother.'

   a. $\neg p \wedge \neg q$
   b. *$\neg(p \wedge q) = \neg p \vee \neg q$

(26) Petr nepřečetl dvě knížky od Jiráska a   tři   knížky
      Petr neg-read two books by Jirasek and three books
      od Němcové.
      by Němcová
      'Petr didn't read two books by Jirásek and three books by
      Němcová.'

      a. $\neg p \wedge \neg q$
      b. $\neg(p \wedge q) = \neg p \vee \neg q$

- **Information structure isn't the decisive factor.**
- According to Jackendoff (1972) (27) has only the $\forall > neg$ due to the informational structure (focused element has the widest scope).
- This cannot be right, as the corpus data show, the real factor is specificity, see also Kadmon (2001) and Kadmon & Roberts (1986), Kučerová (2012).

(27) $[All]_F$ the men didn't go.
   a. $\forall > \neg$
   b. $\neg > \forall$

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