Outline

- States of affairs
- Infons
- Relations, Arguments, Polarity
- Truthmakers

States of affairs

- ➜ States of affairs are the most fundamental entities in reality and are *all* the entities that exist in reality
- ➜ A (atomic) state of affairs exists if and only if a particular has a property, or a relation holds between two or more particulars.
- ➜ Relations and properties are universals (state-of-affairs *types*)
- ➜ States of affairs may or may not be factual (with respect to a world)

Infons

- Infons have the form $\ll R, a_1, ..., a_n; p \gg$, with R a relation (or a relation-concept), $a_1, ..., a_n$ individual (or representations of individuals), and p a polarity (either 0 or 1).
- (They are only mentioned so we can refer to them in the following slides)

Relations

- Relations are defined by their *arity*, the *types* of objects that may fill an argument place and by the *roles* each argument can play.
- A relation may be noted as $< rel^n | role_1 : type_1, ..., role_n : type_n >$, where $type_i$ are *object-types*.
- In an infon, not all the argument places for R have to be filled.
- Do we need a "minimality condition" for each relation in order to create infons, entities that contain information? (More later)

Example for relations

Consider the relation $eats$:

$< eats|eater : ANIMAL, thingEaten : EDIBLESUBSTANCE, location : LOC, time : TIM >$

"John is eating an apple here" will become $\ll eats, John, apple, l_{here}, t_{now}; 1 \gg$, or, more precise, $\ll eats, eater \Rightarrow John, thingEater \Rightarrow apple, location \Rightarrow l_{here}, time \Rightarrow t_{now}; 1 \gg$

"John is eating" will become $\ll eats, John; 1 \gg$.

ARGUMENTS (AND TYPES)

- Basic types: GFO categories plus types for infons, parameters and "situations"
- Parameters denote arbitrary objects of type T. Values are assigned by an anchor: An anchor for a set A of parameters is a function defined on A, which assigns to each parameter x of type T in A an object of type T.
- Infons may involve parameters (of appropriate type, as arguments for relations) and form *parametric infons*
- Parameters may be restricted: $v\lceil C$ with C an infon
- Let $r = v\lceil C$, situation s. f is anchor for r in s if (1) f is anchor for v and every free parameter in C, (2) for each infon ϕ in C: $s \models \phi[f]$, (3) $f(r) = f(v)$

Example for parameters

Let $r = IND_1 \lceil \{ \ll speaking, IND_1, LOC_1, TIM_1; 1 \gg, \ll person, IND_1; 1 \gg$. Let f be an anchor for r in situation s. Then each of $f(IND_1) = a$, $f(LOC_1) = l$, $f(TIM_1) = t$ are defined and constituents of s. Also, $f(r) = a$ and $s \models \ll speaking, a, l, t; 1 \gg$.

Or: we want parameter denoting all situations that cause an alarm bell to ring. Then: $r = SIT_1 \lceil \ll causes, SIT_1, SIT_2 \lceil \tau; 1 \gg$ with $\tau = \ll \models SIT_2, \phi; 1 \gg$,
$\phi = \ll rings, IND_1 \lceil \psi, LOC_1, TIM_1; 1 \gg$ and
$\psi = \ll isBell, IND_1; 1 \gg$.

Types or Concepts or Universals

Situation types are denoted as $[s|s \models I]$, where I is a set of infons.

Object types are denoted $[x|s \models I]$ with I a set of infons (with a free parameter x), and s a given (initial, "grounding") situation (possibly w, the world).

TYPE-EXAMPLE

The type of all “winning”-situations would be $[s|s \models \ll winning, x, l, t; 1 \gg$ (situations in which x, a person, is winning)

The type of all persons would be $[x|w \models \ll person, x, l_{world}, t_{now}; 1 \gg]$, or the types of all situations that John sees is $[e|s \models \ll sees, John, e, l, t; 1 \gg]$ (all situations John sees within s).

All persons could also be $[p|w \models \emptyset]$, with p a parameter restricted to persons. But: Parameters are variables, restricted to what they may represent, types are “higher uniformities”. Parameters are artifacts of the theory, types are objects of the theory. (Parameters define types only in the world-situation)

Polarity

The polarity of an infon $\phi = \ll R, a_1, ..., a_n; 1 \gg$ is either 1 or 0, with the interpretation that the entities $a_1, ..., a_n$ stand or do not stand in the relation R.

It is possible leave the polarity out and use strong and weak negation in the theory.

Infons in Ontology

- ➜ Infons are located on the mental/social level
- ➜ They contain information about (parts of) reality by reference to the existence or absence of a "corresponding" state of affairs
- ➜ Infons are elementary informational "particles"
- ➜ They reflect the manner in which an agent classifies the world
- ➜ Infons are abstract and intentional

Infon algebra, Compound infons

All infons are compound infons. Let ϕ_1 and ϕ_2 be compound infons and A a set. Then $\phi_1 \wedge \phi_2$, $\phi_1 \vee \phi_2$, $(\exists x \in A)\phi_1$ and $(\forall x \in A)\phi_1$ are compound infons with the interpretation:

$$s \models \phi_1 \wedge \phi_2 \iff s \models \phi_1 \text{ and } s \models \phi_2$$

$$s \models \phi_1 \vee \phi_2 \iff s \models \phi_1 \text{ or } s \models \phi_2$$

$$s \models (\exists x \in A)\phi_1 \iff \text{for an anchor } f \text{ of } x \in A : s \models \phi_1[f]$$

$$s \models (\forall x \in A)\phi_1 \iff \text{for all anchors } f \text{ of } x \in A : s \models \phi_1[f]$$

PROPOSITIONS

Basic propositions are of the form $s \models \phi$ with s being a situation and ϕ a (compound) infon, with the interpretation "s supports the information ϕ".

What are the truthmakers for this proposition? Are situoids sufficient? Or states of affairs plus situoids?

Constraints

Constraints realise the *flow of information*.

$$S_0 = [s_0 | s_0 \models \ll smokePresent, l, t; 1 \gg] \tag{1}$$

$$S_1 = [s_1 | s_1 \models \ll firePresent, l, t; 1 \gg] \tag{2}$$

$$C = S_0 \Rightarrow S_1 \tag{3}$$

$$C = \ll involves, S_0, S_1; 1 \gg \tag{4}$$

Translation: "Smoke means fire." Whenever there is a smoky-situation, there also is firy-situation.

C is parameter-free, involving two (parametric) types.