Satelliten-Erdbeobachtung und objekt-basierte Bildanalyse...

...wie aus Terabytes an Daten gesellschaftsrelevante Geoinformation extrahiert wird.

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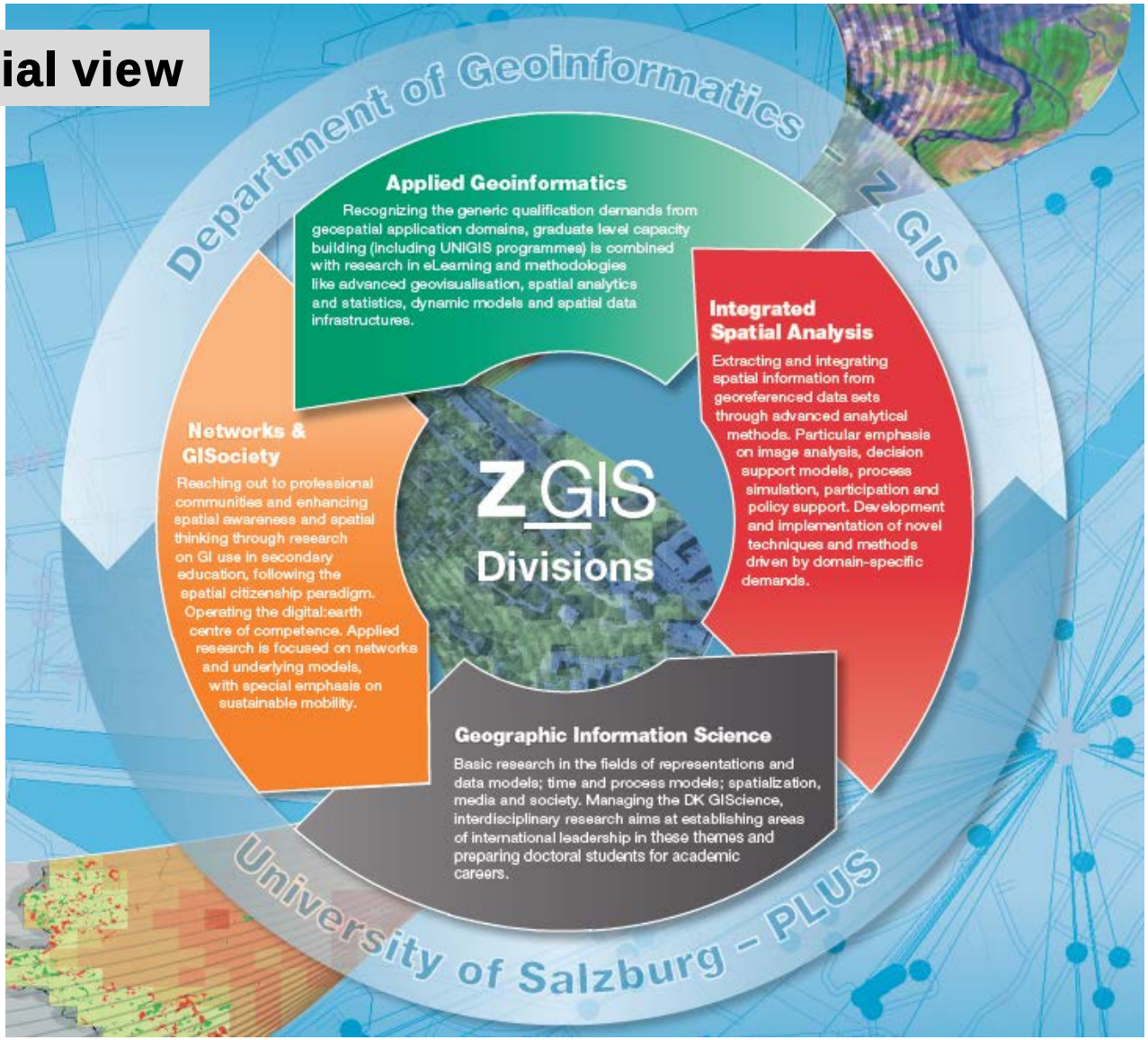
Experts for the spatial view

Analyse,
understand and
visualise

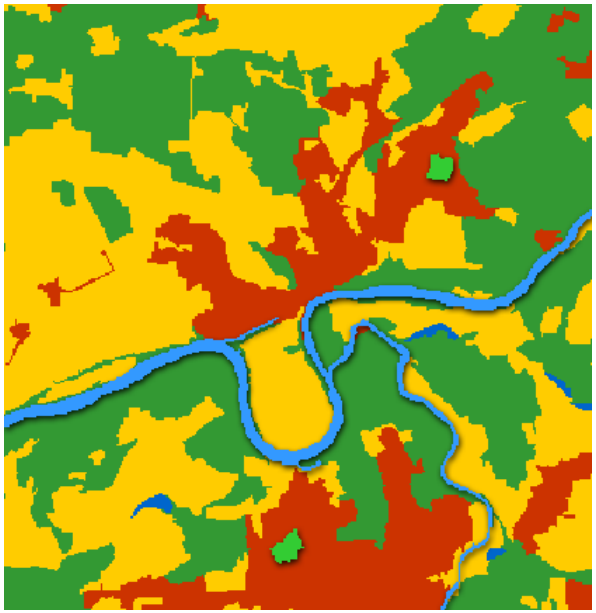
spatial phenomena,

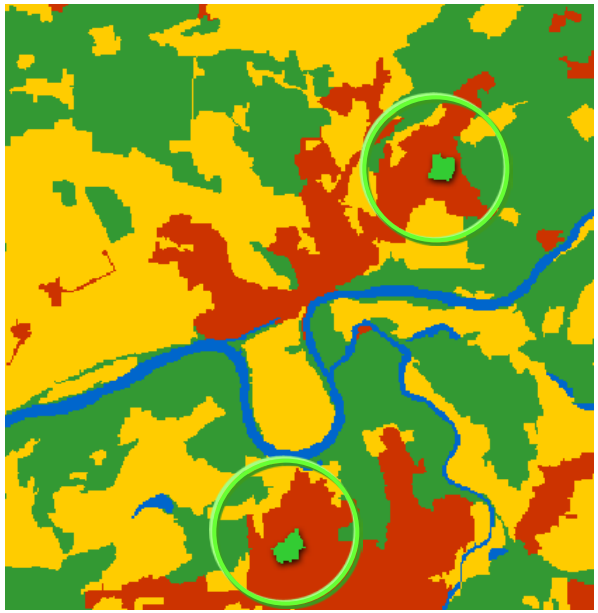
their causes and
mutual relationships

as well as
their temporal dynamics.



Pixel- vs. object-scape





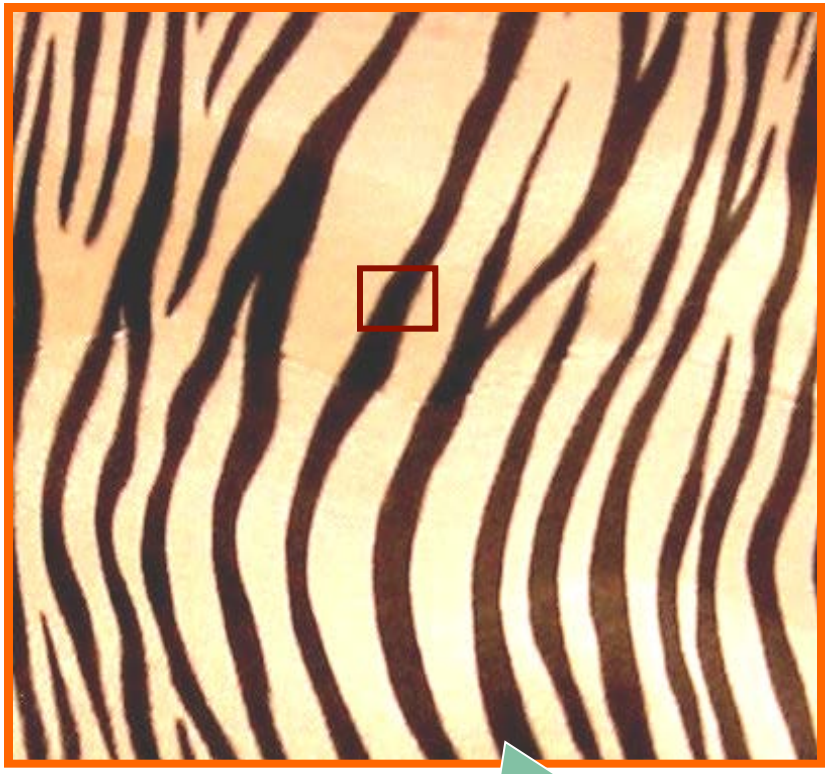
river
- spectral properties
- specific form/shape

municipal park
- spectral properties
- specific spatial context

From Definiens, 2004

Visual perception – image context

contrast b/w and shape:
“black line in white area”



mainly shape (pattern suppressed): **“chair with zebra pattern”**

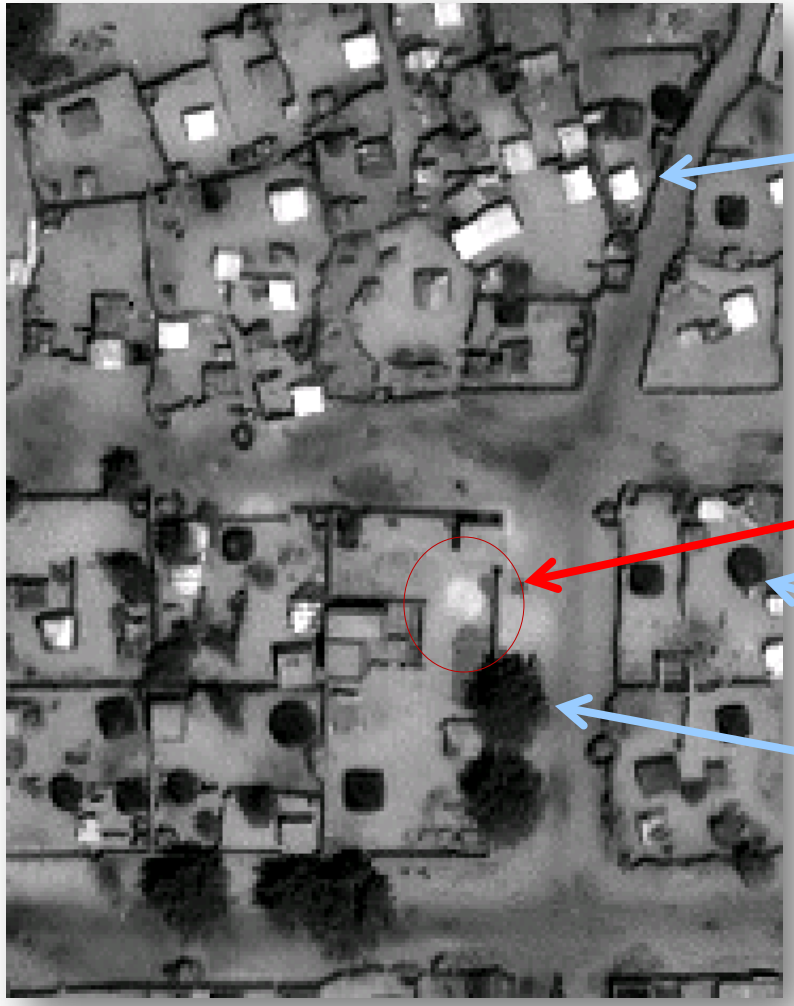
contrast b/w and shape (elongated but acute): **“certain stripes pattern ➔ *zebra*”**

Making our knowledge explicit

GeoEye
GSD 40 (50) cm

Subset IDP camp Al Genina, West Darfur

High Resolution: The objects of interest are larger than the pixel size



Making our knowledge explicit

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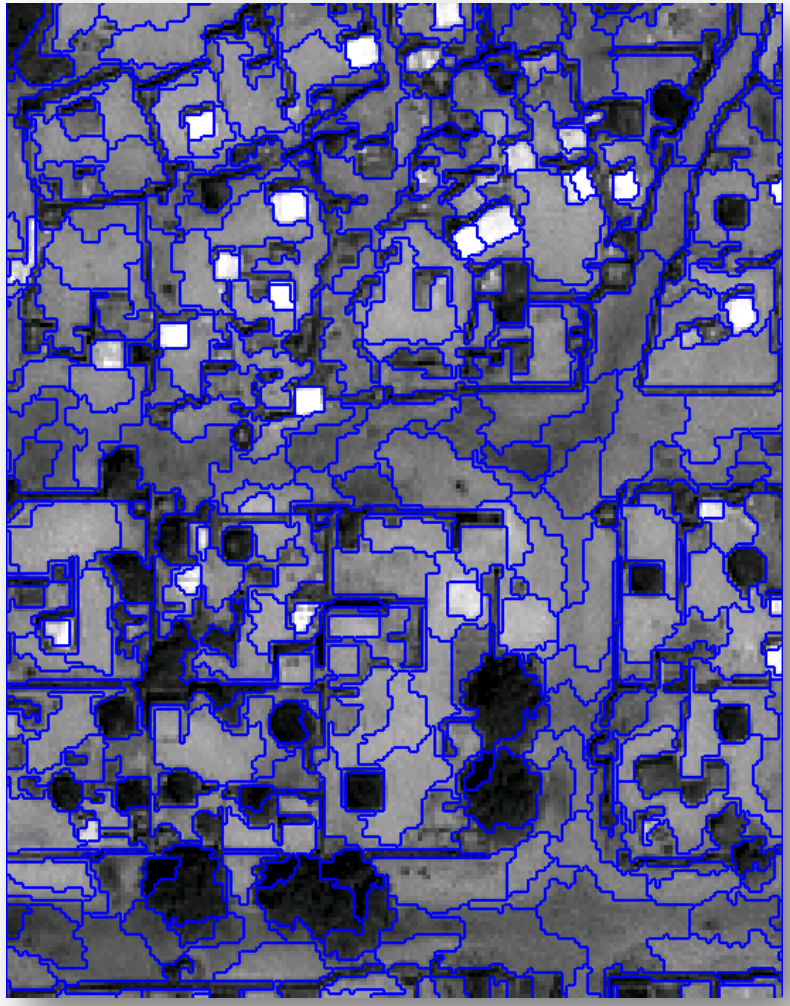

Apply rule:
Image segmentation based on reflection values and optimizing shape

Then, apply more rules to the segments, e.g. “light objects are tents”

Making our knowledge explicit

GeoEye
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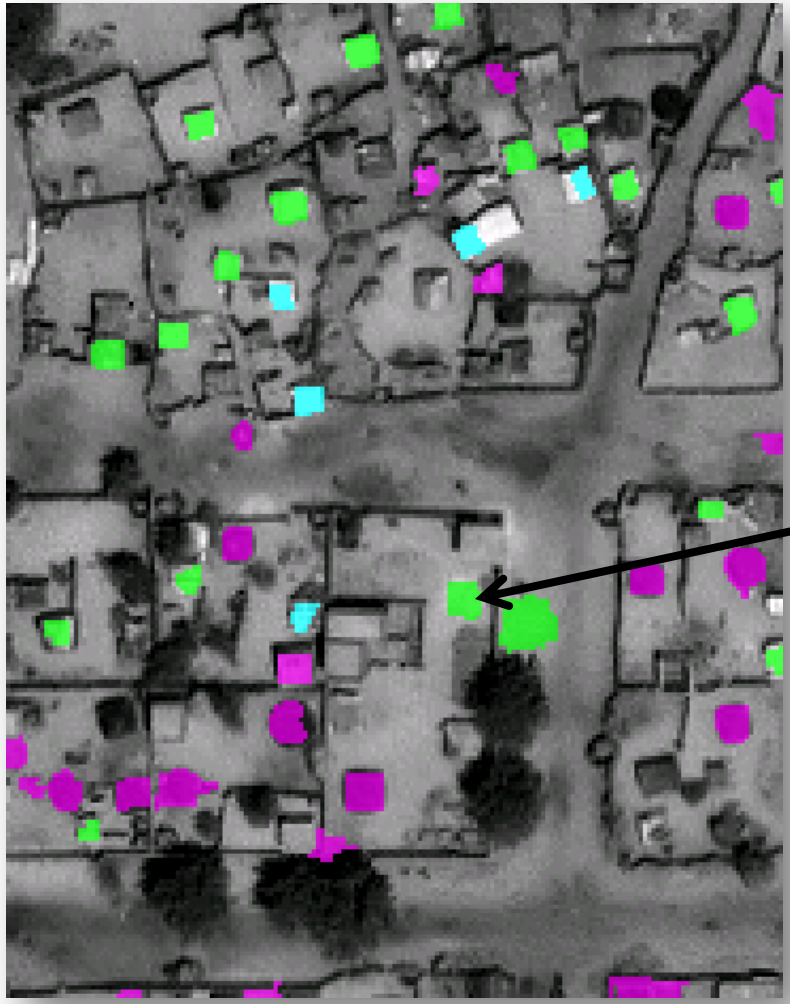
Subset IDP camp Al Genina, West Darfur



Final set of rules describes the objects in the image

Tent or white spot ?

Pixel- vs. object-scape

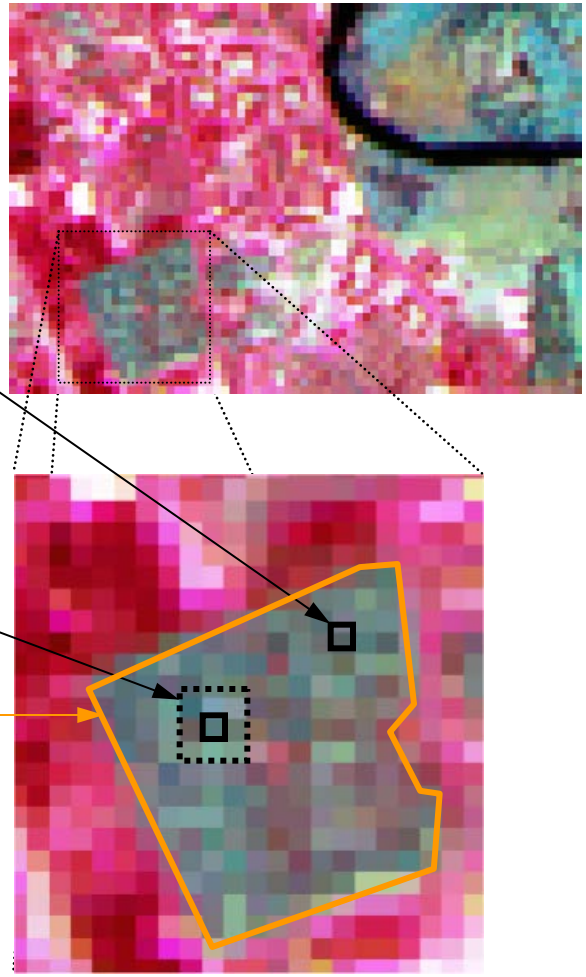
Limitations of **pixel-based analysis**

considering

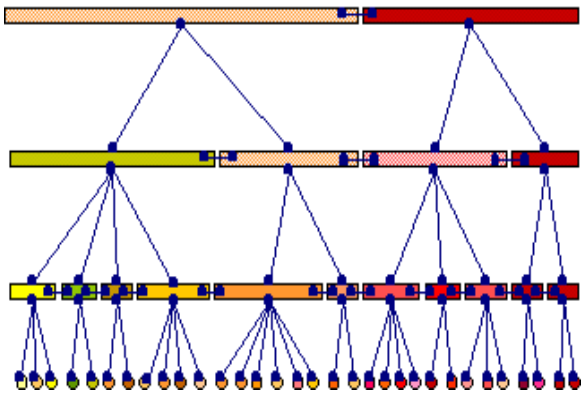
- **Colour** (spectral reflectance in *n* Bands)
- **Texture** (certain environment, e.g. 3*3 pixels)

but not

- **Form & shape**
- **Neighbourhood**
- **Context**
- **Levels**



Object-based classification

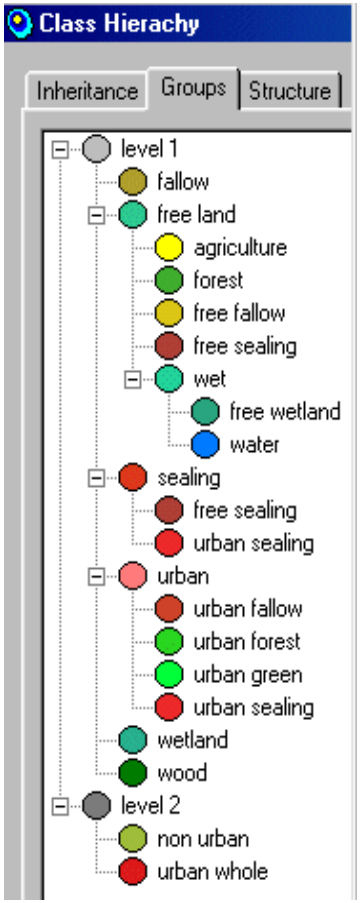


Hierarchic network of image objects

Classified objects with specifc attributes and mutual relations

eCognition®

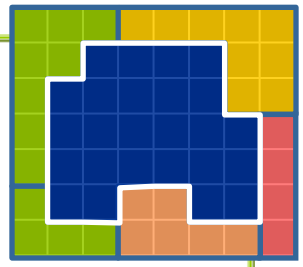
Geo-information



Knowledge based class system

Available features for classification

- **layer values**
  - mean
  - std-dev
- **geometrical properties**
  - size, shape, …
- **textural properties**
  - layer value texture (e.g. mean of sub objects: std-dev)
  - shape texture (e.g. directions of sub objects)
- **hierarchical properties**
  - number of higher levels
  - number of super or sub objects



object features

- colour
- shape
- texture
- hierarchy

- **relations to classes of …**
  - neighbour objects
  - sub objects (relative area of …)
  - super objects
- **membership to …**

class related features

- to neighbour objects
- to sub objects
- to super objects

Automatische Vorklassifikation von optischen Multi-Sensor Fernerkundungsdaten als Grundlage für semantische Abfragen

User

Geospatial Semantic Query Interface

Search results based on
- pre-classification statistics
- Based on spatial semantic queries

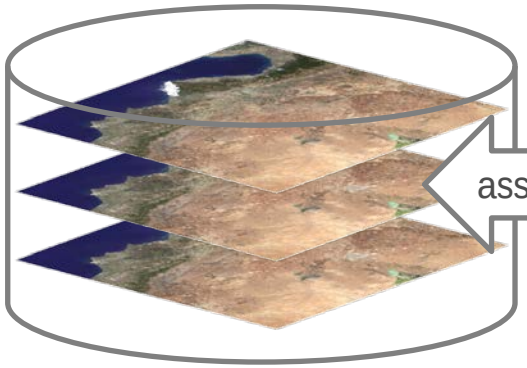
AOI request

Semantic based Metafile (multi-temporal)

Semantic query	
Cloud cover	15%
Vegetation	25%
Water bodies	30%

Data and information download

Image database (e.g. Landsat)

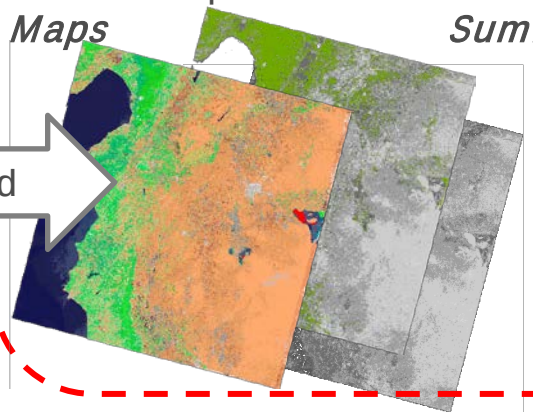


associated

Pre-classifications

Data-derived continuous and categorical geospatial information products

Maps



Summary statistics

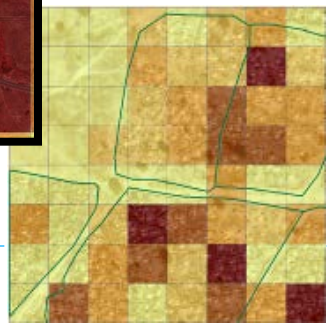
Class	N.pix	Percentage
SVVHNIR	3148	0.439
SVHNIR	3885	0.542
SVMNIR	249	0.035
SVLNIR	0	0.000
AVVHNIR	7103	0.991
AVHNIR	92417	12.893
AVMNIR	74388	10.378
AVLNIR	806	0.112
WVHNIR	1	0.000
WVLNIR	334	0.047
WE	502	0.070
SHV	372	0.052
SSR	1	0.000

❶ Situation awareness

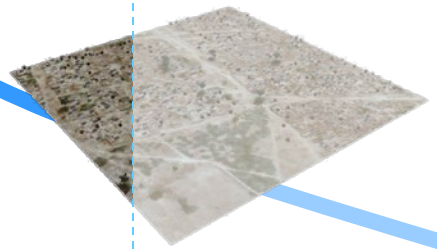
Event /
regular update

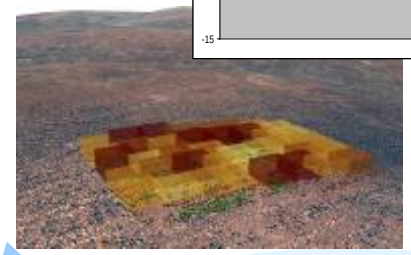
❷ Data integration / information extraction

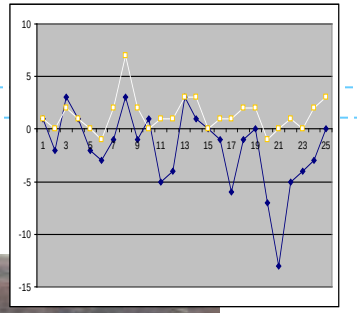
❸ Spatial analysis



❹ Information delivery



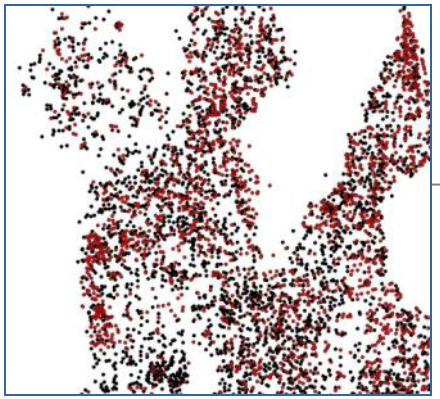


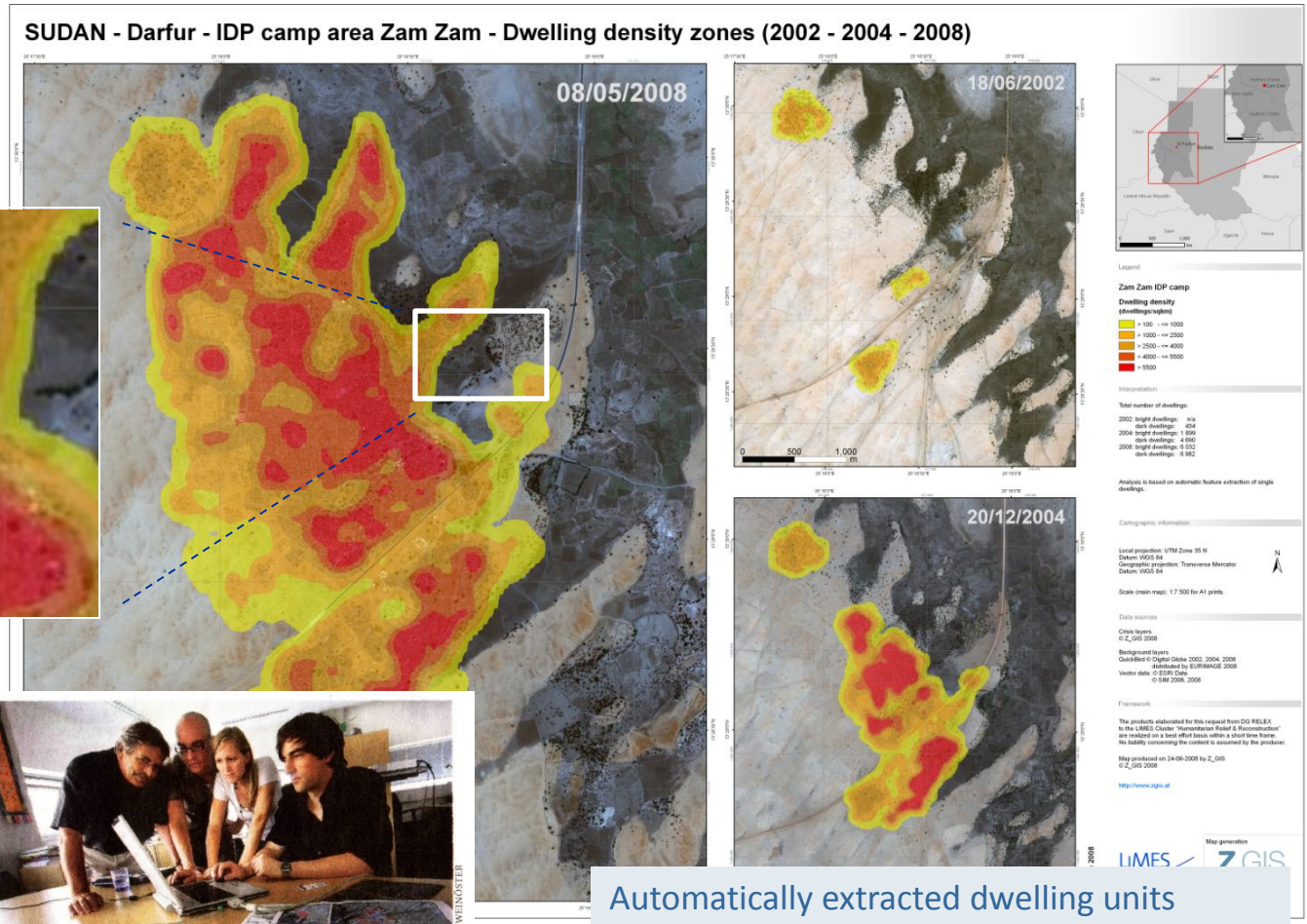


Demand for **conditioned information**

Integrated workflow for *(here: crisis-related)* **information delivery**

> Disaster risk reduction
Population monitoring



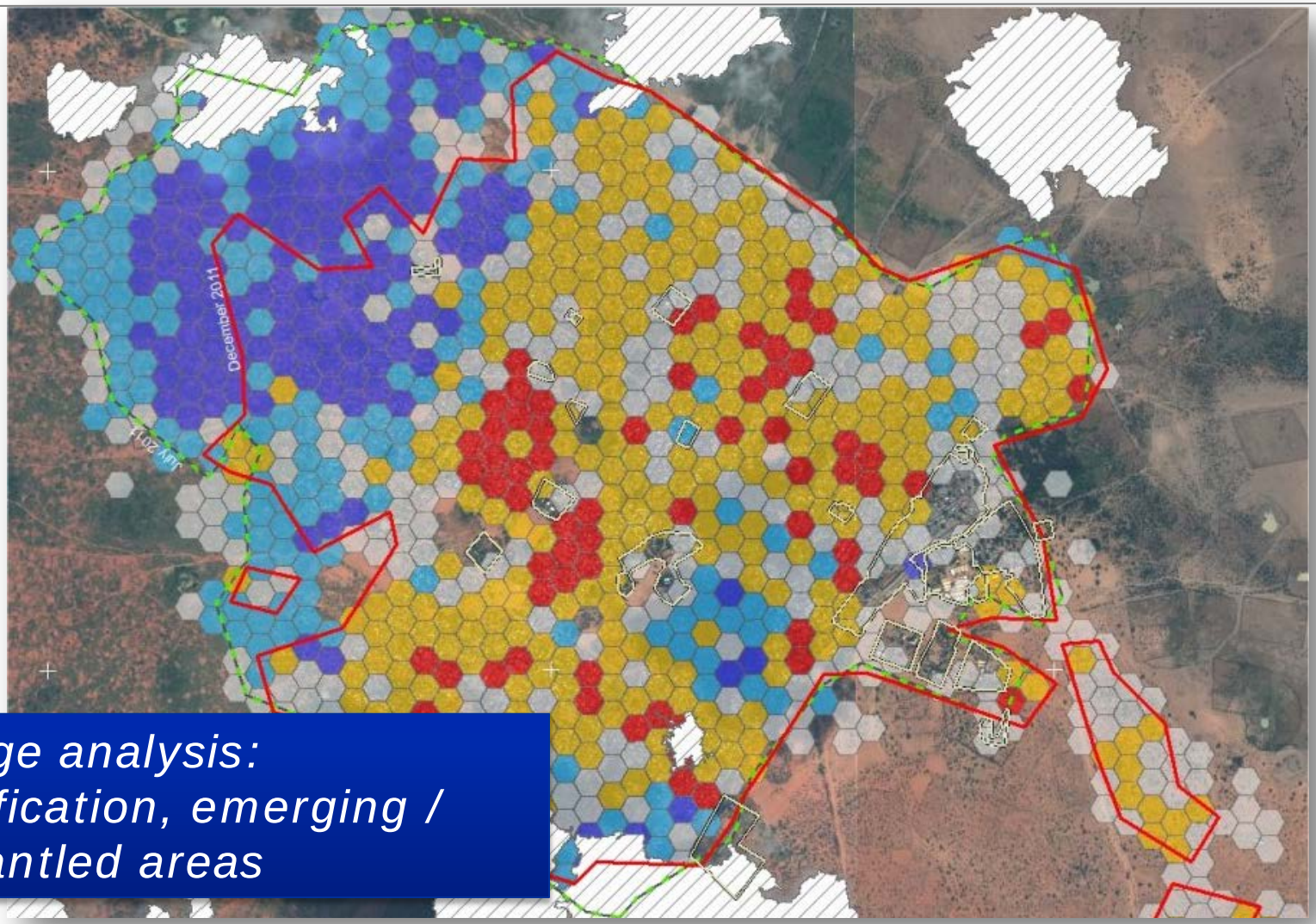


LIMES
Land-sea integrated monitoring for European security
FP-6 SPACE CP
2006-2010

Salzburger Forscherteam: Wertvolle Informationen per Satellit

Automatically extracted dwelling units
➔ Calculation of density zones
➔ Evolvement over time

Camp evolution 2011-2012



Change analysis: densification, emerging / dismantled areas

Summary

- **Incorporate knowledge in classification process**
- **Use hierarchy dependencies**
- **Include different types of data**
- **Make knowledge explicit**

→ semantic classification approaches

- **Derive relevant (geo)information for society**

Fragen? Kommentare?

Herzlichen Dank für Ihre Aufmerksamkeit.

www.zgis.at

Stefan Lang

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