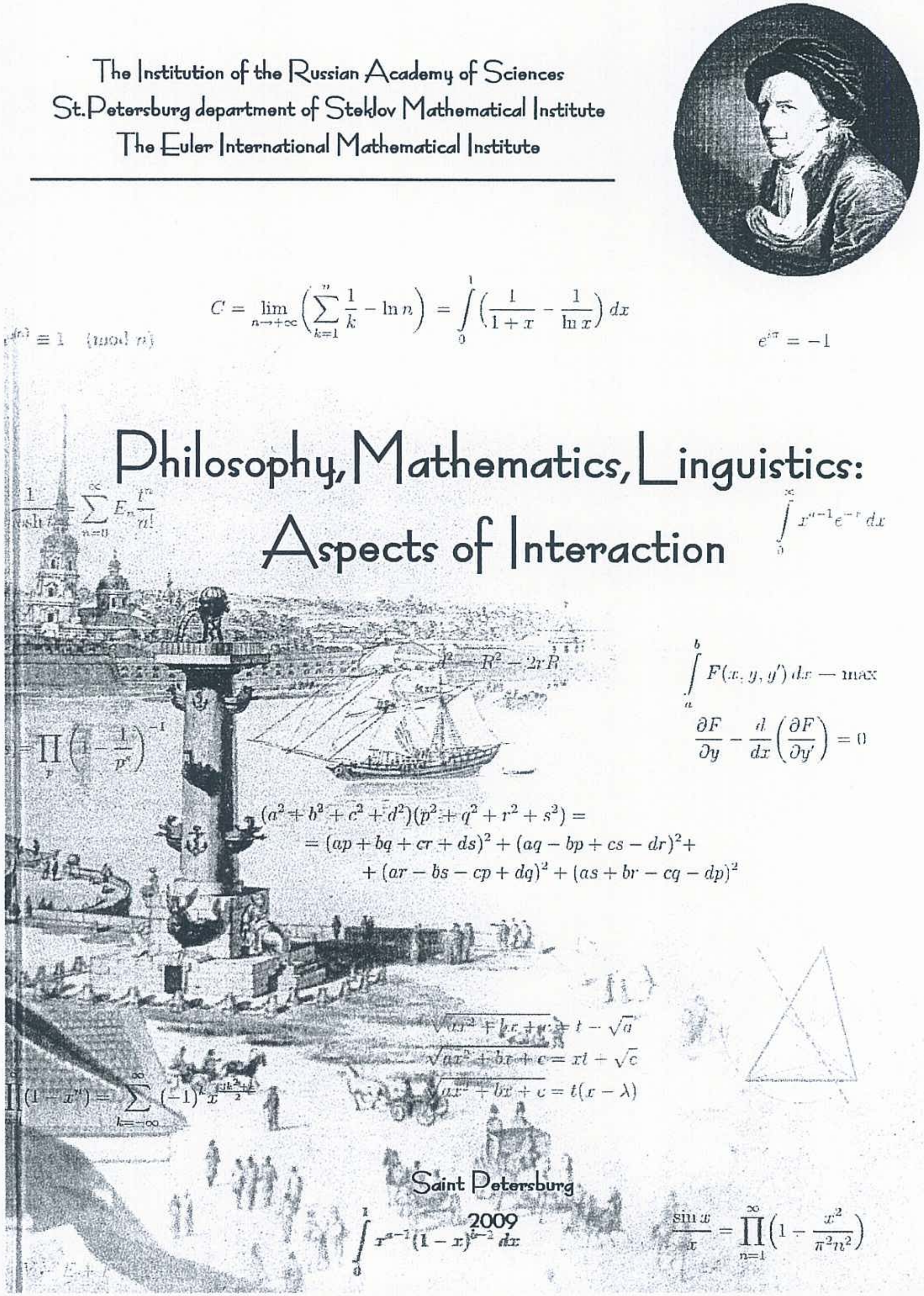

Defining permutations in the lexicon of natural languages

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Abstract: This version for the PhML-2009 proceedings provides a summary of a longer paper scheduled for publication in a linguistic journal. In this contribution, I define properties of natural language predicates that are centred on the notion of argument. I show that every natural language predicate allows and disallows certain permutations of its arguments. With argument-permutation properties, I refer to the property of a predicate to allow two accessible events (in two accessible worlds): one in which its arguments occur in a certain configuration, the other in which its arguments are permutated. I will then make sense of the mathematical notion of permutation group and demonstrate that every n-place predicate (n natural number) exactly generates one permutation group of degree n. This permutation group can be involved to predict the grammaticality pattern of the predicate in sentences employing quantificational aspects such as experiential and habitual aspect markers.

Keywords: Permutation, natural language predicate, arguments, Kam (Dong).

Formally, a predicate-induced permutation problem is defined by the subsequent data. Suppose that the following entities are given:

(1) Predicate-induced Permutation Problem

(a) for a natural number n (generally n = 1, 2, 3),

- an n-place predicate P (e.g. intransitive, monotransitive or ditransitive predicates)
- n arguments $x_1, \ldots, x_n$

(b) a bijective function π: $\{1, \ldots, n\} \rightarrow \{1, \ldots n\}$ (also called *permutation*).

We define three argument-permutation properties that P may satisfy or violate: NON-$\pi(P)$, WEAK-$\pi(P)$, STRONG-$\pi(P)$. Note that the square brackets ensure that the formulas are interpreted through possible worlds that are mutually accessible.

(2) Definition (Generic form of argument-permutation properties):

(a) NON-π-compatible: $\forall x_1 \ldots \forall x_n \Box[P(x_1, \ldots, x_n) \rightarrow \Box\neg P(x_{\pi(1)}, \ldots, x_{\pi(n)})]$

(b) WEAK-π-compatible: $\forall x_1 \ldots \forall x_n \Box[P(x_1, \ldots, x_n) \rightarrow \Diamond P(x_{\pi(1)}, \ldots, x_{\pi(n)}) \wedge \Diamond\neg P(x_{\pi(1)}, \ldots, x_{\pi(n)})]$

(c) STRONG-π-compatible: $\forall x_1 \ldots \forall x_n \Box[P(x_1, \ldots, x_n) \rightarrow \Box P(x_{\pi(1)}, \ldots, x_{\pi(n)})]$

We can make sense of the mathematical notion of permutation group and demonstrate that every n-place predicate exactly generates one permutation group of degree n. Let us first introduce the notion *of permutation set of n-place predicates*.