Arabic Ontology

الأنطولوجيا العربية

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Watch this lecture and download the slides from

http://jarrar-courses.blogspot.com/2011/12/arabic-ontology.html

The lecture is based on:

Mustafa Jarrar: **Building A Formal Arabic Ontology** (Invited Paper) . In proceedings of the Experts Meeting On Arabic Ontologies And Semantic Networks. Alecso, Arab League. Tunis, July 26-28, 2011.Article http://www.jarrar.info/publications/J11.pdf.htm
Slides: http://mjarrar.blogspot.com/2011/08/building-formal-arabic-ontology-invited.html

Mustafa Jarrar: **Towards The Notion Of Gloss, And The Adoption Of Linguistic Resources In Formal Ontology Engineering**. In proceedings of the 15th International World Wide Web Conference (WWW2006). Edinburgh, Scotland. Pages 497-503. ACM Press. ISBN: 1595933239. May 2006.http://www.jarrar.info/publications/J06.pdf.htm

Please use both articles if when citing the Arabic Ontology

The Arabic Ontology الأنطولوجيا العربية

- Part 1: The Arabic Ontology Design
- Part 2: Gloss in the Arabic Ontology
- Part 3: The Top Levels of the Arabic Ontology
- Part 4: Arabic Ontology Vs WordNet
- Part 5: Building Synsets Automatically

Lecture Keywords:

Arabic Ontology, Why Arabic Ontology, Ontology, Linguistic Ontology, Lexical Semantics, Semantics, Meaning, Concept, Upper Level Ontology, Lexical Relation, Semantic Relation, Subtype, subsumption, Hyponymy, Meronymy, Inheritance, Part-whole, WordNet, Arabic WordNet, Synonymy, Polysemy, Gloss, Ontology versus WordNet, Ontology Matching, Thesaurus construction,

الانطوولوجيا العربية، استخدام الانطولوجيا العربية، الانطولوجيا، اطولوجيا اللغة، علم الدلالة، الدلالة، المعنى، المفهوم، حدود الانطولوجيا العليا، العلاقات اللغوية، العلاقات المفاهيمية، علاقة الجنس، الوراثة، جزء-كل, شبكة المفردات، شبكة المفردات العربية، تعدد المعاني، الترادف، تعريف الحد، الفرق بين الانطولوجيا وشبكة المفردات، ربط الانطولوجيات المفاهيمية، زكم، بناء المكانز اليا.

Application ontology vs. Linguistic Ontology

- The importance of linguistic ontologies is growing rapidly.
- **An application ontology** is a representation of the semantics of a certain domain/application. Such as, the FOAF ontology, the Palestinian e-government ontology, the CContology, etc.
  - Each word convey one concept (no polysemy).
  - Represents application's knowledge and data structure.
  - Used only by a certain application, or a class of applications.

- **A linguistic ontology** is a representation the semantics of all words of a human language, independently of a particular application. Such as WordNet for English.
  - Each word may convey several concepts (Polysemy).
  - Represents common-sense knowledge (lexical semantics).
  - Can be used for general purposes.

➔ Let's first understand the relations between a word and its meaning(s).

The Arabic Ontology Project

http://sina.birzeit.edu/ArabicOntology/

- A project started in 2010, at Sina Institute, Birzeit University, Palestine.
- The Arabic Ontology is can be use an **Arabic WordNet**, but it is more.
- Unlike WordNet, the ArabicOntology is logically and philosophically well-founded, as it follows strict ontological principles. ➔ but can be used an Arabic WordNet.
- Built semi-manually

➔ The project is partially funded (Seed funding) by Birzeit University (VP academic Office, Research Committee).

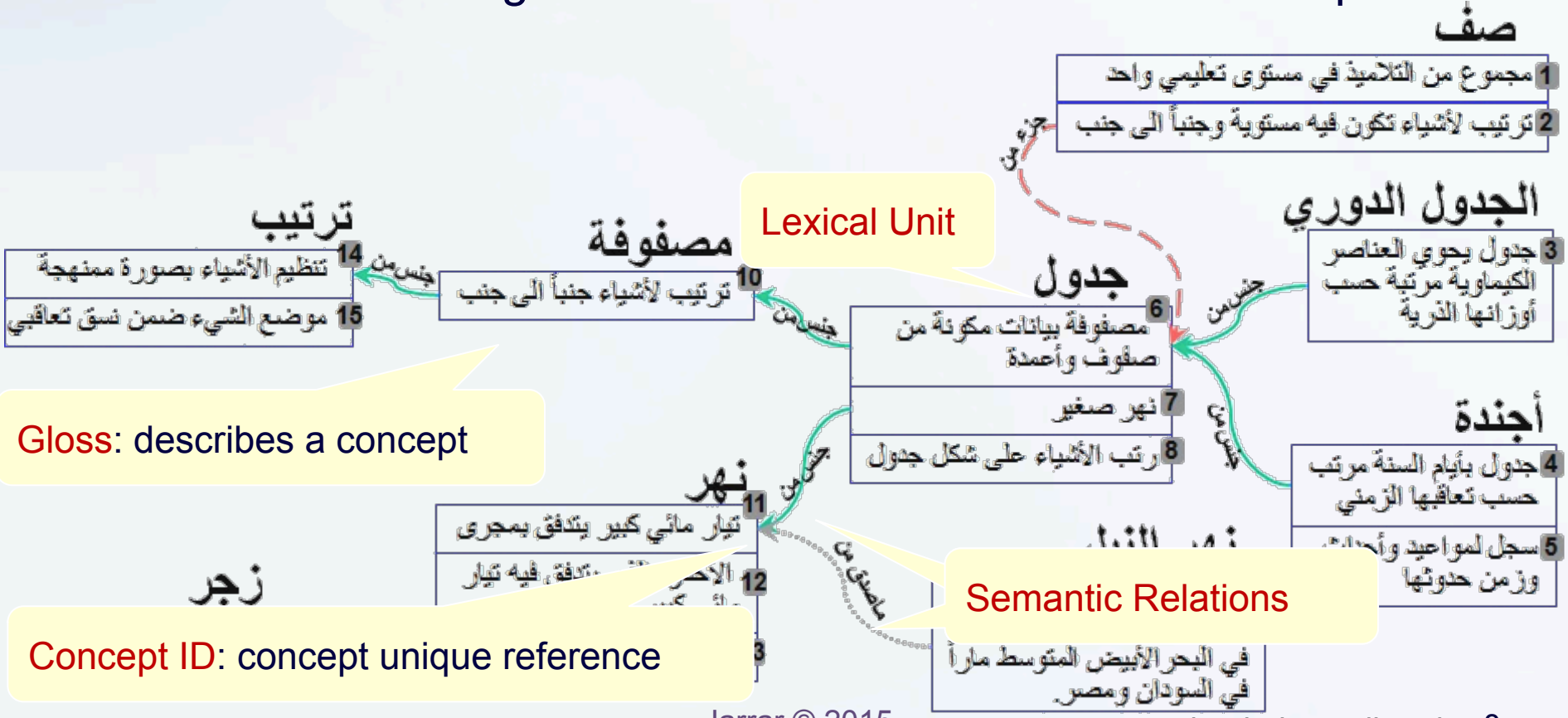
Why the Arabic Ontology?

In application scenarios such as

- **Information Search and Retrieval** -to enrich queries and improve the quality of the results, i.e. meaningful search rather than string-matching search;
- **Machine Translation and Term Disambiguation** -by finding the exact mapping of concepts across languages, specially that the Arabic ontology is also mapped to the WordNet;
- **Data Integration and Interoperability** -in which the Arabic ontology can be used as a semantic reference to several autonomous information systems;
- **Semantic Web and Web 3.0** -by using the Arabic ontology as a semantic reference to disambiguate the meanings used in the web sites;
- among many, **many other applications.**

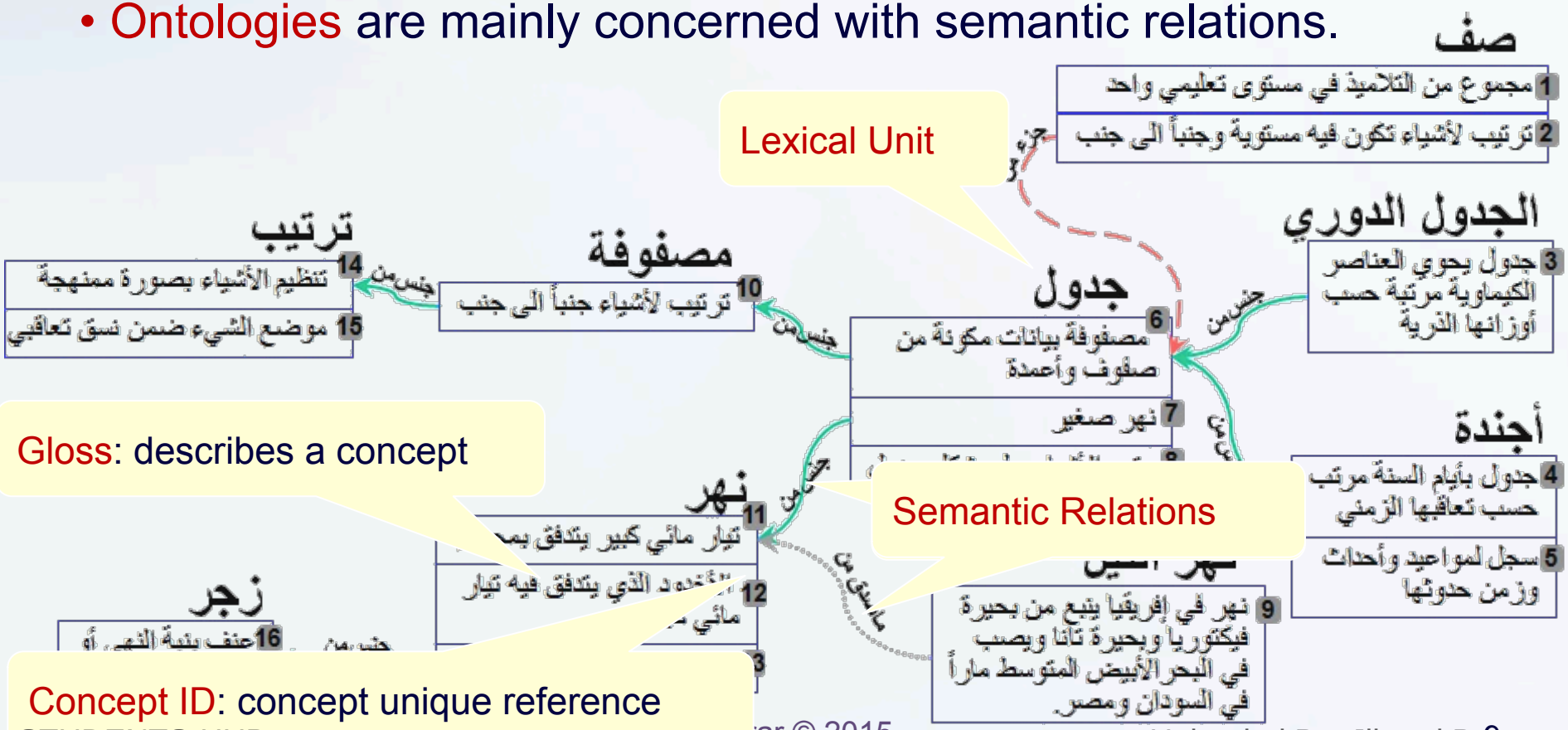
Arabic Ontology: Data Model (Simplified)

- ConceptID (as a synsetID in WordNet) to identify a concept.
- Polysemy and synonymy: like in WordNet, several words (i.e., lexical units) can be used to lexicalize one concept (synonymy); and one word might be used to lexicalize several concepts.



Lexical vs. Semantic Relationships

- Semantic relations (علاقات مفاهيمية) are relationships between concepts (not words), e.g., subtype, part-of, etc.
- Lexical relations (علاقات لغوية) are relationships between words (not concepts), e.g., synonym-of, root-of, abbreviation-of, etc.
- Ontologies are mainly concerned with semantic relations.

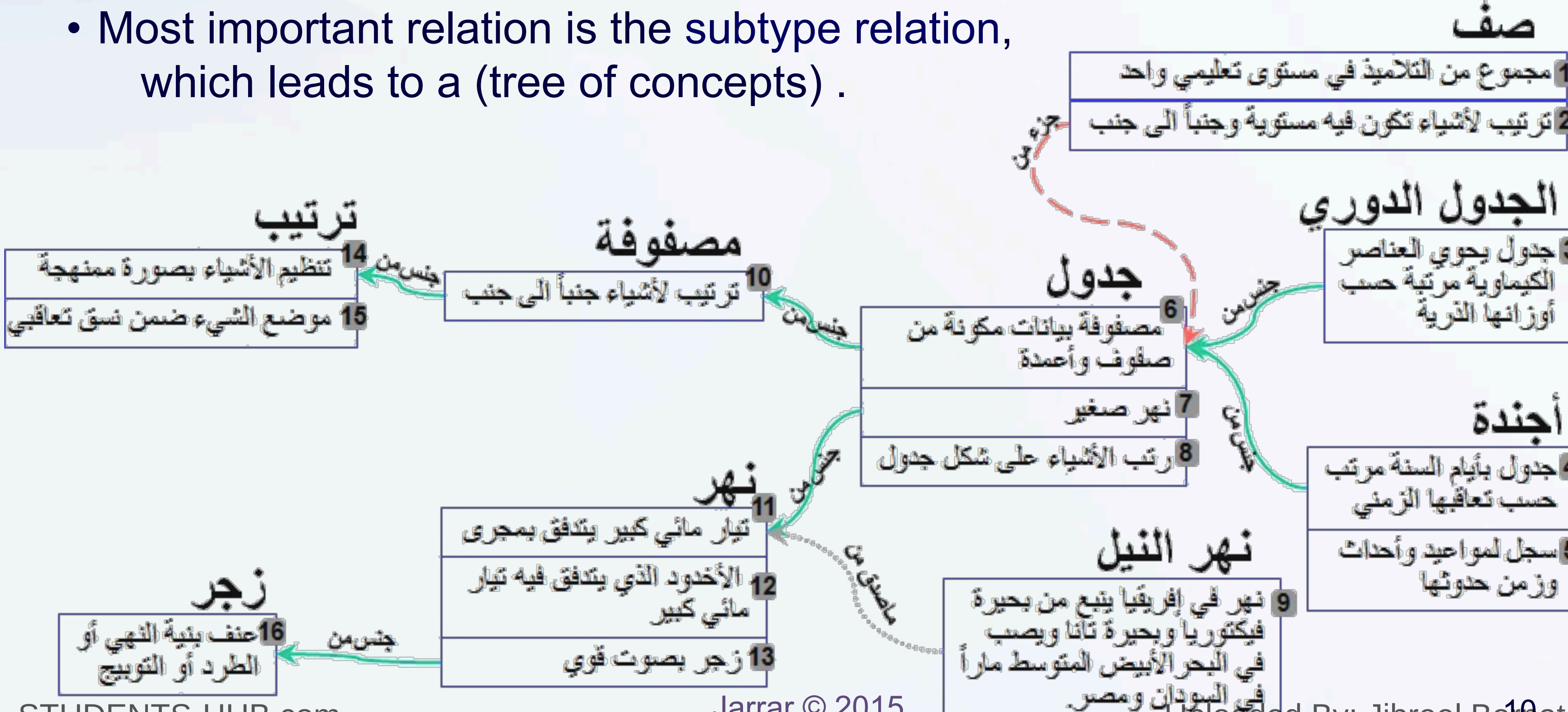


Arabic Ontology

- Arabic Ontology: the set of concepts (of all Arabic terms), and the semantic (not lexical) relationships between these concepts.

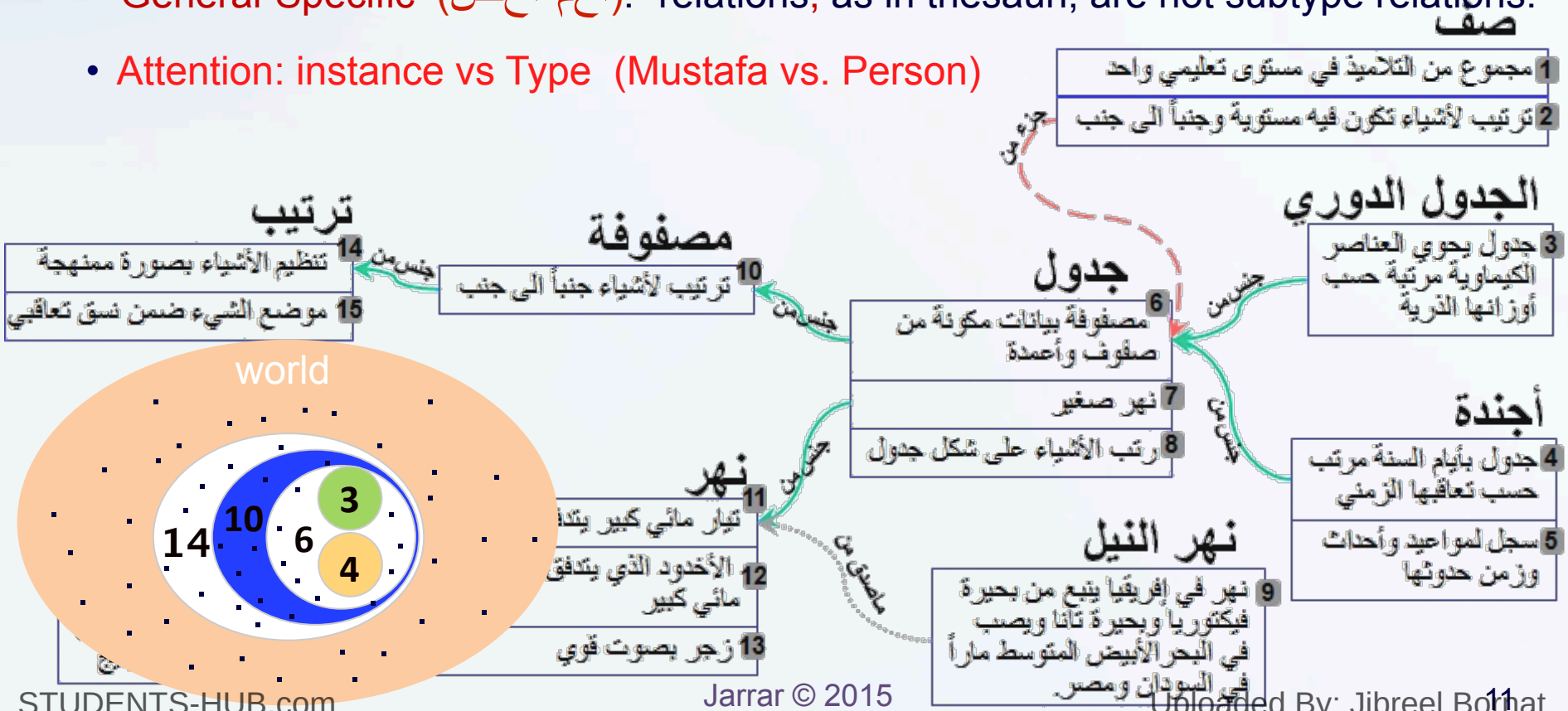
الانطولوجيا العربية هي مجموعة معاني كلمات اللغة العربية، والعلاقات بين هذه المعاني (وليس بين الكلمات).

- To build an Arabic Ontology: Identify the set of concepts for every Arabic word (Polysemy), and define semantic relations between these concepts.
- Most important relation is the subtype relation, which leads to a (tree of concepts) .



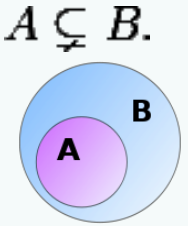
Arabic Ontology: **Subtype Relationships**

- Subtype relation (علاقة جنس من): is a mathematical relations (subset: A ⊆ B), such that every instance in A must also be an instance of B.
- Inheritance (التوارث): subtypes inherit all properties of their super types.
- "Hyponymy" in WordNet is close to (but not the same as) the subtype relation.
- "General-Specific (أعم-أخص):" relations, as in thesauri, are not subtype relations.
- Attention: instance vs Type (Mustafa vs. Person)



Arabic Ontology: **Subtype Relationships**

- It is recommended to use proper subtypes, as it is more strict.
- That is, A and B are never equal, B is always a super set of A.



- It is recommended to classify concepts based on "rigidity".
- For example it is wrong to say that a 'WorkTable' is type of 'Table'. as being a work table is a non-rigid property.
- As such, subtypes form a tree.

سيلو ةرجش ايجولوطالا حبصت يلاتلابو
يناعم ةكبش

Please see my lecture about Ontology Modeling (OntoClean)
http://jarrar-courses.blogspot.com/2012/05/aai-ontocleanavi.html

The Arabic Ontology الأنطولوجيا العربية

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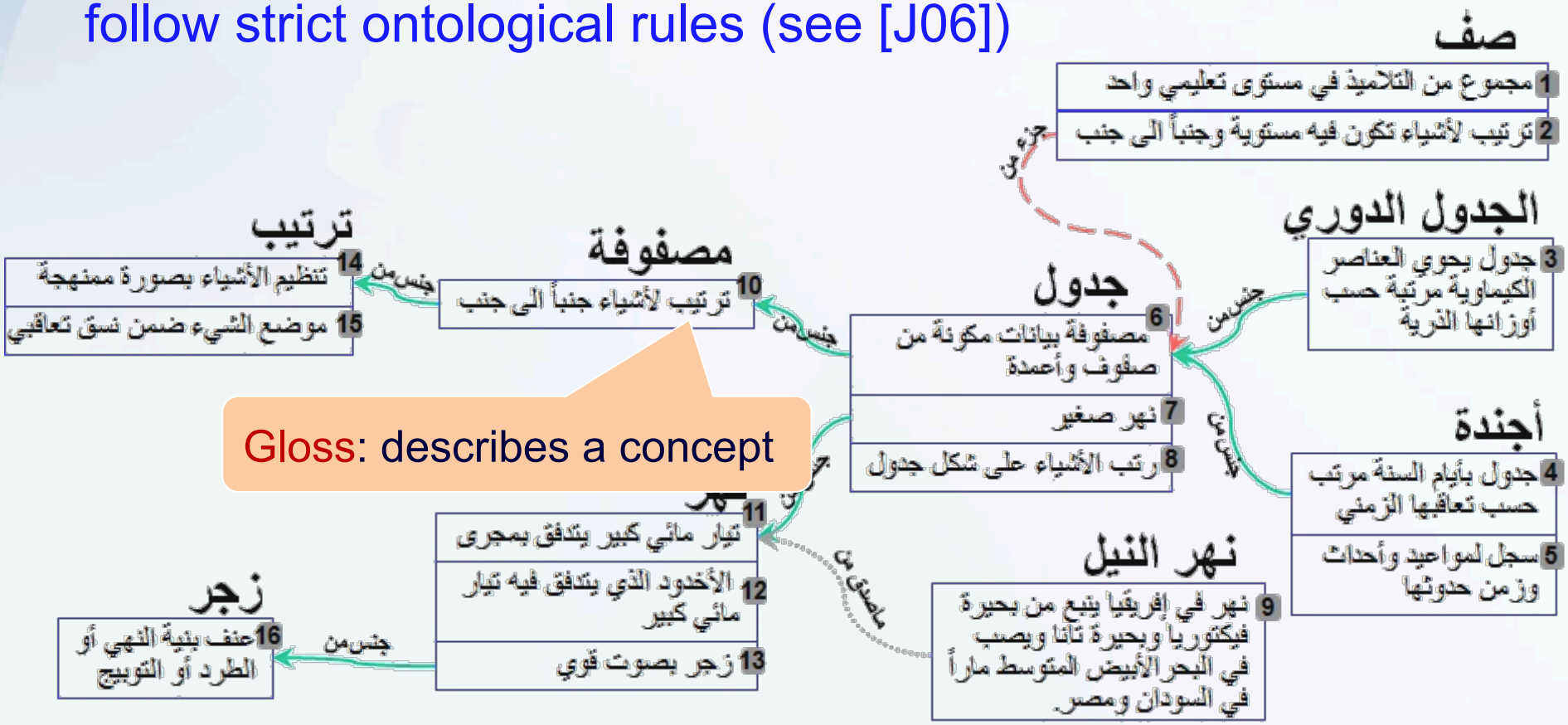
Glosses in the Arabic Ontology

Writing glosses in the Arabic Ontology follow strict ontological rules (see [J06])

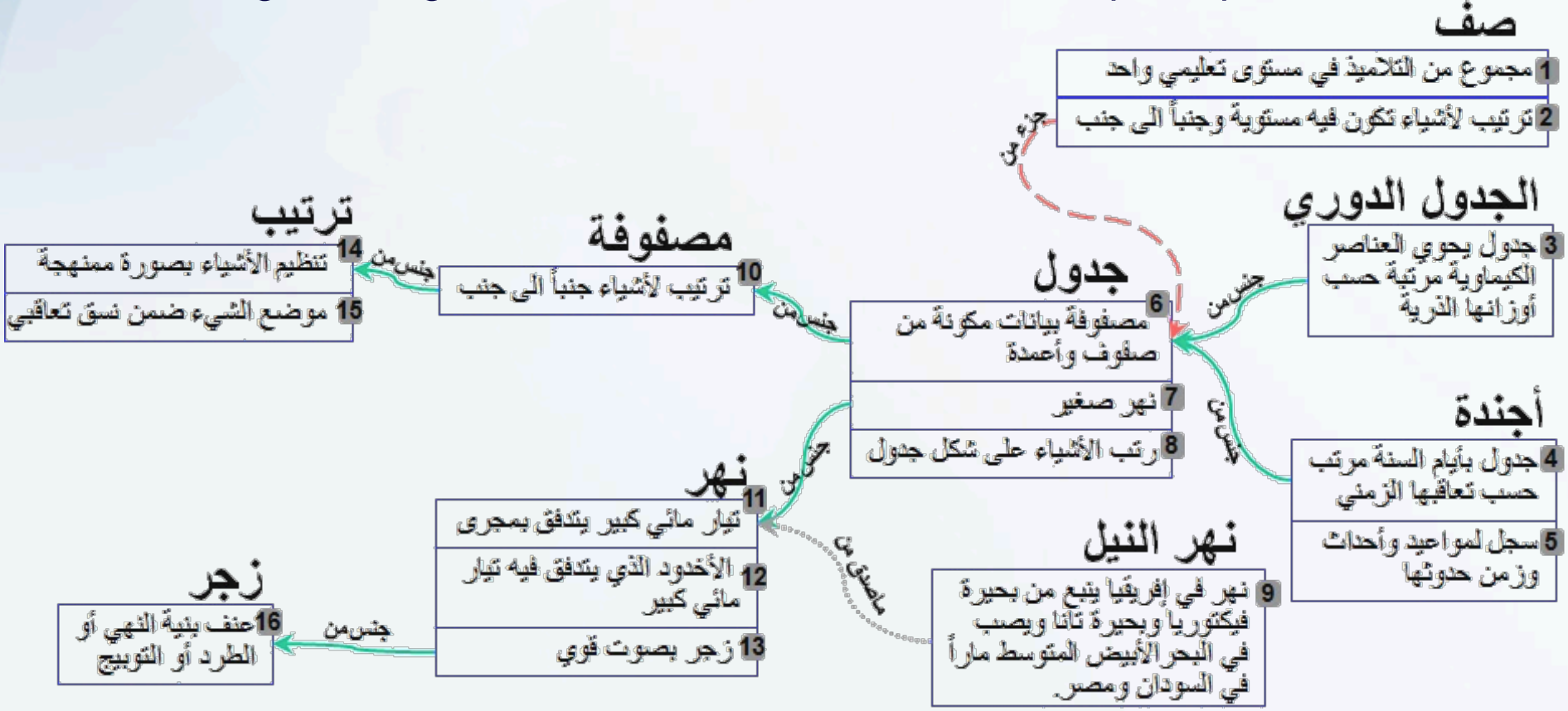


What/ Why a Gloss

according to strict ontological guidelines[J06]

التعريفات

A gloss: is an auxiliary *informal (but controlled) account* of the intended meaning of a linguistic term, for the commonsense perception of humans.



A gloss is supposed to render factual knowledge that is critical to understand a concept, but that e.g. is implausible, unreasonable, or very difficult to formalize and/or articulate explicitly. (NOT) to catalogue general information and comments, as e.g. conventional dictionaries and encyclopedias usually do, or as <rdfs:comment>.

Arabic Ontology: **Gloss Guidelines**

قواعد كتابة التعريفات

What should and what should not be provided in a gloss:

1. Start with the *principal/super type* of the concept being defined.

   E.g. ‘Search engine’: “A computer program that …”, ‘Invoice’: “A business document that…”, ‘University’: “An institution of …”.

   لجنس العالى للمفهوم المراد تعريفة

2. Focus on distinguishing characteristics and intrinsic prosperities that differentiate the concept out of other concepts.

   E.g. Compare, ‘Laptop computer’:
   “A computer that is designed to do pretty much anything a desktop computer can do, it runs for a short time (usually two to five hours) on batteries”.
   “A portable computer small enough to use in your lap…”.

   تليها الصفات الجوهورية/ المميزة للمفهوم المراد تعريفة

3. Written in a form of propositions, offering the reader inferential knowledge that help him to construct the image of the concept.

   E.g. Compare ‘Search engine’:
   “A computer program for searching the internet, it can be defined as one of the most useful aspects of the World Wide Web. Some of the major ones are Google, ….”;
   A computer program that enables users to search and retrieves documents or data from a database or from a computer network…”.

   ضايا، بطريقة تقود القارىء لاستنباط المعنى

Arabic Ontology: **Gloss Guidelines**

4. Use supportive examples :

إستخدم الامثلة مسموح ولكن
بتحفظ شديد و حالات معينة

- To clarify cases that are commonly known to be false but they are true, or that are known to be true but they are false;
- To strengthen and illustrate distinguishing characteristics (e.g. define by examples, counter-examples).

Examples can be types and/or instances of the concept being defined.

5. Be consistent with formal definitions/axioms.

6. Be sufficient, clear, and easy to understand.

➔ WordNet glosses do not follow such ontological guidelines

Arabic Ontology: **Gloss Guidelines**

As a gloss starts with a supertype of concept being defined, try to read the gloss as the following, to verify what you do is correct:

جدول: مصفوفة بيانات مكونة من صفوف وأعمدة.

جدول: ترتيب بيانات جنباً الى جنب على شكل صفوف وأعمدة.

جدول: تنظيم بيانات بصورة ممنهجة جنباً الى جنب على شكل صفوف وأعمدة.

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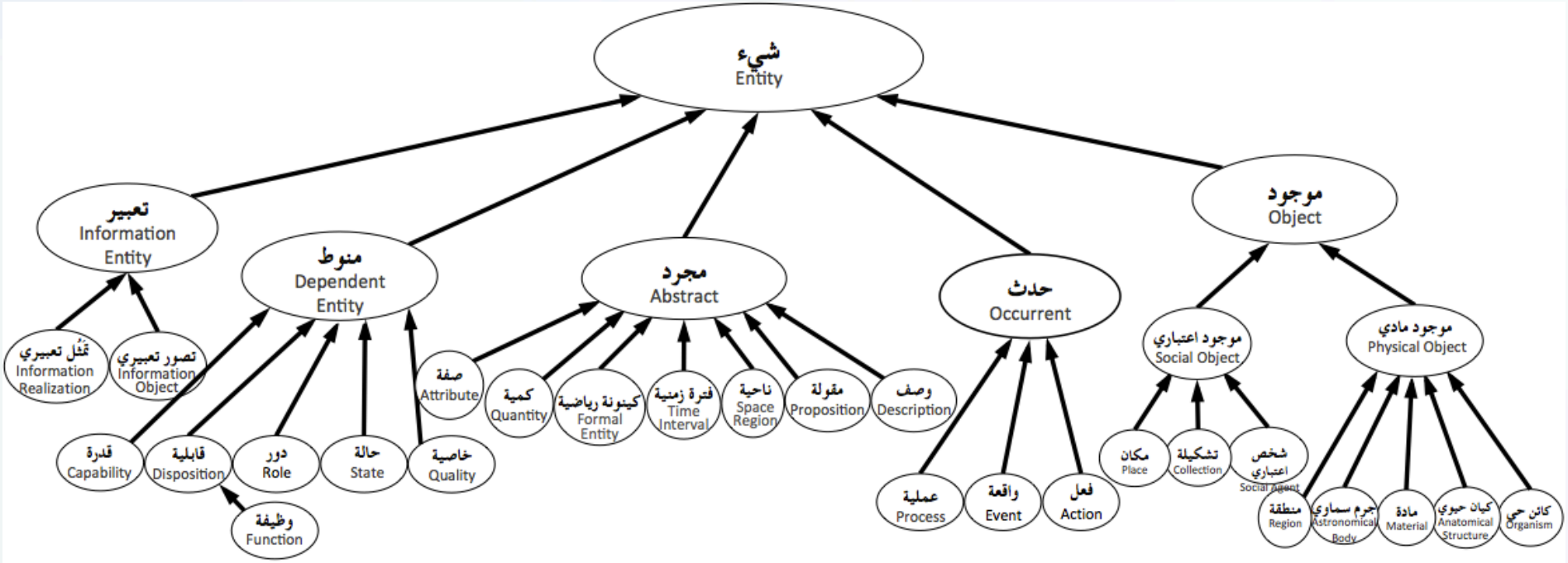
The Core (Top Levels) of the Arabic Ontology

الحدود العليا: هي أمهات المعاني لجميع الكلمات العربية

Arabic Core Ontology: the top levels of the Arabic Ontology - built manually, and carefully considering the the philosophical and historical aspects of the Arabic concepts\terms, as well as BFO and DOLCE upper level ontologies. Different from the 25 unique beginners in WordNet

Top 3 levels shown here, for simplicity



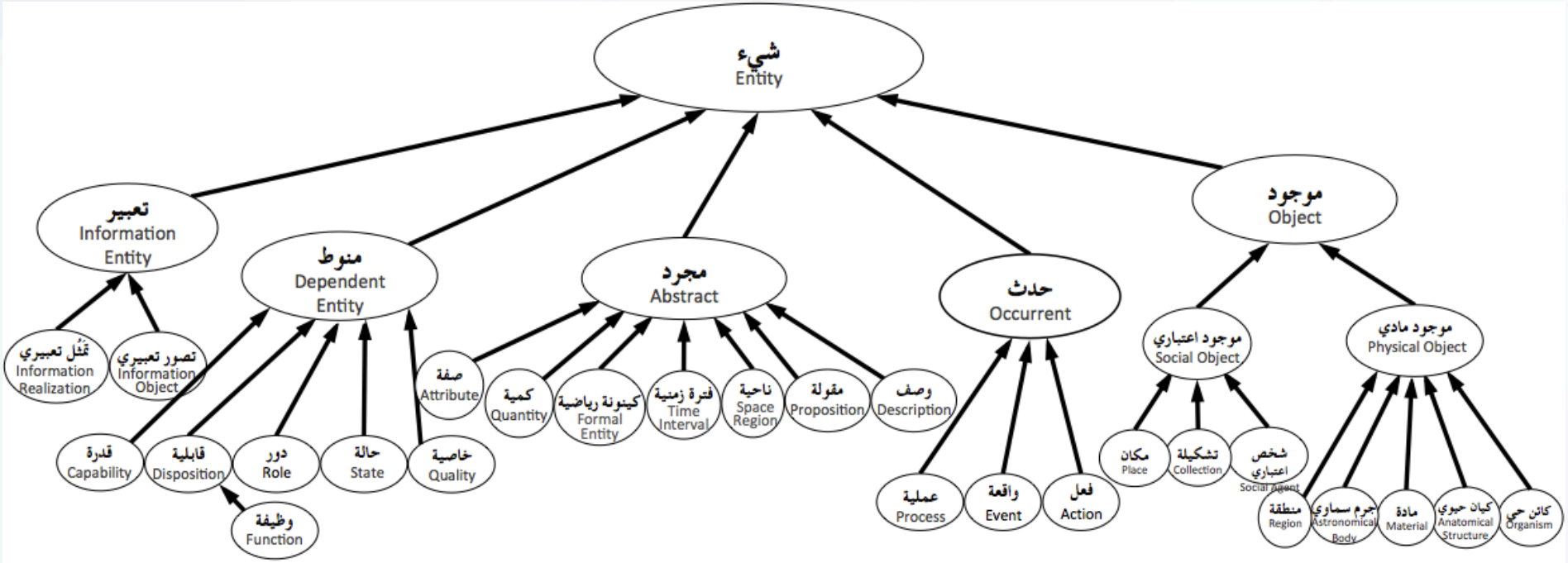
Why these Core Concepts (Top Levels)?

الحدود العليا: هي أمهات المعاني لجميع الكلمات العربية

Why this these top levels are so important:

- The 10th level of this core ontology should top all Arabic concepts and levels.
- This allow us to detect any problems in the tree/relations!
- The core Ontology governs the correctness and the evolution of the whole Arabic Ontology.

Top 3 levels shown here, for simplicity



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Ontology Versus WordNet

Meaning (called Ontological Precision):

WordNet: based on what native speakers agree roughly

Ontology: based on Scientific and philosophical findings.

Classification:

WordNet: based on what native speakers agree roughly

e.g., (Student IsA person) (Nile IsA River)

Ontology: based on strict formal methodologies

e.g., (Student IsA role) (Nile InstanceOf River)

Formal Specification:

WordNet: logically vague

Ontology: strictly formal

→ WordNet as a linguistic ontology, though it needs lots of cleaning!

→ Linguistic ontologies are difficult to build but they are immune to changes

Arabic Ontology Vs WordNet

Unlike WordNet, the Arabic Ontology is:

1. Philosophically well founded:

- Focuses on intrinsic properties;
- All types are rigid;
- The top level is derived from known Top Level Ontologies.

2. Strictly formal:

- Semantic relations are well-defined relations.

3. Strictly-controlled glosses

- The content and structure of the glosses is strictly based on ontological principles.

➔ The Arabic Ontology can be used an Arabic WordNet, but is more.
➔ The Arabic Ontology follows a similar to WordNet, and its well-mapped.

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(this is a research part)