THE THEORETICAL BASIS OF THE UNI-DIRECTIONAL
MATCHING (LUKJANOW) METHOD

by

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Those who deal with computers, even indirectly, speak of them as "logical machines". This is true, with a caveat: the logic involved is not the ordinary human logic of inductive and deductive reasoning, but a logic based on a particular mathematic, Boolean algebra, or some similar system. Everything in this system is based on two "concepts", if one wants to call them that, of "yes" and "no", plus and minus, one and zero. The machine has often been called "stupid" by computer men themselves, but when it comes to matching, that is, saying "yes" or "no", the machine is a phenomenal genius. We all probably re-member Mr. Bellmore's account of how the machine arrives at the square root of 25. It goes through a laborious, redundant series of matching: Is it I? (I x I = I). No. Is it 2? (2 x 2=4) No. Is it 3? (3 x 3 = 9) No. Is it 4? (4 x 4 = 16). No. Is it 5? (5 x 5 = 25) Yes. This redundancy would be a hopeless obstacle were it not for the fantastic speed of electrons. To operate most effectively on this plus-or-minus circuit the machine must be fed the <u>maximum</u> of <u>data</u>. Only then can it perform its binary operations successfully. Anything resembling "logical human reasoning" that may come out of a machine depends entirely on what the programmer has fed into it. The "logical machine" is, above all, a machine of redundance.

We now come to what I have called the "uni-directional matching method" of Miss Lukjanow. Miss Lukjanow has said that her system is based on "traditional grammar". This has frightened some. But it must be remembered that Russian is an arachaizing Indo-European language, and the "traditional grammar" of Greek and Latin fits Rus-sian, if not English, rather well. The reasons given may be the

wrong ones   (e.g., "adjectives modify nouns", when a more descrip-
tively correct statement might be that forms that take only one set
of inflectional morphemes are "nouns", while forms that take two or
more are "adjectives"), but the results are very nearly right.   Miss
Lukjanow applies this grammatical apparatus not only to Russian, but
to English as well, and to Russian what distinctions English has that
are missing there, e.g. "(there) is, are".   Thus, we arrive at the
essence of the oft-repeated phrase, "bi-lingual grammar."   This, in a
sense is the intermediate language, the language, in the black box
that represents the combined grammar of both source and target lang-
uages. Throw everything in so the machine can most efficiently per-
form its binary operations. The excess can be easily removed later.
On the chart *you w*ill note that all operations from the beginning of
the coded Russian glossary box to the end of the coded English glos-
sary box are in the domain of this bi-lingual grammar. This is the
most important point, the principle of redundancy which the machine
requires.
The method is spoken of as being "uni-dimensional".   That is,
the search is always from left to right except in such a sequence
as N A N where N = noun A = adjective) where the search goes one step
to the left only (and this is rare).

КНИГА	ИНОСТРАННОГО	АВТОРА
Book	of foreign	of author
Nmsg	Amsga	Nmsga

The second attribute of the method is "matching".   Miss Lukjanow

has compared this to a dial telephone or the links in a chain. Such
a link or sequence could, for the purposes of MT, be called a const-
ruct. A construct might consist of adjective (or adjectival parti-
ciple) plus noun, or preposition requiring only one case plus noun,
or verb requiring one case (acc. or gen.) plus (adjective) noun.
Anything else means a break in the sequence, the start of a new
construct.   The chain of constructs consists of series of simple
matching operations somewhat as follows:

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            a a a       1 1 1       x x x
            b b b       m m m       y y y
            c c c       n n n       z z z
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This can be illustrated by such a Russian phrase as:

	КОВЕР		ИНТЕРЕСНОЙ		ОКРАСКИ	
	Msn		Afsgdie		Nfsg	
					Nplna	

Constructs: a (Nmsn)   1 (Afsg)   1 (Nfsg)   x

             m (Afsd)   m (Ngpln)   y

             n (Afsi)   n (Nfpla)   z

                rug   of interesting   of color

English syntax pattern: N pr. A N
(a, the) rug of interesting color

     In providing the maximum possibilities of matching this method
entails the minimum of searching. This certainly makes the task

easier for the linguist and programmer and should shorten the time

required by the machine (this latter will have to be checked by a

computer expert, of course).

The simplicity of operations of the (predominantly) matching method versus the (predominantly) searching method "Experimental Group") can readily be seen from a comparison of the two methods dealing with the noun morph — a (except F).

Searching method	Matching method
I.a. Is subdivided item preceded	HET Nsg
or followed by HET or РАДИ? if	HE Nsg
yes, suffix is translated as Ø	("of" dropped after negations)
stem is singular.	Vg ------Nsg
I.b. Is subdivided item preceded	Ag ------Nsg
by -certain prepositions govern-	Prg ------Nsg
ing the genitive only,	(genetiv's "of", in noun ignored
or -indefinite numerals (i.e.	
СКОЛЬКО 'howmuch),	N ----- Nsg
	"of" is kept)
Or -certain verbs governing the	A -----Nsg
genetive only,	("of" = "than")
or -adjectival case morphs: (	A ---- N other comb.-Ad
-ЕГО,-ОГО,-ЬЕГО /. If yes,	ОВА, ДВА etc ---------Nsg
suffix is translated as Ø , stem	("of" = "-s")
is singular.	

I.e. Is subdivided item imme-
diately or next to immediately
preceded by "HE"?
If yes,   suffix is translated as
Ø, stem is singular.
2. Is subdivided item preceded by

a noun?

If yes, suffix is translated as "of",

stem is singular, reverse order of

translation of stem and suffix.

3. Is subdivided item preceded by

a comparative adjectival form?

If yes, suffix is translated as

'than', stem is singular, reverse

order of left and right partials.

4. Is subdivided item preceded by

certain numerals (ОВА, ДВА, ТРИ,

четре / -'both, two, three.

four)? If yes, suffix is trans-

lated as Ø , stem is plural.

5. Otherwise, translate suffix as

Ø , stem as singular.

   Finally, let it be stated that this method is by no means com-

plete or perfected. It is the outline of a method that needs the im-

plementation of much hard spade work. But, as an outline of a method,

it seems, to this writer at least, to indicate a path to the goal of

MT, a path less steep and tortuous than some others that have been

taken.

FLOW CHART

Bilingual grammar

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┌────────────────┐     ┌────────────────┐     ┌────────────────┐     ┌────────────────┐
│ RUSSIAN TEXT   │ ──► │ CODED RUSSIAN  │     │ CODED ENGLISH  │ ──► │   ENGLISH      │
│ _____ │     │ GLOSSARY       │     │ GLOSSARY       │     │   TEXT         │
└────────────────┘     └────────────────┘     └────────────────┘     └────────────────┘
                               │                       ▲
                               ▼                       │
              ┌──────────────────────────────────────────────────┐
              │              TEMPORARY MEMORY                     │
              │  STORAGE,  MATCHING,  SELECTION,  ARRANGEMENT     │
              └──────────────────────────────────────────────────┘
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