Universität Konstanz

Counterfactual Donkeys and the Modal Horizon

Andreas Walker and Maribel Romero

Universität Konstanz

Universität Konstanz

1 Introduction
Counterfactual Donkey Sentences

(1) a. If a farmer owns a donkey, he beats it.

b. $\exists xPx \rightarrow Qx$

Donkey quantification

Geach (1962): "Every farmer beats every donkey he owns."

Groenendijk & Stokhof (1991): $\exists xPx \rightarrow Qx \Leftrightarrow \forall x[Px \rightarrow Qx]$

$[\![\varphi \rightarrow \psi]\!]_g = \{h \mid h = g \wedge \forall k: \langle h,k\rangle \in [\![\varphi]\!] \rightarrow \exists j: \langle k,j\rangle \in [\![\psi]\!]\}$

(2) a. If John owned Platero, he would be happy.

Counterfactuals

Stalnaker (1968), Lewis (1973):

$[\![\varphi > \psi]\!]^{f,\leq}{}_w = 1$ iff $\forall w' \in f_w([\![\varphi]\!]^{f,\leq})$: $w' \in [\![\psi]\!]^{f,\leq}$

(3) a. If a farmer owned a donkey, he would beat it.

Counterfactual donkey sentences

$[\![\varphi > \psi]\!]^{f?,\leq}{}_{\langle w,g\rangle} = 1$ iff $\forall \langle v,h\rangle \in f^{?}{}_{\langle w,g\rangle} (/\varphi/_g)$: $\langle v,h\rangle \in /\psi/_g$

(3) a. If a farmer owned a donkey, he would beat it.

$[\![\varphi > \psi]\!]^{f?,\leq}_{<w,g>} = 1$ iff $\forall <v,h> \in f\,?_{<w,g>}(/\varphi/_g): <v,h> \in /\psi/_g$

Counterfactual donkey sentences

Two questions:

(i) Which world-assignment pairs do we want to quantify over in counterfactual donkey sentences?

(ii) How can we spell out a selection function that gives us these world-assignment pairs?

2 Readings

High and low readings

A first, plausible assumption (van Rooij 2006):

Indicative donkeys: $\exists xPx \rightarrow Qx \Leftrightarrow \forall x[Px \rightarrow Qx]$ High reading

Counterfactual donkeys: $\exists xPx > Qx \Leftrightarrow \forall x[Px > Qx]$

Scenario: There are three donkeys a, b and c. John owns neither of them. He is a violent man who likes beating donkeys.

(4) If John owned a donkey, he would beat it.

a. ⇒ If John owned a, John would beat a.
b. ⇒ If John owned b, John would beat b.
c. ⇒ If John owned c, John would beat c.

van Rooij's analysis: $[\![\varphi > \psi]\!]^{f^*,\leq^*}_{<w,g>} = 1$ iff $\forall <v,h> \in f^*_{<w,g>}(/\varphi/_g)$: $<v,h> \in /\psi/_g$

$f^*_{<w,g>}(/\varphi/_g) = \{<v,h> \in /\varphi/_g \mid \neg\exists <u,k> \in /\varphi/_g : <u,k> <^*_{<w,g>} <v,h>\}$

$<v,h> \leq^*_{<w,g>} <u,k>$ iff $h = k \supseteq g$ and $v \leq u$

	donkey	own	beat
w_0	$\{a,b,c\}$	$\varnothing$	$\varnothing$
w_1	$\{a,b,c\}$	$\{\langle j,a\rangle\}$	$\{\langle j,a\rangle\}$
w_2	$\{a,b,c\}$	$\{\langle j,b\rangle\}$	$\{\langle j,b\rangle\}$
w_3	$\{a,b,c\}$	$\{\langle j,c\rangle\}$	$\{\langle j,c\rangle\}$
w_4	$\{a,b,c\}$	$\{\langle j,a\rangle\}$	$\varnothing$

$w_0 < w_1 < w_2 = w_3 < w_4$

$f^*_{\langle w,g\rangle}$(/John owns a donkey/$_g$) =

$\{\langle w_1,g^{x/a}\rangle, \langle w_2,g^{x/b}\rangle, \langle w_3, g^{x/c}\rangle\}$

Although w_1 is closer to w_0 than both w_2 and w_3, $\langle w_1,g^{x/a}\rangle$ is unranked with respect to both $\langle w_2,g^{x/b}\rangle$ and $\langle w_3, g^{x/c}\rangle$ because they differ in their assignments.

$\langle w_4, g^{x/a}\rangle$ is excluded, because it is shares an assignment with $\langle w_1,g^{x/a}\rangle$, and $w_1 < w_4$.

However, there is also a second reading argued for by van Rooij (2006) and Wang (2009):

Scenario: Given how poor John's family is, the only realistic chance he ever had to own a donkey was for his grandpa's donkey Melissa to have descendants. Alas, Melissa never has descendants! But, if she had had them, they would have been as stubborn as Melissa herself, so that their owner would have had to beat them. Excepting stubborn donkeys, John has no inclination to beat donkeys.

(4') If John owned a donkey, he would beat it (... because it would be a descendant of Melissa) Low reading

$\not\Rightarrow$ If John owned a, John would beat a.
$\not\Rightarrow$ If John owned b, John would beat b.
$\not\Rightarrow$ If John owned c, John would beat c.

$\rightsquigarrow$ "In the most likely world in which John owns a donkey, that donkey is a descendant of Melissa's, and therefore John beats it."

van Rooij's analysis: make use of selective quantification (Root 1986)

$[\![\varphi >^{X} \psi]\!]^{f^{*}, \leq^{*}, X}{}_{<w,g>} = 1$ iff $\forall <v,h> \in f^{*,X}{}_{<w,g>}(/\varphi/_{g})$: $<v,h> \in /\psi/_{g}$

$<v,h> \leq^{*,X}{}_{<w,g>} <u,k>$ iff $h, k \supseteq g$, $h\uparrow^{X} = k\uparrow^{X}$ and $v \leq u$

If X contains the variable x, then the computation proceeds as before and yields the high reading. With X = $\varnothing$, however, we can now obtain the low reading.

	donkey	own	beat
w_0	{a,b,c}	∅	∅
w_1	{a,b,c}	{<j,a>}	{<j,a>}
w_2	{a,b,c}	{<j,b>}	{<j,b>}
w_3	{a,b,c}	{<j,c>}	{<j,c>}
w_4	{a,b,c}	{<j,a>}	∅

$w_0 < w_1 < w_2 = w_3 < w_4$

$f^{*,X=\varnothing}_{\langle w,g\rangle}(/\text{John owns a donkey}/_g) =$

$\{\langle w_1, g^{x/a}\rangle\}$

Since all the world-assignment pairs under consideration trivially fulfill the conditions of their assignments agreeing on the values of the variables in X, they are all ranked by the similarity of their worlds. Since w_1 is more similar to w_0 than all other worlds, we only yield $\langle w_1, g^{x/a}\rangle$.

van Rooij (2006) uses two kinds of sentences to prime a low reading: identificational sentences, like (5a), and weak sentences like (5b).

(5a) If an animal had escaped from the zoo, it would have been Alex the Tiger.

(5b) If John had a dime, he would throw it into the meter.

3 A problem
NPI licensing

One particular phenomenon to be explained in van Rooij (2006) is the licensing of NPI *any* in the antecedent of counterfactual donkeys:

(6) If John owned any donkey, he would beat it.

van Rooij (2006) appeals to Kadmon & Landman's (1993) widening analysis. On this analysis, downward entailing contexts (which usually license NPIs) are just a subcase of a more general phenomenon: NPI *any* can be used if the domain widening it induces generates a stronger interpretation for the sentence.

(7) If John owned a$_{D=\{a,b,c\}}$ donkey, he would beat it.

High reading

a. ⇒ If John owned a, John would beat a.
b. ⇒ If John owned b, John would beat b.
c. ⇒ If John owned c, John would beat c.

(8) If John owned any$_{D=\{a,b,c,d,e\}}$ donkey, he would beat it.

a. ⇒ If John owned a, John would beat a.
b. ⇒ If John owned b, John would beat b.
c. ⇒ If John owned c, John would beat c.
d. ⇒ If John owned d, John would beat d.
e. ⇒ If John owned e, John would beat e.

(9) If John owned a$_{D=\{a,b,c\}}$ donkey, he would beat it. Low reading

a. ↝ "In the most likely world in which John owns a donkey, John owns a and John beats a."

(10) If John owned any$_{D=\{a,b,c,d,e\}}$ donkey, he would beat it.

No guaranteed outcome.
?↝ "In the most likely world in which John owns a donkey, John owns a and John beats a."
?↝ "In the most likely world in which John owns a donkey, John owns d and John beats d."
?↝ "In the most likely world in which John owns a donkey, John owns e and John beats e."

NPIs are not predicted to be licensed. But empirically they are:

(11) If any animal had escaped from the zoo, it would have been Alex the Tiger.

(12) If John had any dime, he would throw it into the meter.

4 Our solution

A strict conditional analysis for counterfactual donkeys

Our proposed solution (Walker & Romero to appear): combine van Rooij's system with a strict conditional semantics à la von Fintel (1999, 2001).

von Fintel (2001) departs from the tradictional Stalnaker/Lewis analysis of counterfactuals and uses, instead of a selection function, a contextually provided domain of quantification (the modal horizon):

$[\![\varphi > \psi]\!]^D$	is defined only if $[\![\varphi]\!] \cap D \neq \varnothing$
$[\![\varphi > \psi]\!]^D(w) = 1$	iff $\forall w' \in D: w' \in [\![\varphi]\!] \rightarrow w' \in [\![\psi]\!]$

von Fintel proposes that NPIs are licensed in Strawson-downward entailing contexts. This is the case here: for any modal domain/horizon D for which both $[\![\varphi > \psi]\!]^D$ and $[\![(\varphi \wedge \chi) > \psi]\!]^D$ are defined, the former will entail the latter.

A function f of type <st,st> is Strawson-downward-entailing iff
for all p_{st} and q_{st} such that $p \subseteq q$ and f(p) is defined: $f(q) \subseteq f(p)$.

von Fintel's modal horizon is a set of worlds. In our analysis, the modal horizon consists of world-assignment pairs.

(14) $[\![\varphi >^{X} \psi]\!]_{g}^{f^*, \leq^*} = \{<w,g> \mid \forall <v,h> \in f^*|\varphi >^{X} \psi|_{g}^{f^*,\leq^*}(<w,g>)$:
if $<v,h> \in [\![\varphi]\!]_{g}^{f^*,\leq^*}$ then $<v,h> \in [\![\psi]\!]_{g}^{f^*,\leq^*}\}$

(15) $f^*|\varphi >^{X} \psi|_{g}^{f^*, \leq^*}(<w,g>) = f^*(<w,g>) \cup$
$\{<v,h> \in [\![\varphi]\!]_{g}^{f^*, \leq^*}: \neg\exists <u,k> \in [\![\varphi]\!]_{g}^{f^*, \leq^*}: <u,k> <^{*,X}_{<w,g>} <v,h>\}$

That is, when the modal horizon contains no antecedent world-assignment pairs, it is expanded minimally to include such pairs. However, since we use van Rooij's X-relativized similarity relation for defining the minimal update, we can handle both readings for counterfactual donkey sentences.

(4) If John owned a donkey, he would beat it.

	donkey	own	beat
w_0	{a,b,c}	∅	∅
w_1	{a,b,c}	{<j,a>}	{<j,a>}
w_2	{a,b,c}	{<j,b>}	{<j,b>}
w_3	{a,b,c}	{<j,c>}	{<j,c>}
w_4	{a,b,c}	{<j,a>}	∅

$w_0 < w_1 < w_2 = w_3 < w_4$

$f^*(\langle w,g\rangle) = \varnothing$

$f^*|\text{John owns a}^x \text{ donkey } >^{X=\{x\}} \text{he beats it}|(\langle w,g\rangle) = \{\langle w_1, g^{x/a}\rangle, \langle w_2, g^{x/b}\rangle, \langle w_3, g^{x/c}\rangle\}$

$f^*|\text{John owns a}^x \text{ donkey } >^{X=\varnothing} \text{he beats it}|(\langle w,g\rangle) = \{\langle w_1, g^{x/a}\rangle\}$

We get the same results as on van Rooij's framework, but by keeping the modal horizon fixed we can now derive Strawson-DE for both high and low counterfactuals.

5 Extensions

High and low readings in indicative epistemic donkeys and in modal subordination

So far, high and low readings have been detected in counterfactual donkey sentences. However, we note that they also exist in indicative conditionals with e.g. an epistemic modal base.

(16) Let me tell you something about John and his relationship with donkeys. John hates donkeys with a passion. I don't know whether John owns a donkey. But I know this: if John owns a donkey, he beats it. High reading

(17) I don't know whether any animal escaped from the zoo last night, but I know that John forgot to lock the tiger cage. If an animal escaped from the zoo last night, it was Alex the Tiger. Low reading

(18) I don't know whether John has a dime. But if he has one, he will put it in the meter. Low reading

Universität Konstanz

What gives us this variation here seems to be some kind of epistemic modality.

If we assume that epistemic modality can be analyzed with an epistemic modal base MB and a stereotypical ordering source OS giving rise to order ≤ (Kratzer 1991, Portner 2009), then we can give a (tentative) parallel analysis to our proposal for counterfactual donkey sentences.

(19) $[\![\varphi \rightarrow^{X} \psi]\!]_g^{MB, f^*, \leq^*} = \{\langle w,g\rangle \mid \forall \langle v,h\rangle \in f^*|\varphi \rightarrow^{X} \psi|_g^{MB, f^*, \leq^*}(\langle w,g\rangle):$
$\text{if } \langle v,h\rangle \in (MB \cap [\![\varphi]\!]_g^{MB, f^*, \leq^*}) \text{ then } \langle v,h\rangle \in [\![\psi]\!]_g^{MB, f^*, \leq^*}\}$

(20) $f^*|\varphi \rightarrow^{X} \psi|_g^{MB, f^*, \leq^*}(\langle w,g\rangle) = f^*(\langle w,g\rangle) \cup$
$\{\langle v,h\rangle \in (MB \cap [\![\varphi]\!]_g^{MB, f^*, \leq^*}): \neg\exists \langle u,k\rangle \in (MB \cap [\![\varphi]\!]_g^{MB, f^*, \leq^*}): \langle u,k\rangle <^{*,X}_{\langle w,g\rangle} \langle v,h\rangle\}$

We have seen that in our use of the modal horizon in counterfactual and indicative conditionals, the set of world-assignment pairs that is being passed on is sensitive to the high and low reading of indefinites.

A related phenomenon that has been analyzed as involving sets of world-assignment pairs being passed up (Asher & McCready 2007) is modal subordination (Roberts 1987, 1989).

(21) a. A wolf might walk in. It would eat you first.
b. A wolf might walk in. # It will eat you first.

This raises the question of whether high and low readings can also be detected here.

(22) Let me tell you something about wolves in this area. A wolf might come into the house. It would eat grandpa first, because they target the old and weak.

High reading

(23) An animal might have escaped last night. It would have been Alex the Tiger.

Low reading

(24) John might have a dime. He would put it into the meter for us.

Low reading

If we follow Roberts in assuming that the first sentence in (25) is accommodated as an antecedent for the second, to yield (26), we can explain this effect by assuming that we obtain a high or low reading for the indefinites in this accommodated antecedent, otherwise keeping our previous analysis.

(25) A wolf might walk in. It would eat you first.

(26) A wolf might walk in. If a wolf walked in, it would eat you first.

Universität Konstanz

6 Conclusion

An outlook

(i) We have shown that van Rooij's partialized orderings for counterfactual donkey sentences can (and should) be implemented in a strict conditional Fintelian framework to account for NPI licensing with both high and low readings.

(ii) We have presented data that suggests that this is a more general principle at work: high and low readings also show up in indicative epistemic donkeys and in modal subordination, suggesting that the partialization of the similarity function might have to be extended to a general partialization of ordering sources in accounts of modality

Thank you!