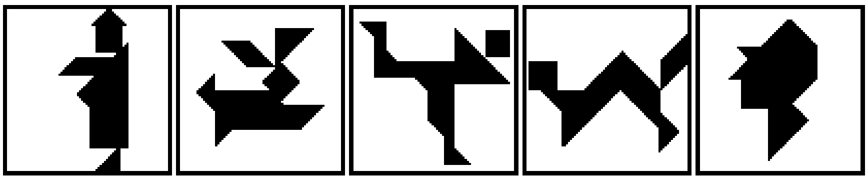
Constructing and Counting Ephemeral Entities

Manfred Krifka
Humboldt-Universität zu Berlin & ZAS, Berlin

It is a common assumption that count nouns differ from mass nouns insofar as they come with a criterion of counting – they specify what it means to be one thing of a given sort. E.g., the meaning of *apple* comes with the information what counts as one apple; the meaning of *milk* doesn't (cf. Quine 1960). This can be implemented in various ways, e.g. by assuming that *apple(s)* is atomic, whereas *milk* is homogeneous. Typically, it is assumed that noun meanings apply to individuals, type e, that are subject to a join operation, and that the criterion of counting can be defined in terms of such individuals.

However, there are types of nouns whose criteria of application and of counting cannot be understood in this way. Gupta (1980) argued that one and the same *person* may count as more than one *passenger*, a distinction that is difficult to understand in terms of simple individuals. This talk will concentrate on examples like the following, where we count different possibilities of constructing configurations of entities:

(1) *With the seven pieces of the tangram set that John got for his birthday, he can construct hundreds of figures, like the following ones:*



On one reading, this is true; there are indeed hundreds of possibilities to construct figures out of the seven pieces of the particular tangram set John got for his birthday (where the rules require that the pieces should all be used and that they should not overlap but all be adjacent to each other, and should result in a shape that is easily recognized). On another reading, the sentence is false, as with seven pieces John can only construct one figure a time.

I argue for the use of individual concepts to capture the notion of predicates of ephemeral entities such as *figure of this tangram set*, and of the ambiguity exhibited in (1). Individual concepts have been proposed as referents for a number of referring expressions, from *Miss America* (Lewis 1970) and *the temperature* (Montague 1973) to *the gifted mathematician that Bill claims to be* (Grosu & Krifka 2008). Individual concepts were also invoked by Gupta (1980) for *passenger*-type nouns, but notice that a similar ambiguity appears with seemingly entity-related nouns like *person*, as in *National Airlines flew 6 million persons last year*. Notice that this sentence, as well as example (2), shows the use of temporally restricted individual concepts, whereas (1) exemplifies modal individual concepts.

(2) *With the seven pieces of the tangram set that John got for his birthday, he has constructed hundreds of figures, like the ones above.*

I will show that the ambiguity of sentences like (1) and (2) can be captured if nouns like *tangram figure* are understood as applying to individual concepts that interact with the semantics of modality and with the semantics of verbs of creation.

To be specific, if t is a particular tangram set (a sum individual of seven atoms), then the ice-skater figure that can be made from t is the following individual concept, which maps indices (worlds or times) i to t provided that t is a T(angram) set and is arranged in the T(angram) shape of the ice-skater in i; otherwise the individual concept is undefined. (Here and in the following, I write λi. Condition [Value] for a function from i that is defined iff Condition is satisfied, and in case it is defined, yields Value as its value).

(3) ⟦*the ice-scater made from t*⟧ =
λi.t is a T-set in i $\wedge$ t is arranged in the T-shape of the icescater in i [t]

Nominal predicates like the following consequently are properties of individual concepts. Notice that these are all constant properties, yielding the same set for each index; we can vary the notion of what counts as a T-set and as a T-figure as indicated in angled brackets.

(4) ⟦*ice-scater figure made from t*⟧(i_0) =
{λi.t is a T-set in i $\wedge$ t is arranged in the T-shape of the icescater in i [t]}

(5) ⟦*tangram figure made from t*⟧(i_0) =
{λi.t is a T-set in i $\wedge$ t is arranged in the shape F in i [t] | F is a T-shape ⟨in i_0⟩}

(6) ⟦*ice-scater figure*⟧(i_0) =
{λi.T is arranged in the T-shape of the icescater in i [T] | T is a T-set ⟨in i_0⟩}

(7) ⟦*tangram figure*⟧(i_0) =
λi{λi. T is arranged in the shape F in i [T] | T is a T-set ⟨in i_0⟩, F is a T-figure ⟨in i_0⟩}

While the property (4) contains a single individual concept, (5) contains individual concepts with disjoined domains but identical values, (6) contains individual concepts with potentially overlapping domains but distinct values, and (7) allows for both kinds of variations.

We assume that individual concepts can be joined by a sum operation $\sqcup$, and that their atoms can be counted by an additive measure function AT. For example, *two tangram figures* has the meaning given in (8), where x is a sum of individual concepts that is in the closure under the join operation of ⟦*tangram figure*⟧(i), and which consists of two individual concepts.

(8) ⟦*two tangram figures*⟧
= λiλx[Cl(⟦*tangram figure*⟧(i))(x) $\wedge$ AT(x)=2]
= λiλx$\exists$x′$\exists$x″[x=x′$\sqcup$x″ $\wedge$ x′$\neq$x″ $\wedge$ ⟦*tangram figure*⟧(i)(x′) $\wedge$ ⟦*tangram figure*⟧(i)(x″)]

The two readings of (1) then can be captured along the same lines as in the following, somewhat simplified example, where R(i_0) are the indices modally accessible from i_0, $\sqsubseteq_a$ is the atomic part relation, and ⟦*construct from*⟧(i′)(t)(x′)(j) states that in i′ John causes that the individual concept x′ with value t becomes realized (more specifically, that John causes i′ to change into i″ such that x′(i″) is defined, where x′(i″)=t) (cf. von Stechow 2000 for verbs of creation). The plausible reading is a wide-scope distributive reading; implausible readings can be achieved as a wide-scope non-distributive reading or as a reading in which the modal takes scope over the existential.

(9) ⟦*John can construct hundred tangram figures from t*⟧(i_0)
$\exists$x[Cl(⟦*tangram figures*⟧(i_0))(x) $\wedge$ AT(x)=100 $\wedge$
$\forall$x′$\sqsubseteq_a$x$\exists$i′$\in$ R(i_0)[⟦*construct from*⟧(i′)(t)(x′)(j)]]

Notice that this reading does not imply that more than one T-figure is constructed at the same index, as the indices i′ might vary with the atomic parts x′. Similarly, for the temporal interpretation of (2) we need not assume that there was a particular time in the past such that John constructed hundreds of T-figures out of his T-set at that time.

In the talk I will also look at a variety of other examples. I will deal with distributive constructions over indices, as in *With these tangram sets, one can construct three tangram figures at a time*, and I will discuss the reading of *How many tangram figures are there?* where we have to abstract away over tangram sets.

Grosu, Alexander & Manfred Krifka (2007), "'The gifted mathematician that you claim to be': Eqational intensional 'reconstruction' relatives.", *Linguistics and Philosophy* 30, 445-485. – Gupta, Anil (1980), *The logic of common nouns: An investigation in quantified modal logic*, Yale University Press, New Haven. – Link, Godehard (1983), "The logical analysis of plurals and mass terms: A lattice-theoretical approach", in R. Bäuerle, C. Schwarze & A. von Stechow, *Meaning, use and the interpretation of language*, Berlin, New York, Walter de Gruyter, 303-323. – Lewis, David (1970), "General semantics", *Synthese* 22, 18-67. – Montague, Richard (1973), "The proper treatment of quantification in ordinary English", in K.J.J. Hintikka, J.M.E. Moravcsik & P. Suppes, *Approaches to Natural Language*, Dordrecht, Reidel, 221-242. – Quine, Willard V.O. (1960), *Word and object*, MIT Press, Cambridge, Mass.