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LARGE-SIZE MESSAGE CONSTRUCTION FOR ETI RECURSIVITY IN LINGUA COSMICA ALEANDER OLLONGREN ALEXOLL@LIACS.NL LEIDEN INSTITUTE OF ADVANCED COMPUTER SCIENCE NIELS BOHRWEG 1, 2333 CA LEIDEN, HOLLAND

Abstract

In a sequence of papers on the topic of message construction for interstellar communication by means of a cosmic language the present author has discussed various significant requirements such a lingua should satisfy. The author's *Lingua Cosmica* is a (meta) system for annotating contents of possibly large-scale pictorial or textual messages for ETI. The present paper shows how recursively defined entities in such messages can be dealt with in the LINCOS system. Two stages are distinguished: the domain of discourse is first enriched with representations of the entities, and then supervening properties can be treated within the system itself. As a first characteristic example Russian matrioshka's are chosen. These dolls have a linear one-dimensional recursive structure: rather loosely stated one might say that in a matrioshka doll, matrjoshka dolls are contained – or that matrjoshka's contain matrjoshka's. One relation illustrated by this example is the notion 'to be contained in' another is 'to contain'. The first can be considered to be an example of a grammatical *perfective aspect*, the second of a grammatical *imperfective aspect*. In the case of the dolls these aspects both are *transitive*: they propagate from top to bottom or from bottom to top in a matrjoshka. The paper describes how (supervening) aspects as these are modelled as terms within the LINCOS system. A brief introduction to some relevant features of LINCOS itself in this respect is included in the paper. The more complicated case of recursive structures occurring within recursive structures (linear multi-dimensional recursion) is also discussed. This case is common in natural language expressions, i.e. sentences. A sentence (S) can contain either just a number of terminals or a noun part (NP) followed by a verbal part (VP) embedded in sequences of terminals (but it can also be empty). Terminals are words from a vocabulary. Let α , β and γ be sequences of terminals (possibly of length zero), ε is the empty sequence (of length zero). We write for the above $S \Rightarrow \alpha NP \beta VP \gamma$.

Sentences are recursive because a noun part, if it is not empty, can contain a sentence. The same applies to the verbal part. We write NP => S 'or' ε , VP => S 'or' ε .

We are then concerned with linear two-dimensional recursive structures. It is seen that a onedimensional Matrjoshka over the terminal 'doll' is a concretisation of the special case S => 'doll' NP, NP => S 'or' ε .

The paper explains how various aspects of recursive sentences containing both noun and verbal parts are modelled in LINCOS (itself also recursive). Noteworthy is that the lingua cosmica, devised primarily for annotating contents of sentences in natural languages, can also be used for modelling grammatical aspects of them.