

Semantic Maps in Lexical Typology

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HHA124

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Lexical Typology

How do words in different languages cover a conceptual space of related meanings?

- ...
- Georgakopoulos, T, Polis, S. The semantic map model: State of the art and future avenues for linguistic research. *Lang Linguist Compass*. 2018; 12:e12270
- Rakhilina, E, Ryzhova, D and Badryzlova, Yu. Lexical typology and semantic maps: Perspectives and challenges. *Zeitschrift für Sprachwissenschaft*, vol. 41, no. 1, 2022, pp. 231-262.

Meanings/Frames

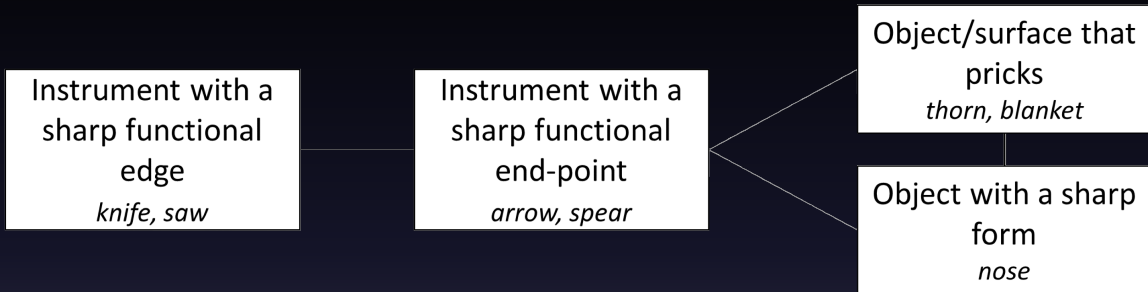
		Lexical items			
		Danish	French	German	Spanish
ANALYTICAL PRIMITIVES	TREE	<i>træ</i>	<i>arbre</i>	<i>Baum</i>	<i>árbol</i>
	WOOD (mat.)		<i>bois</i>	<i>Holz</i>	<i>madera</i>
	FIREWOOD	<i>leña</i>			
	FOREST (small)	<i>skov</i>		<i>forêt</i>	<i>Wald</i>
	FOREST (large)		<i>selva</i>		

from (Haspelmath 2003, Georgakopoulos and Polis 2018)

- A semantic field is cut into frames based on how words from this field are used.
- A semantic map shows how frames within the semantic field are related.

Traditional Semantic Maps as Frame Graphs

Semantic Field *Sharp*

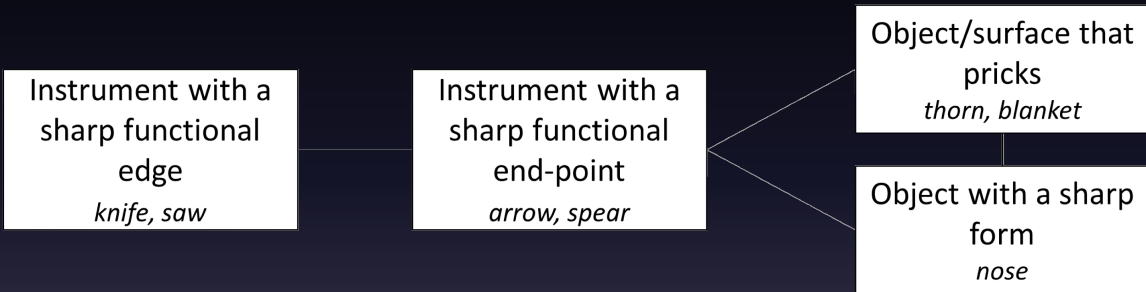


Connectivity hypothesis: Any relevant language-specific and/or construction-specific category should map onto a connected region in conceptual space. (Croft 2001)

Economy principle: No edge is needed between frames *A* and *C* if linguistic items expressing *A* and *C* always express *B* (Georgakopoulos and Polis 2018).

Implications in Semantic Maps

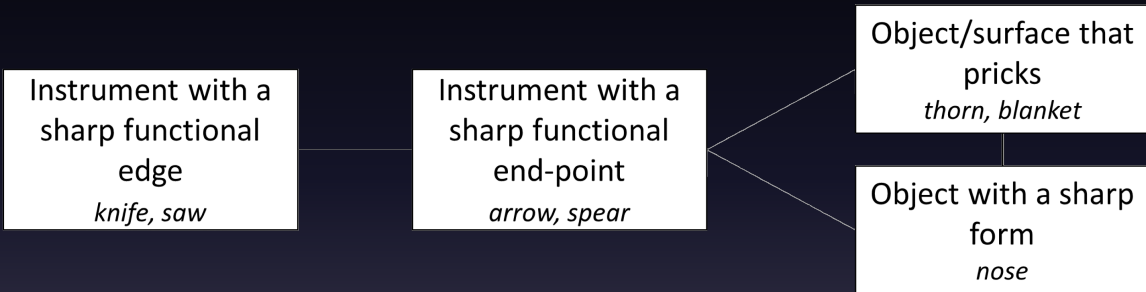
Semantic Field *Sharp*



If ~~X~~ *knife* and ~~X~~ *thorn*, then ~~X~~ *arrow*.

Implications in Semantic Maps

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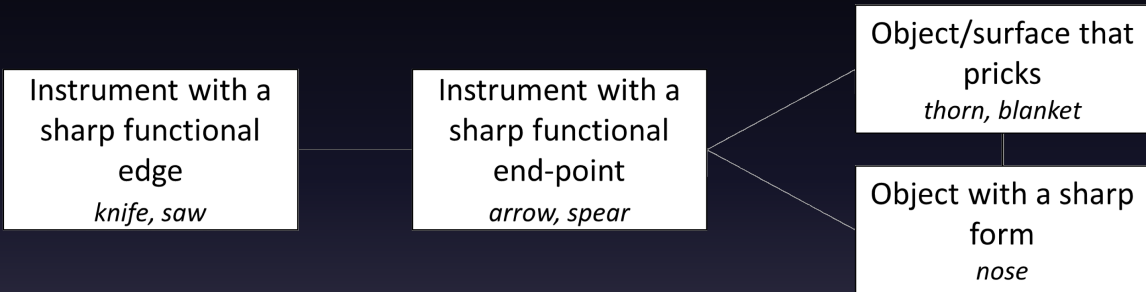


If ~~X~~ *knife* and ~~X~~ *thorn*, then ~~X~~ *arrow*.

If ~~X~~ *knife* and ~~X~~ *thorn*, then ~~X~~ *arrow* and ~~X~~ *nose*?

Implications in Semantic Maps

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If *X* *knife* and *X* *thorn*, then *X* *arrow*.

If *X* *knife* and *X* *thorn*, then *X* *arrow* and *X* *nose*?

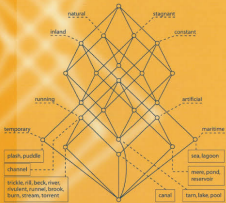
Is there an *X* such that *X* *knife* and *X* *thorn*?

FCA Approach

Bernhard Ganter
Rudolf Wille

Formal Concept Analysis

Mathematical Foundations



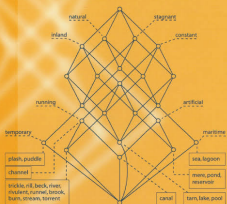
 Springer

FCA Approach

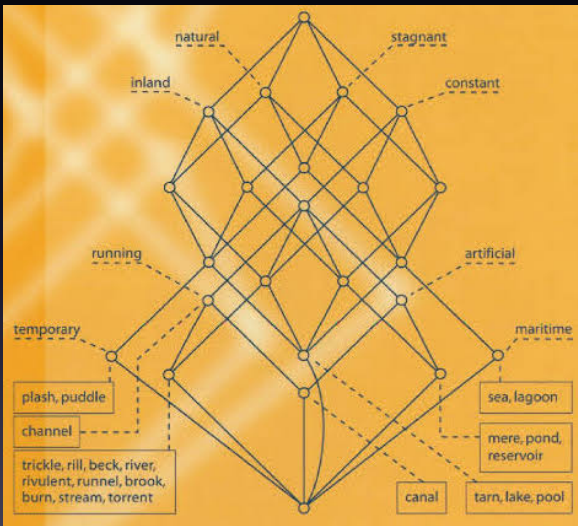
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Formal Concept Analysis

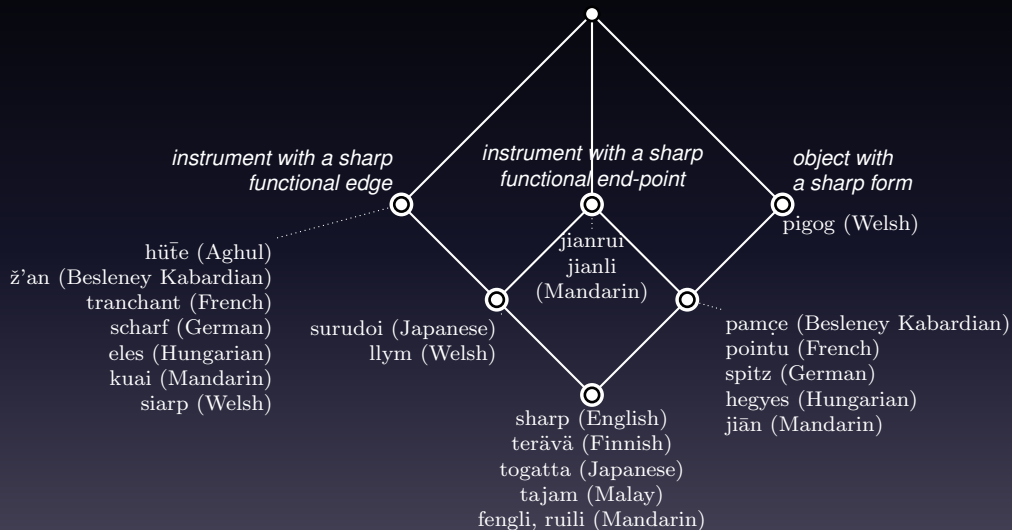
Mathematical Foundations



Springer

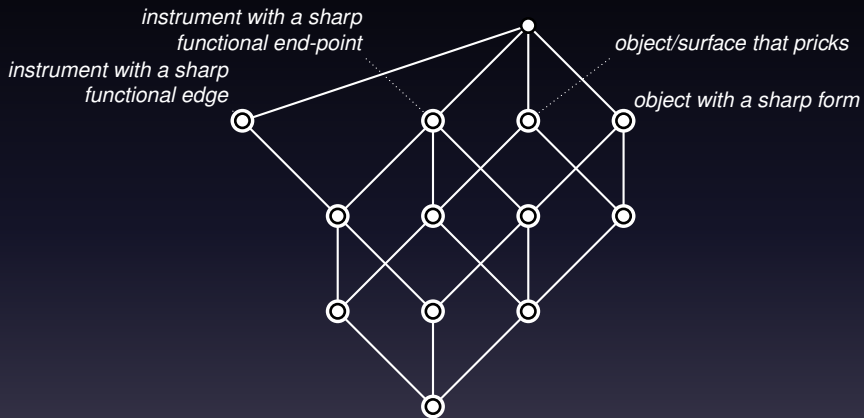


FCA Approach: Semantic Field *Sharp*



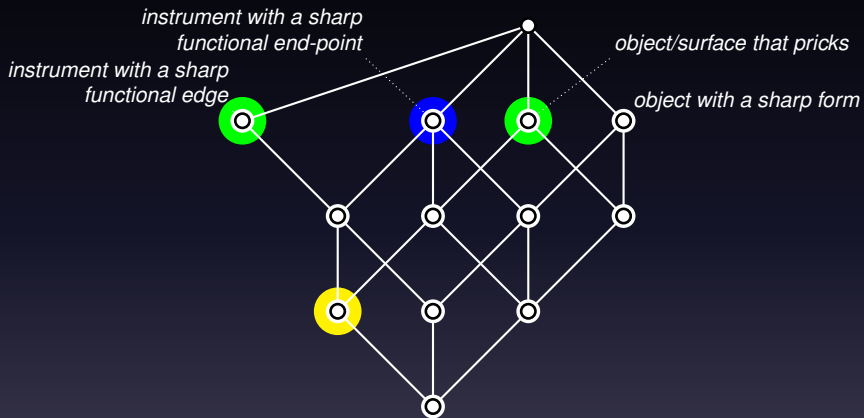
All and Only Implications Supported by Data

Semantic Field *Sharp*



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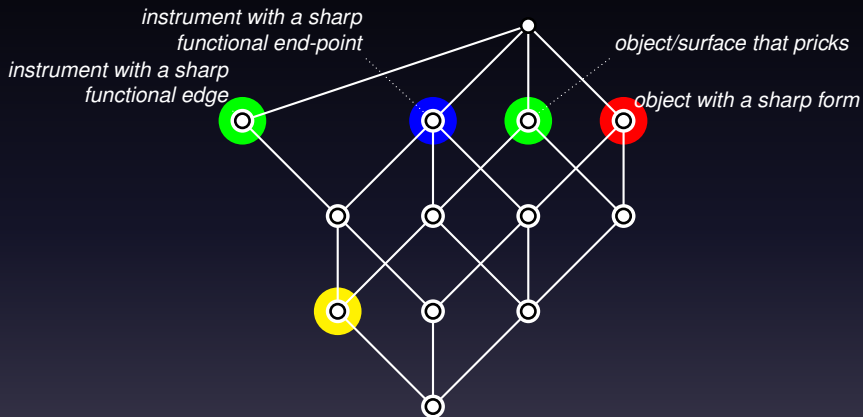
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If ~~X~~ knife and ~~X~~ thorn, then ~~X~~ arrow.

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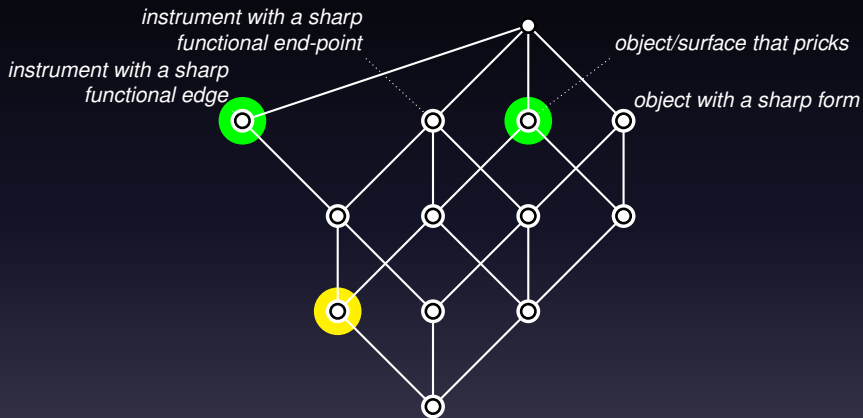


If ~~X~~ knife and ~~X~~ thorn, then ~~X~~ arrow.

If ~~X~~ knife and ~~X~~ thorn, then ~~X~~ arrow and ~~X~~ nose? No.

All and Only Implications Supported by Data

Semantic Field *Sharp*



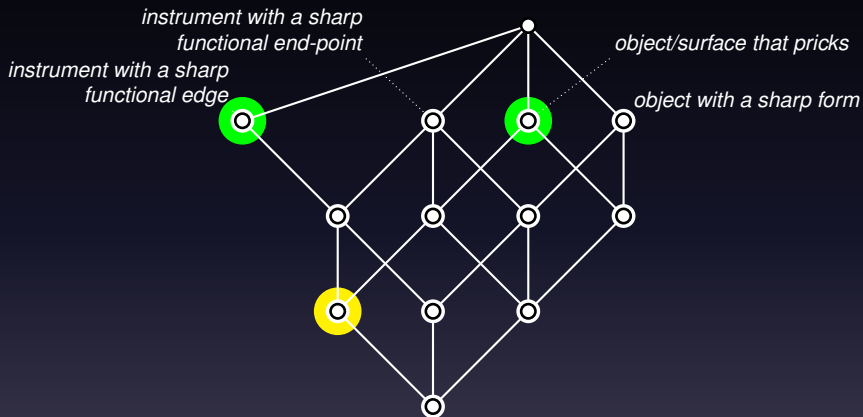
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All and Only Implications Supported by Data

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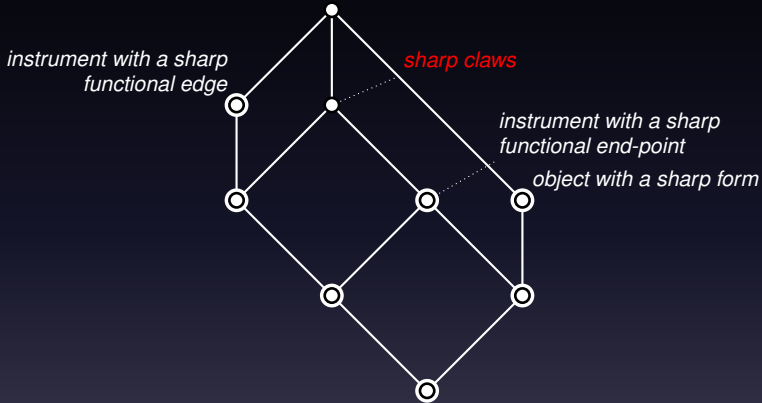
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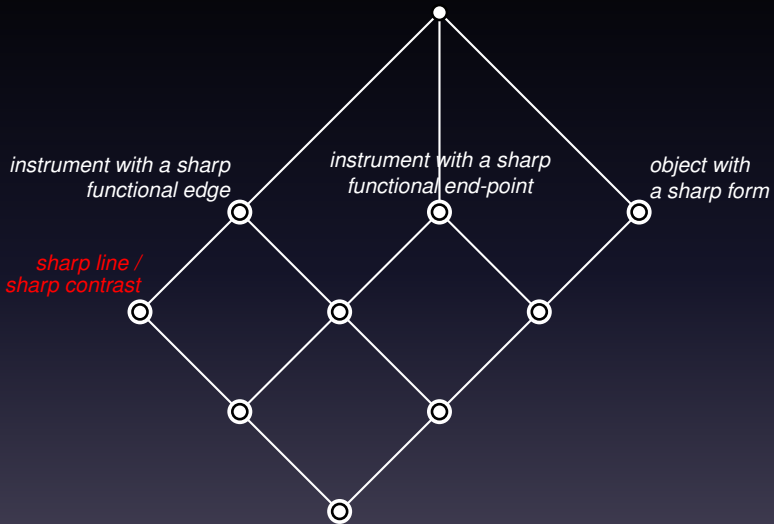
Transitional Microframes

Semantic Field *Sharp*

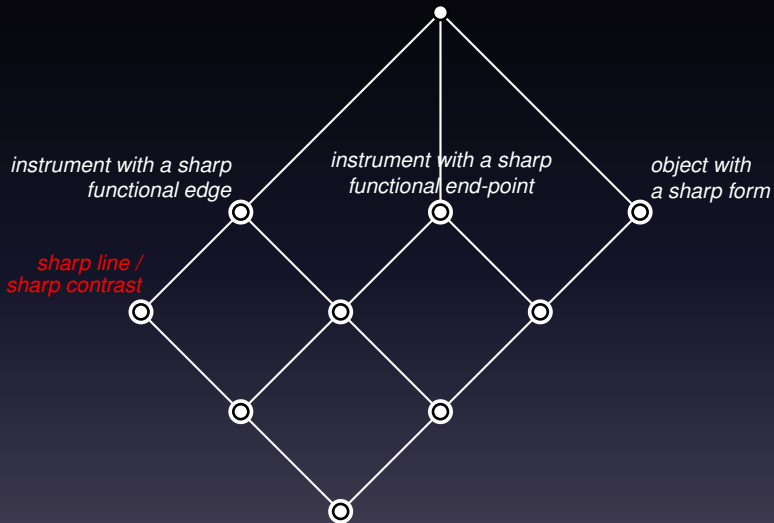


- For every frame, there is usually a language with a dedicated linguistic form.
- Exceptions—**transitional microframes**—may be of special interest.
- They correspond to non-object concepts.

Figurative Meanings



Figurative Meanings



If *X line*, then *X knife*.

Figurative meanings as subconcepts of direct meanings.

Collecting Data for Semantic Maps

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Onomasiological approach: Identify core meanings and search for the individual forms that express these meanings in different languages.

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Attribute exploration: Fix a few meanings and collect words as counterexamples to implications over these meanings.

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Semasiological approach: Choose a single meaning as a pivot and list the other meanings of the linguistic items expressing the pivot meaning.

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Object exploration: Fix a set of words sharing a meaning and identify their other meanings as counterexamples to implications over the words.

Collecting Data for Semantic Maps

Onomasiological approach: Identify core meanings and search for the individual forms that express these meanings in different languages.

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The two approaches can be applied consecutively.

Attribute exploration: Fix a few meanings and collect words as counterexamples to implications over these meanings.

Object exploration: Fix a set of words sharing a meaning and identify their other meanings as counterexamples to implications over the words.

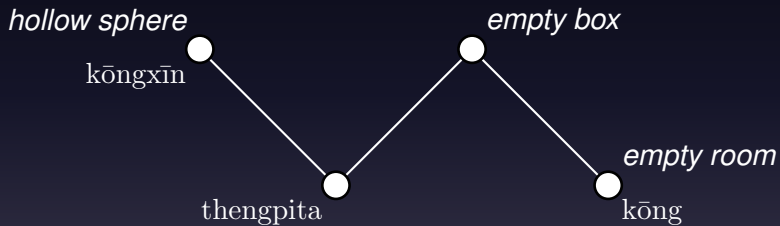
Attribute Exploration of the Semantic Field *Empty*

Start with three words (two Chinese and one Korean) and three frames:

	<i>hollow sphere</i>	<i>empty box</i>	<i>empty room</i>
<i>kōngxīn</i>	×		
<i>kōng</i>		×	×
<i>thengpita</i>	×	×	

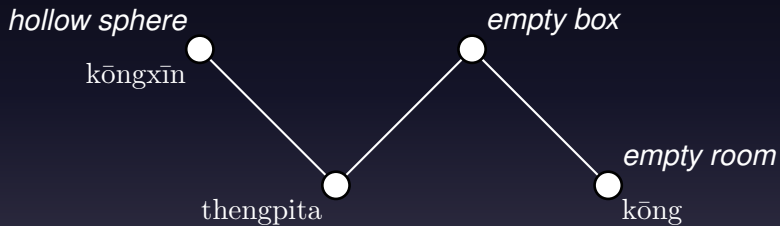
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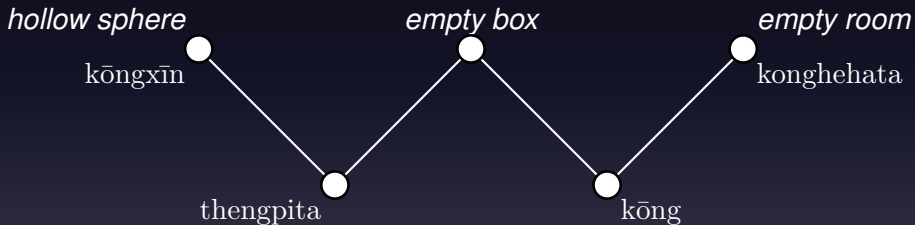
No: there is a counterexample in Korean.

	<i>hollow sphere</i>	<i>empty box</i>	<i>empty room</i>
kōngxīn	×		
kōng		×	×
thengpita	×	×	
konghehata			×

Attribute Exploration of the Semantic Field *Empty*

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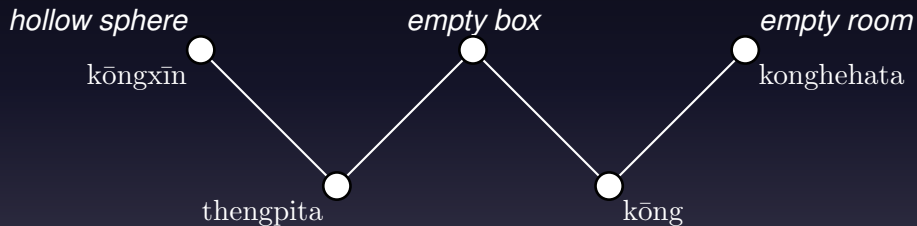
No: there is a counterexample in Korean.



Attribute Exploration of the Semantic Field *Empty*

Does every word for *empty room* is also suitable for *empty box*?

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Is there a word used for both *hollow sphere* and *empty room*?

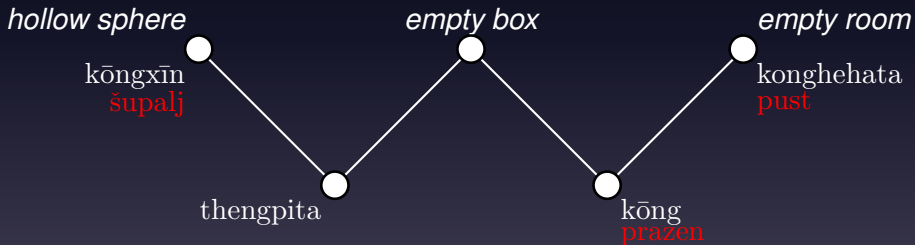
Probably, no.

Object Exploration of the Semantic Field *Empty*

Object exploration

Exploration using implications on objects with new attributes as counterexamples

Let's add some Serbian words:

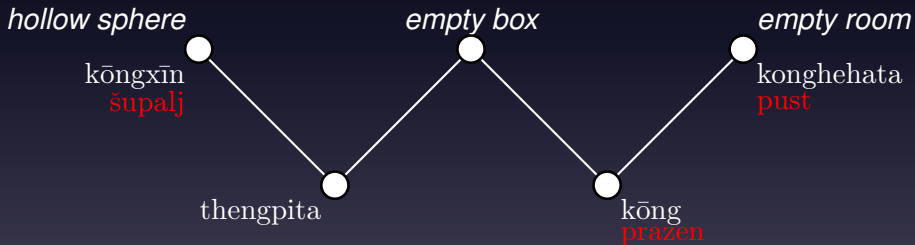


Object Exploration of the Semantic Field *Empty*

Object exploration

Exploration using implications on objects with new attributes as counterexamples

Let's add some Serbian words:



and run attribute exploration the other way round:

Are all the meanings of *pust* shared by *kōng*, *konghehata*, and *prazen*?

Object Exploration of the Semantic Field *Empty*

Are all the meanings of *pust* shared by *kōng*, *konghehata*, and *prazen*?

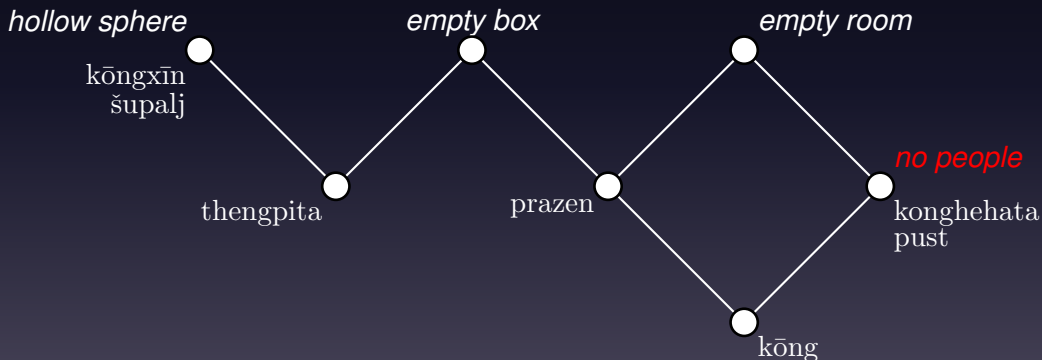
No: *prazen* is not used to denote local spaces without people (but only those without inanimate objects).

	<i>no people</i>
kōngxīn	
kōng	×
thengpita	
konghehata	×
šupalj	
prazen	
pust	×

Object Exploration of the Semantic Field *Empty*

Are all the meanings of *pust* shared by *kōng*, *konghehata*, and *prazen*?

No: *prazen* is not used to denote local spaces without people (but only those without inanimate objects).



FCA for Lexical Typology

- Concept lattices provide an interesting alternative to classic semantic maps.

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- Concept lattices provide an interesting alternative to classic semantic maps.
- They can be built automatically if data is already collected.
- Attribute and object exploration can help organize data collection.
- However, better software is needed for linguists to use these methods.