

FCA Tools Bundle - a Tool that Enables Dyadic and Triadic Conceptual Navigation

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FCA TOOLS BUNDLE

Motivation:

- user-friendly tool for visualization and exploration of polyadic datasets

FCA Tools Bundle:

- a collection of tools for dyadic and higher-adic FCA
- offers features of visualization, navigation and exploration of formal contexts
- in the future: a platform comprising a multitude of functionalities related to FCA

CREATING, IMPORTING AND EXPORTING A CONTEXT

- create dyadic or triadic context using cross-tables
- import and export `cxt` format for dyadic contexts and `csv` format for any dimension
- `csv` format: contains only the tuples in the relation
- `cxt` format: only for dyadic contexts

b1	g1	g2	Add object...
m1	X		
m2		X	
Add attribute.			

b2	g1	g2	Add object...
m1		X	
m2	X		
Add attribute.			

Add condition

MAIN FUNCTIONALITIES

Visualize and explore contexts by:

- context details (list of elements and incidences)
- concepts list
- concept lattice
- concept finder

HOSTEL TRICONTEXT

Hostel Tricontext

(defined by Glodeanu)

- hostels as objects
- hostel services as attributes
- websites with hostel ratings as conditions

<i>hostel-bookers</i>	<i>character</i>	<i>safety</i>	<i>location</i>	<i>staff</i>	<i>fun</i>	<i>cleanliness</i>
<i>Nuevo S.</i>		x	x			
<i>Samay</i>	x	x	x			
<i>Oasis B.</i>		x	x	x	x	
<i>One</i>	x	x	x	x	x	
<i>Ole B.</i>	x	x	x	x	x	
<i>Garden B.</i>	x	x	x	x		

<i>hostels</i>	<i>character</i>	<i>safety</i>	<i>location</i>	<i>staff</i>	<i>fun</i>	<i>cleanliness</i>
<i>Nuevo S.</i>			x			
<i>Samay</i>		x	x			
<i>Oasis B.</i>	x	x	x	x		
<i>One</i>	x	x	x	x	x	
<i>Ole B.</i>	x	x	x	x	x	
<i>Garden B.</i>	x	x	x	x		

<i>hostel-world</i>	<i>character</i>	<i>safety</i>	<i>location</i>	<i>staff</i>	<i>fun</i>	<i>cleanliness</i>
<i>Nuevo S.</i>			x			
<i>Samay</i>		x	x			
<i>Oasis B.</i>	x	x	x			
<i>One</i>	x	x	x	x	x	
<i>Ole B.</i>	x	x	x	x	x	
<i>Garden B.</i>		x	x			

Hostel Reviews

[Home](#) / [Contexts](#) / Hostel Reviews

Actions

[Export context as cxt](#)

[Export context as csv](#)

[Find a concept](#)

Object (6)

[Show](#)

[Garden B.](#) [Nuevo S.](#) [Oasis B.](#) [Ole B.](#) [One](#) [Samay](#)

Attribute (6)

[Show](#)

[character](#) [cleanliness](#) [fun](#) [location](#) [safety](#) [staff](#)

Condition (3)

[Show](#)

[hostelbookers](#) [hostels](#) [hostelworld](#)

Incidences (80)

[Show](#)

Concepts (18)

[Show](#)

ALGORITHMS FOR COMPUTING FORMAL CONCEPTS

Dyadic Context:

- slightly modified version of `In-Close2` [*Andrews*, 2011]

Triadic Context:

- previously: `Trias` [*Jäschke*, 2006]
- now: `Data-Peeler` [*Cerf*, 2009]

Higher-dimensional contexts ($n > 3$):

- now: `Data-Peeler` [*Cerf*, 2009]

Restrictions:

- when the context is too big, this functionality is not available

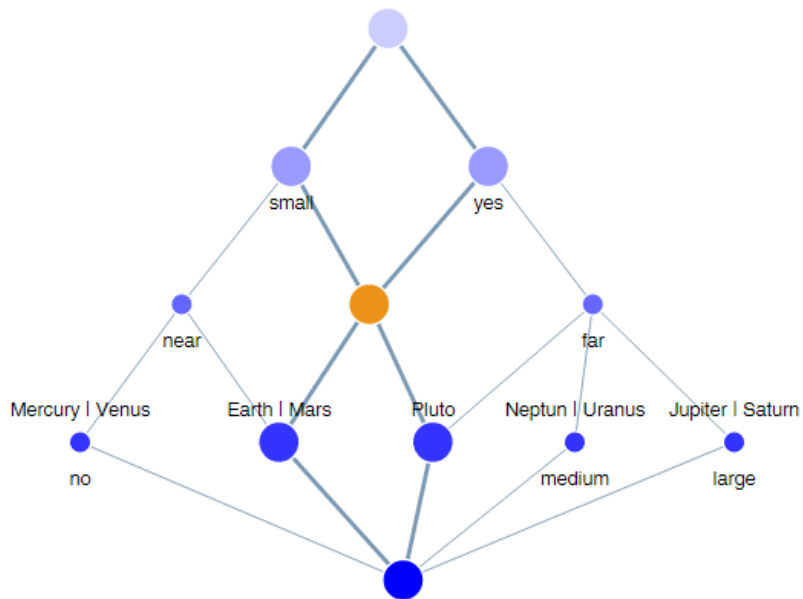
GENERATING THE CONCEPT LATTICE OF A DYADIC CONTEXT

- force-directed approach: nodes at somewhat equal distances with as few intersections as possible
- uses a lattice drawer algorithm proposed by R. Puntaier
- nodes have a fixed y-level, but can be moved by the user on the x-axis
- collision detection functionality

Restrictions:

- if the formal concept set is too large (currently > 100), this functionality is not available

PLANETS CONTEXT



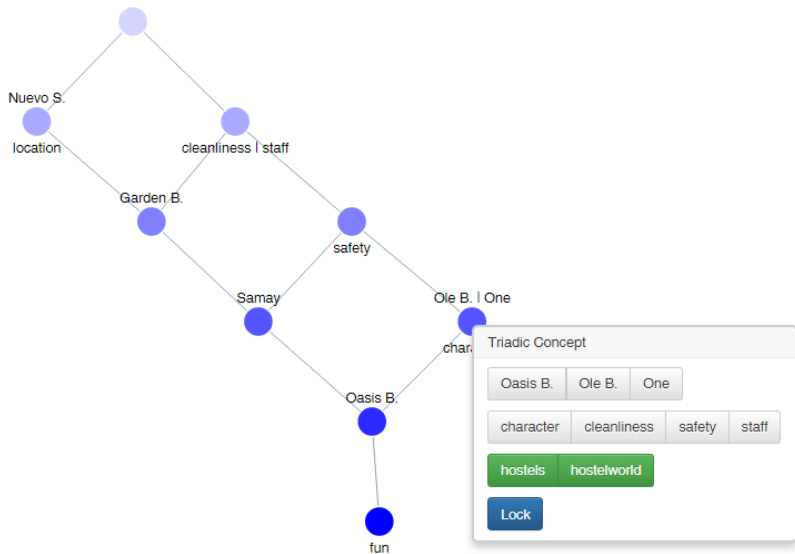
REACHABILITY-BASED NAVIGATION

- navigation with a local character based on projections
- available for triadic contexts
- introduced in previous papers (ICFCA 2015, FCA4AI 2016)

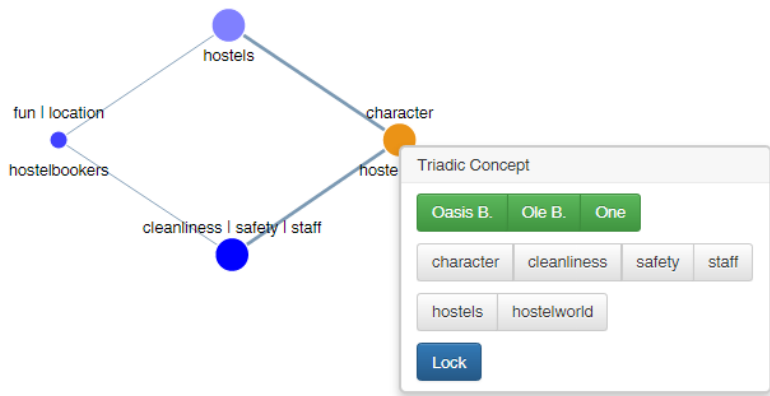
Steps:

- choose a set of elements (of the same type) to project on
- visualize the concept lattice of the dyadic projection

NAVIGATION IN HOSTELS CONTEXT



NAVIGATION IN HOSTELS CONTEXT



CONCEPT FINDER

- ASP-based context exploration
- available for any n -dimensional contexts ($n \geq 2$)
- introduced in previous papers (IJCAI 2015, AI4KM 2016)

Idea

- User-interface: Interactively navigate towards a single concept by iteratively adding constraints
- Implementation: Iteratively narrow down the space of formal concepts based on constraints chosen by the user

CONCEPT FINDER

A concept was found using the provided constraints.

Out In Nuevo S.

Out In Oasis B.

Out In Ole B.

Out In One

Out In Samay

Out In character

Out In cleanliness

Out In fun

Out In location

Out In safety

Out In hostelbookers

Out In hostels

Out In hostelworld

Objects: Oasis B. Ole B. One

Attributes: staff cleanliness safety character

Conditions: hostels hostelworld

CONCEPT FINDER ON A LARGE CONTEXT

Mushroom context:

- 8124 objects
- 126 attributes
- 179624 incidences

Problem:

- Concepts and Concept Lattice Generation are not available
- Finding a starting point for the Reachability-based Navigation

Solution:

- Concept Finder

CONCEPT FINDER ON A LARGE CONTEXT

A concept was found using the provided constraints.

Out In 0	Out In ring-type-pendant
Out In 1	Out In ring-type-sheathing
Out In 2	Out In ring-type-zone
Out In 3	Out In spore-print-color-black
Out In 4	Out In spore-print-color-brown

← 1 / 82 →

← 1 / 2 →

Objects: 7342 7981

Attributes: veil-type-partial cap-color-cinnamon spore-print-color-white stalk-shape-enlarging veil-color-white cap-shape-knobbed class-poisonous cap-surface-scaly gill-size-broad gill-spacing-close habitat-woods odor-musty population-clustered ring-number-none ring-type-none stalk-color-above-ring-cinnamon stalk-color-below-ring-cinnamon stalk-root-club stalk-surface-above-ring-silky stalk-surface-below-ring-scaly gill-color-yellow

FUTURE WORK

- find a better lattice drawer algorithm
- add new context visibility status: public for a particular user group
- add search by regexp functionality for context elements
- consider multi-valued contexts
- exploration procedures based on implications

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