Intelligent Information Systems

Prof. M. Muraszkiewicz, *mrm@ii.pw.edu.pl*

Lecture Notes: Module 7

HUMAN CAPITAL
HUMAN – BEST INVESTMENT!

EUROPEAN UNION
EUROPEAN
SOCIAL FUND

Project is co-financed by European Union within European Social Fund

Semantic Atoms

Module 7

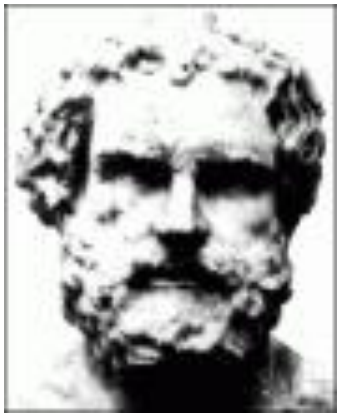
Table of Contents

Background

Atomism

"In natural philosophy, atomism is the theory that all the objects in the universe are composed of very small, indestructible building blocks - atoms. Or, stated in other words, that all of reality is made of indivisible basic building blocks. The word atomism derives from the ancient Greek word *atomos* which means "that which cannot be cut into smaller pieces"

http://en.wikipedia.org/wiki/Atomism



Democritus

B. Russell

What's Knowledge?

Knowledge is what can be expressed in a language.

Back to Wittgenstein

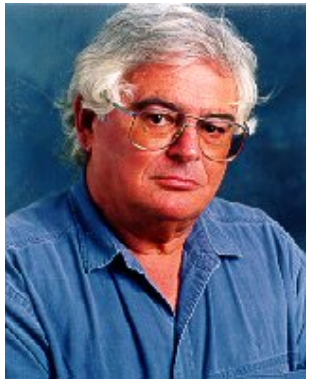
The language is in a sense the essence of reality.

- ***"Die Grenzen der Sprache sind die Grenzen der Welt".***
- ***"Wovon man nicht sprechen kann, darüber muss man schweigen"***
- ***"Einen Satz verstehen, heisst, eine Sprache verstehen. Eine Sprache verstehen, heisst eine Technik beherrschen."***

Ludwig Wittgenstein, *Tractatus Logico Philosophicus*

Semantic Atoms

We are not *Tabula Rasa*



Jerry Fodor claims that the brain of each human being stores an in-born set of "semantic primitives" that are the background of all natural languages (which we can learn).

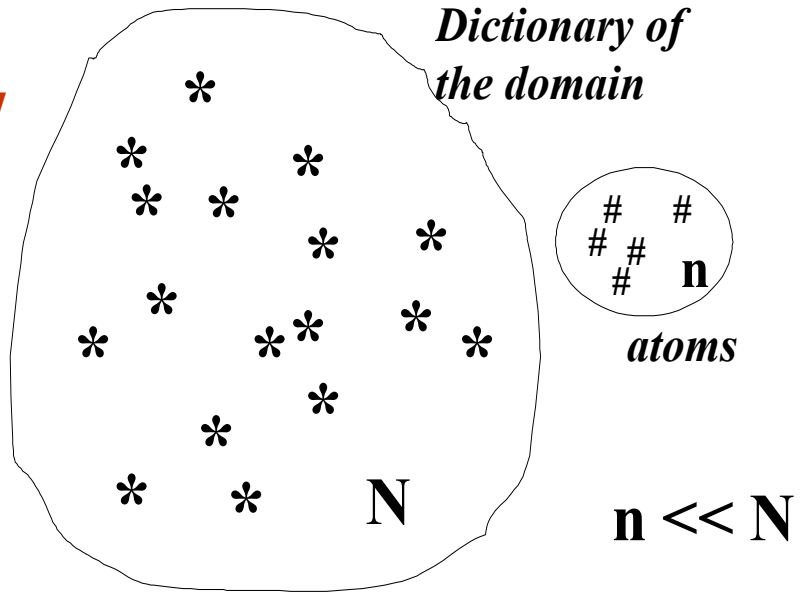
(N. Chomsky most likely would accept the above assumption,

Also the believers of Dawkins' mem theory would certainly agree upon).

Objective

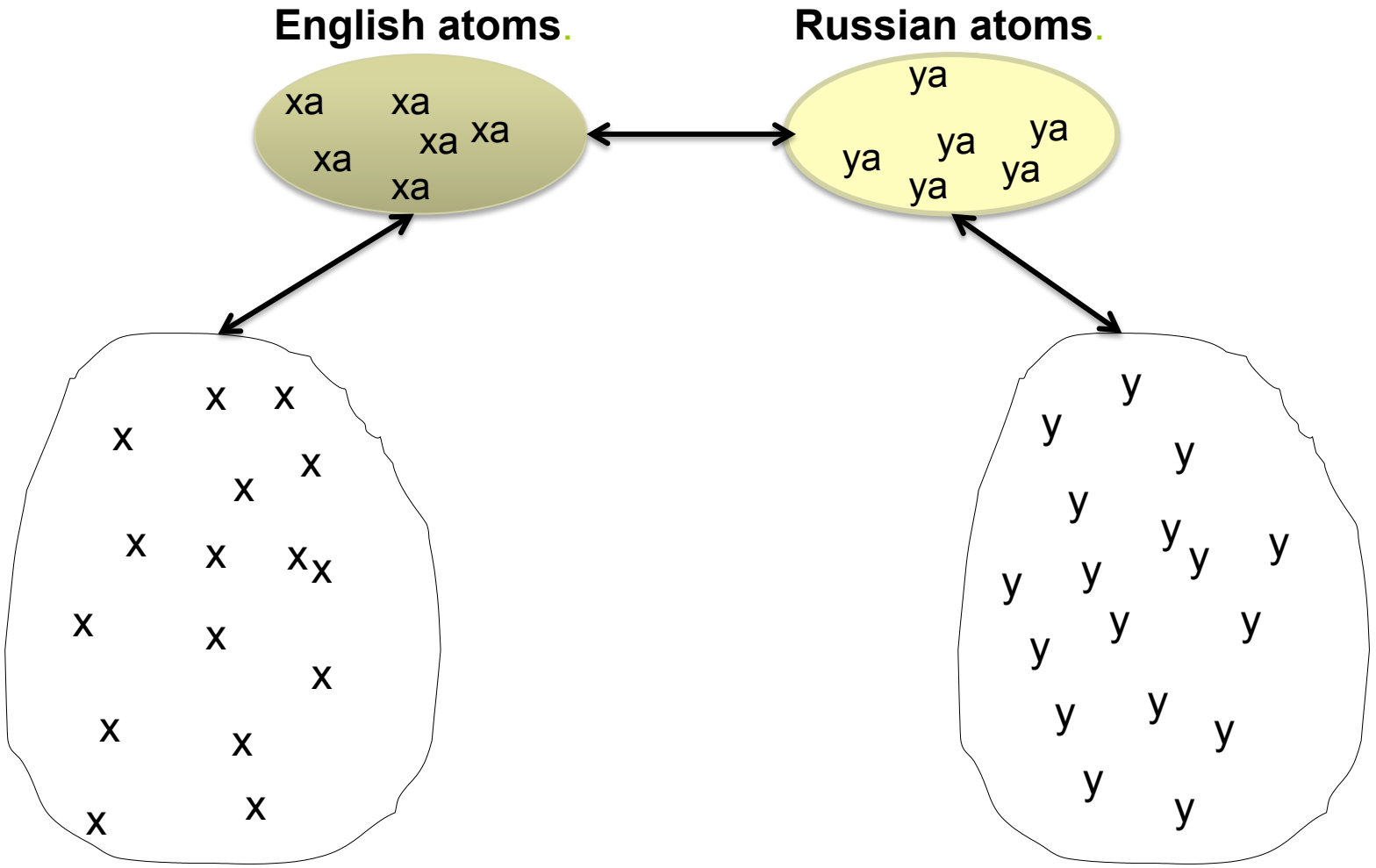
To set up a meta-language to be used for a precise and unique description of the given domain, which will allow one to ask questions and carry out inference.

The meta-language uses a small set of semantic atoms (primitives). The formulae of the language * (“asterisks") are translated in formulae of the language #.



First applications – understanding and translation of natural languages.

Translation



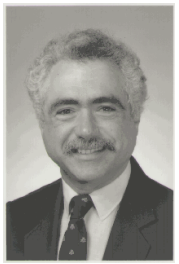
Pioneers

AI:
Schank (1968),
Abelson (1977),
Wilks (1977),
Winograd (1978)

Psychology:
Miller (1975),
Johnson-Laird (1976),
Norman i Rumelhart (1975)

Linguistics:
Jackendoff (1975)


R. Schank


T. Winograd


Y. Wilks

Desired Properties of Atoms

- small, finite set
- non-reductability,
- uniqueness,
- completeness,
- undependability,
- ... ?

What to Take into Account?

- thing,
- state,
- event,
- action,
- place,
- path,
- property,
- amount,
- contact,
- motion,
- ... ?

Prof. Anna Wierzbicka originally proposed only 14 atoms to deal with simple situations described in a natural language,

then she increased the number to 35,

And eventually up to some 60.

http://arts.anu.edu.au/linguistics/arts_fac/staff/wierzbicka.html

Examples of Semantic Atoms Systems

Wierzbicka's List

I, you, someone, something, this, the same (other), two, all, I want, I don't want, think, say, know, would (I imagine), do, happen, where, when, after, like, can (possible), good, bad, kind (of), part, like, because, very.

Anna Wierzbicka: *„Semantic Primitives"*, Athenäum, Frankfurt, 1972.

Wilks' List

First collection (1997)

ENTITIES	ACTIONS	CASES	QUALIFIERS	TYPE INDICATORS
Man **- a human**	***Cause*** **- causing something to happen**	***To*** **- direction**	***Good*** **- morally correct or approved** ***Much*** **- much, applied to a substance**	***How*** **- being a type of action, for r adverbial constructions**
Stuff **- a substance**	***Be*** **- being as equivalence or prediction** ***Flow*** **- moving as liquids do**	***In*** **- containment**		***Kind*** **- being a quality, for adjectival constructions**
Part **- a part of entity**				

Later on the number of atoms was increased to more than 80 (interestingly enough, in Webster's Dictionary the set of the most often used words for defining other terms in the dictionary is composed of some 80 terms).

Conceptual Dependency by Schank

In 1973 Schank proposed a simple event ontology for describing physical and social situations of “daily life” composed of 11 primitives (this number was increased later on)

The relations between events and objects were described by a small set of "case roles".

ACTS	**- move, grasp, propel, ...**
STATES	**- location, hunger, happiness, ...**
CASES	**- actor, object, from, to, instrumental action, ...**
CAUSAL RELATIONS	**- results, enables, initiates, reason**

Example

The glass broke ***(www.surrey.ac.uk/LIS/JB/julia/PhDCh2html.html)***

[Event cause ([Thing i], [Event inch ([State be ([Thing 'the glass' j], [Property 'broken'])])])]

Main Reservations

- There is no proof that semantic primitives actually exist as a “psychological reality”.
- The selection of semantic primitives depends on the natural language used by the designer, hence, the primitives are neither objective nor universal.
- …

Thank you!

HUMAN CAPITAL
HUMAN – BEST INVESTMENT!

EUROPEAN UNION
EUROPEAN
SOCIAL FUND

Project is co-financed by European Union within European Social Fund