Inquisitive Dynamic Semantics

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Contents

1 Data

wh-questions license discourse anaphora:

(1) Which^x paper did you read? Did you enjoy it$_x$?

How do *questions* update the context set in such a way that anaphora in a subsequent question is licensed.

Some additional relevant facts - accessibility in complex questions patterns with accessibility in complex declaratives (examples after (Enguehard 2021)):

(2) Which^x paper did you read and did you enjoy it$_x$?

(3) Did you read a^x paper, and did you enjoy it$_x$?

(4) Did you NOT read a^x paper, or did you enjoy it$_x$?

(5) If you read a^x paper, did you enjoy it$_x$?

The plan:

- Combine the basic ideas of dynamic semantics and inquisitive semantics (based on (Dotlačil & Roelofsen 2019)).

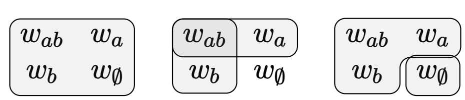
2 Inquisitive semantics: the basics

One of the basic ideas behind inquisitive semantics is that contexts have additional structure - instead of treating a context as an information state, we treat contexts as *downward closed sets of information states.*[1]

Such structures are expressive enough to capture *issues* while subsuming (classical) /informational content.

- Concretely, the *informational content* of an inquisitive context C is just the union of all $s \in C$.
- What's at issue is represented by the *alternatives*, i.e., the maximal elements of C; a context is *inquisitive* just in case it includes more than one alternative.

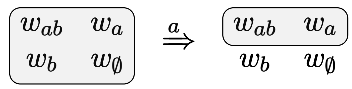
In standard setting, the initial context is simply the powerset of the ignorance state. We can handily represent inquisitive contexts using diagrams where maximal states are highlighted.



Atomic sentences denote downward closed sets of states, i.e., the states which *support* the sentence. Update is cashed out simply as set intersection (just as in a Stalnakerian setting).

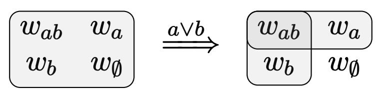
[1] A set C is *downward closed* iff for each element $s \in C$, subsets of s are necessarily elements of C too (including the empty set!).

(6) $[a] := \{\, s \mid s \vdash a \,\}$



Disjunctive sentences denote the *union* of the states that support each disjunct; when we update a context with a disjunctive sentence, we get back an inquisitive context where each disjunct is reflected in an alternative.

(7) $[\phi \vee \psi] := [\phi] \cup [\psi]$



3 Inquisitive dynamic semantics (Dotlačil & Roelofsen 2019)

3.1 The basic system

In standard inquistive semantics, information states are sets of possible worlds; in dynamic inquisitive semantics, we replace this notion with Heimian states.

We'll start by giving a static notion of support for atomic sentences.

Definition 3.1. Support. Support for atomic sentences.

$$s \vdash P(x_1, \ldots, x_n) \iff \forall (w, g) \in s, (g(x_1), \ldots, g(x_n)) \in I_w(P)$$

Definition 3.2. Atomic sentences. If ϕ is atomic, then:

- $C[\phi] = \{\, s \in C \mid s \vdash \phi \,\}$

As before, we'll continue to assume that assignments are partial.

- We need to say what happens if an atomic sentence isn't defined at a possibility in some information state.
- Following (Dotlačil & Roelofsen 2019), we'll assume that if a sentence ϕ is undefined at any possibility in any state $s \in C$, the result is undefinedness (implicitly, a weak Kleene logic).

Definition 3.3. Conjunction. As in update semantics, conjunction is interpreted as a successive update.

- $C[\phi \wedge \psi] = C[\phi][\psi]$

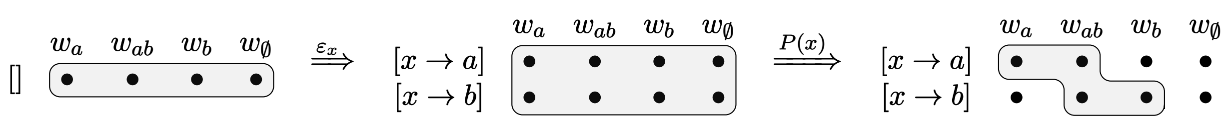
Discourse referents are introduced state-by-state via random assignment.

Definition 3.4. Random assignment (contexts). Random assignment at a context performs random assignment pointwise on states.[2]

- $C[\varepsilon_x] := \{ s[\varepsilon_x] \mid s \in C \}$

In effect, an atomic sentence with a variable x presupposes at C familiarity of x at *every* state in C; random assignment guarantees familiarity at every state.

The diagram below illustrates how random assignment (a) expands states and (b) an atomic sentence cuts the possibilities back down. N.b. none of the resulting contexts are inquisitive (yet).



Definition 3.5. Disjunction. Disjunction parallels inquisitive disjunction and DPL's program disjunction, and as such gives rise to an inquisitive context.

- $C[\phi \vee \psi] = C[\phi] \cup C[\psi]$

It's important to note that the disjunction that (Dotlačil & Roelofsen 2019) assume is internally static but externally dynamic.

[2]We assume the standard definition of random assignment for states:

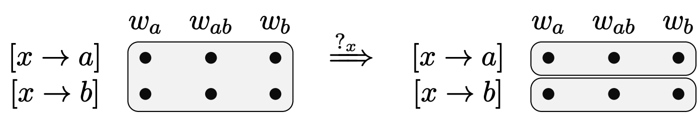
$$s[\varepsilon_x] := \{ (w, h) \mid g[x]h \wedge (w, g) \in s \}$$

3.2 Issues about discourse referents

Having information about the values of variables encoded in states allows us to define an interesting operation – $?_x$, which raises an issue about the value of x by inducing alternatives that agree on x:[3]

Definition 3.6.

- $C[?_x] := \{\, s \in C \mid \forall i, i' \in s, i \sim_x i' \,\}$

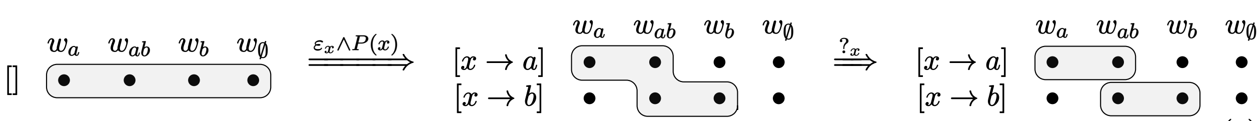


(1)

Inquisitive existential quantification can be defined syncategorematically in terms of random assignment and variable identification. $\exists_x \phi$ does the following:

- Randomly assigns values to x, as restricted by ϕ.
- Raises an issue about the value of x.

(8) $\exists_x \phi := (\varepsilon_x \wedge \phi) \wedge ?_x$



(2)

3.3 Discharging issues

In standard inquisitive semantics *non-inquisitive closure* (!) closes off issues associated with an inquisitive context. Its definition is simple:

Definition 3.7. Non-inquisitive closure (contexts).

- $!C = P(\mathbf{info}(C))$

[3] Here we make use of an equivalence relation over possibilities $\sim_x$, which is defined as follows:

$$(w, g) \sim_x (w', h) \iff g_x = h_x$$

Crucially, it's not necessary that $w = w'$.

In inquisitive dynamic semantics, we can define a closure operator ! that closes off issues in its scope but *not* discourse referents.

Definition 3.8. Non-inquisitive closure.

- $C[!\phi] := \{\, s' \in !C[\phi] \mid \exists s \in C, s \leq s' \,\}$

This allows us to close off the issues raised by an existential statement while retaining the introduced discourse referents. Moreover, the following are equivalent:

(9) $!(\varepsilon_x \wedge P(x) \wedge ?_x)$

(10) $\varepsilon_x \wedge P(x)$

Negation on the other hand is defined in such a way that in closes off issues (as negation does in inquisitive semantics) *and* discourse referents (as negation does in dynamic semantics):

Definition 3.9. Negation. Negation of ϕ at C returns the states in C which don't have a consistent substate that subsists in $C[\phi]$

- $C[\neg\phi] := \{\, s \in C \mid \neg\exists t[t \neq \emptyset \wedge t \subseteq s \wedge t \prec C[\phi]] \,\}$

Just as in standard inquisitive semantics, issues can be raised by disjunction:

Definition 3.10. Inquisitive closure.

- $?\phi := \phi \vee \neg\phi$

3.4 Implication

Definition 3.11. Implication.

- $C[\phi \rightarrow \psi] := \{\, s \in C \mid \forall t \subseteq s, \text{each descendant of } t \text{ in } C[\phi] \text{ subsists in } C[\phi][\psi] \,\}$

3.5 Empirical payoff

3.5.1 Anaphora between questions

(11) Which^x man read a_y book? Did he_x like it_y?

(12) $\underbrace{\varepsilon_x \wedge \varepsilon_y \wedge M(x) \wedge B(y) \wedge R(x,y) \wedge ?_x}_{\text{wh-Q}} \wedge \underbrace{?(L(x,y))}_{\text{pol-Q}}$

- The first conjunct introduces a man dref x and a book dref y, s.t., x read y, and raises an issue about the value of x.
- Suppose there are two men, Gabe and Al. There will be two contextual alternatives:
  - $\{ (w, [x \to G, y \to b]) \mid G \text{ read } b \text{ in } w \}$
  - $\{ (w, [x \to A, y \to b]) \mid A \text{ read } b \text{ in } w \}$
- Familiarity is satisfied, since x and y are familiar throughout all states in the resulting context. Inquisitive closure introduces a new issue about whether x liked y. Now we have four contextual alternatives:
  - $\{ (w, [x \to G, y \to b]) \mid G \text{ read and liked } b \text{ in } w \}$
  - $\{ (w, [x \to G, y \to b]) \mid G \text{ read and didn't like } b \text{ in } w \}$
  - $\{ (w, [x \to A, y \to b]) \mid A \text{ read and liked } b \text{ in } w \}$
  - $\{ (w, [x \to A, y \to b]) \mid A \text{ read and didn't like } b \text{ in } w \}$

3.5.2 Anaphora from polar questions

In dynamic inquisitive semantics, the possibilities of anaphora from polar questions fall straightforwardly under the witness generalization.

(13) **A:** Does Andreea have a^x husband? **B:** Yes, she's married. He_x's waiting outside.

(14) **A:** Does Andreea have a^x husband? **B:** ???No, she isn't married. He_x's waiting outside.

The question in the first conjunct has the following logical form:

(15) $?(\varepsilon_x \wedge H(x))$

It introduces two contextual alternatives (since negation is externally static):

- $\{ (w, [x \to h]) \mid h \text{ is Andreea's husband in } w \}$

- $\{(w, []) \mid \text{Andreea isn't married in } w\}$

If the alternative where Andreea isn't married is contextually eliminated, then subsequent anaphora will be licensed (but only then).

4 Defects

Since disjunction is internally static, there's no chance of accounting for data like the following:

(16) Is there no^x bathroom or is it$_x$ upstairs?

(17) a. Does Andreea not have a^x husband?
b. No, she's married - he$_x$'s waiting outside.

5 Extensions

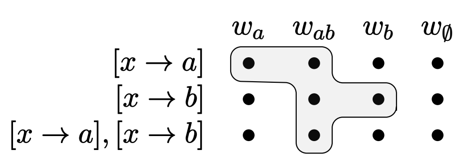
5.1 Presuppositional closure

6 Going plural

(Dotlacil & Roelofsen 2021) extend the basic semantics outlined in this section to a plural setting.

Instead of taking possibilities to be world-assignment pairs, they take them to be world-plural assignment pairs (w, G).

This is illustrated below, for an context post introduction of a dref x:



Applying $?_x$ will produce row-wise alternatives.

Departing from (van den Berg 1996), (Dotlacil & Roelofsen 2021) assume that atomic sentences are interpreted *universally* (see also (Champollion, Bledin & Li 2017)).

Definition 6.1. Support (plural assignments).

- $s \vdash P(x_1, \ldots, x_n) \iff \forall (w, G) \in s, \forall g \in G[g(x) \neq \star \to (g(x_1), \ldots, g(x_n)) \in I_w(P)]$

Plural random assignment needs to be defined as the cumulative generalization of random assignment, as Filipe discussed last week.

Definition 6.2. Random assignment (plural version).

- $G[x]H \iff \forall g \in G, \exists h \in H, g[x]h \wedge \forall h \in H, \exists g \in G, g[x]h$

$$\begin{array}{ll} G & x \\ g_1 & a \\ g_2 & b \end{array} \xrightarrow{\varepsilon_y} \begin{cases} \begin{array}{lll} G & x & y \\ g_1 & a & a \\ g_2 & b & a \\ \hline G & x & y \\ g_1 & a & b \\ g_2 & b & b \end{array} \end{cases}$$

6.1 Q-subordination with questions

One possible motivation (not discussed by (Dotlacil & Roelofsen 2021)):

(18) Which^x book did each^y boy read, and did they^y enjoy it$_x$?

7 References

References

Champollion, Lucas, Justin Bledin & Haoze Li. 2017. Rigid and Flexible Quantification in Plural Predicate Logic. *Semantics and Linguistic Theory* 27(0). 418–437. `https://journals.linguisticsociety.org/proceedings/index.php/SALT/article/view/27.418` (5 May, 2022).

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