

Crosscutting cartographies: Language paradigm in Past, Now, and in Future

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Presentation Plan:

- Crosscutting or Intersecting the “classical” cartographies
- Past: Map language, Cartographic language, or Language of maps
- Now: Operational and Application Map or Cartographic languages only
- Future: Towards the Domain Specific Map Languages as part of System Cartography
- Conclusions

1

Presentation for AKTIVITY V KARTOGRAFII
venované Jánovi Pravdovi
24. november 2023

What it is mean "crosscutting" (cartographies)

Term is borrowed from (Cauvin, et al., 2010; Vol. 1, Figure 1.2), called "**Cartographic trends and paradigms since 1950**", in column 2 - "**Crosscutting current of thought**".

Column 1 of figure is called "**General trends and paradigms**".

(Cauvin, et al., 2010; Fig. 1.2) named "crosscutting" **Metacartography** of W. Bunge and **Analytical cartography** of W. Tobler.

"**General trends and paradigms**" indicate paradigms and conceptions of cartography which we call "classical" or "subject", where subject=map

Example of such "classical"/"subject" cartography is **communication paradigm**

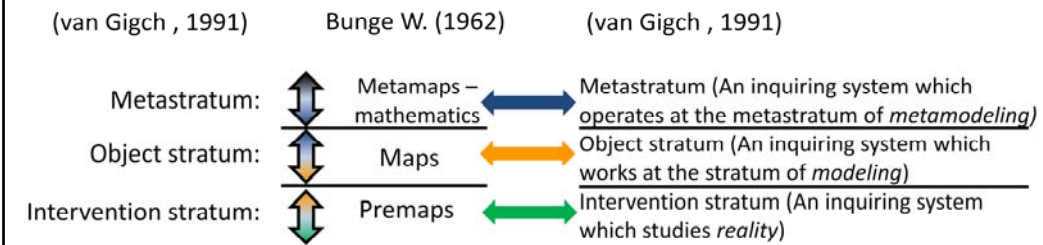
We are using also the term **intersecting** as additional to the term crosscutting.

Cauvin C., Escobar F., Serradj A. (2010) Thematic Cartography. V. 1: Thematic Cartography and Transformations, 512 p. V. 2: Cartography and the Impact of the Quantitative Revolution, 448 p. V. 3: New Approaches in Thematic Cartography, 320 p.- ISTE-Wiley, 2010.

2

Conceptions or Paradigms of cartography (Cartographies) are named crosscutting, if in some sense they are "perpendicular" to subject cartographies, such as communicative paradigm

Our understanding of "crosscutting" (cartographies) term. Metacartography of W. Bunge as example



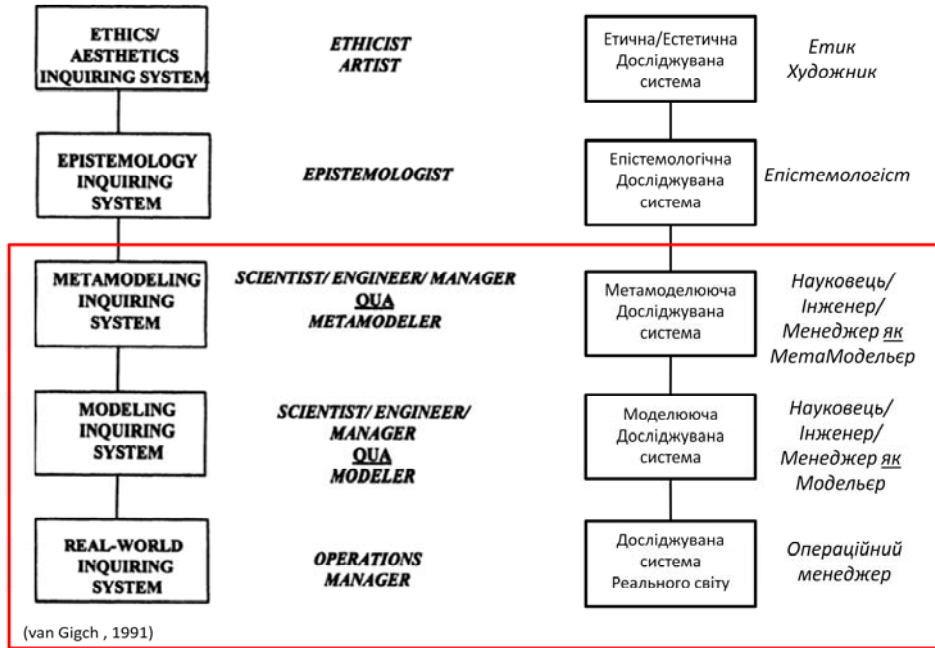
(van Gigch , 1991) System design modeling and metamodeling.- Springer.- 453 p.

(Bunge, 1962) Theoretical Geography. First Edition. Lund Studies in Geography Series C: General and Mathematical Geography. Lund, Sweden: Gleerup. (Translation from English.- M.: Progress, 1967.- 279 p., in Russian)

3

There is the hierarchy of levels or strata in many fields of mankind activity, presented as *metamodeling – modeling - reality* in Van Gigch monographies. Metacartography of W. Bunge is described in Chapter 2 of his monography

Hierarchy of inquiring systems when creating an arbitrary artifact (van Gigch, 2003)



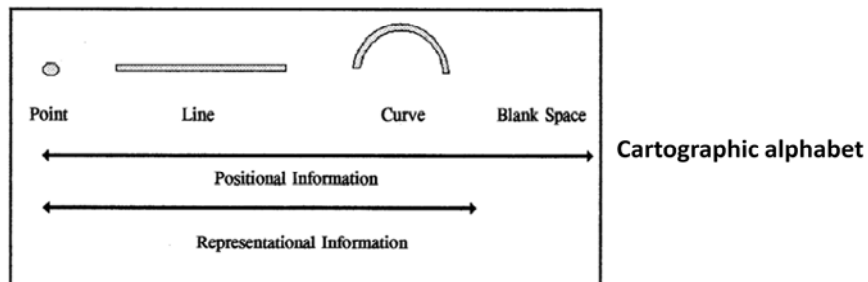
(van Gigch, 2003) Metadecisions: Rehabilitating Epistemology.- Springer, 2003.- 341 (349) p.

4

Components of hierarchy levels or strata are named inquiring systems by Van Gigch. Red rectangle refer to content of presentation. On the right side is shown Ukrainian translation

Past: Cartographic language (Ramirez, 1993). Cartographic (linguistic) levels

Level	Information
5 (+CCI)	SCI + INI + LOI + ECI + CCI - (Complementary cartographic information - CCI) is a part of the complete cartographic information, which can be removed from the map without disturbing essential cartographic information
4 (+ECI)	SCI + INI + LOI + ECI - (External cartographic information - ECI) is a part of essential cartographic information, the removal of which affects the global perception of the territory, but does not affect the local representation
3 (+LOI)	SCI + INI + LOI - (Local information - LOI) is a part of essential cartographic information, the removal of which affects the perception of the local representation of the territory
2 (+INI)	SCI + INI - (Internal information - INI) is a part of essential cartographic information, the removal of which makes the territorial representation disappear
1 (SCI)	SCI - (Skeletal cartographic information - SCI) is a part of the complete cartographic information, which is necessary to recognize the map as a multidimensional graphic representation (in the most primitive way)



(Ramirez, 1993) Development of a Cartographic Language, Ch. 8, pp. 92-112 // LNCS0716. Spatial Information Theory: A Theoretical Basis for GIS.- European Conference, COSIT1993. Frank Andrew U., Campari Irene (Eds.).- Springer, 1993.- 477 (486) p. 5

(Ramirez, 1993) constructed his cartographic language starting from Cartographic alphabet and using Cartographic Grammar.

Cartographic levels correspond to linguistic levels of Chomsky N. (2002) Syntactic Structures.- Mouton de Gruyter, 2nd Ed.- 117 (136) p. (Mouton, 1957, 1st Ed)

Language paradigm in the past

"Past" means the last quarter of the 20th century.

(Ramirez, 1993), (Liuty, 1988) and (Pravda, 1990) are the most characteristic works on the language paradigm at that time.

Although Hansgeorg SCHLICHTMANN, Alexander WOLODTSCHENKO and Jan PRAVDA - defined the Language of Maps in 1995, at the Barselona ICA conference "as a system of map signs and rules of their use. The knowledge of this system enables anyone who wishes to do so (i.e. not only cartographers) to express spatial information in map form and/or to read and understand the map contents which are denoted by signs of map language" (see p. 1840 of conference proceedings). They believed "there are currently three conceptualizations of map language: **Liuty's, Pravda's and Schlichtmann's.**"

Liuty A.A. (1988) Language of map: essence, system, functions.- M.: IG USSR AS, 1988.- 292 p. (in Russian)

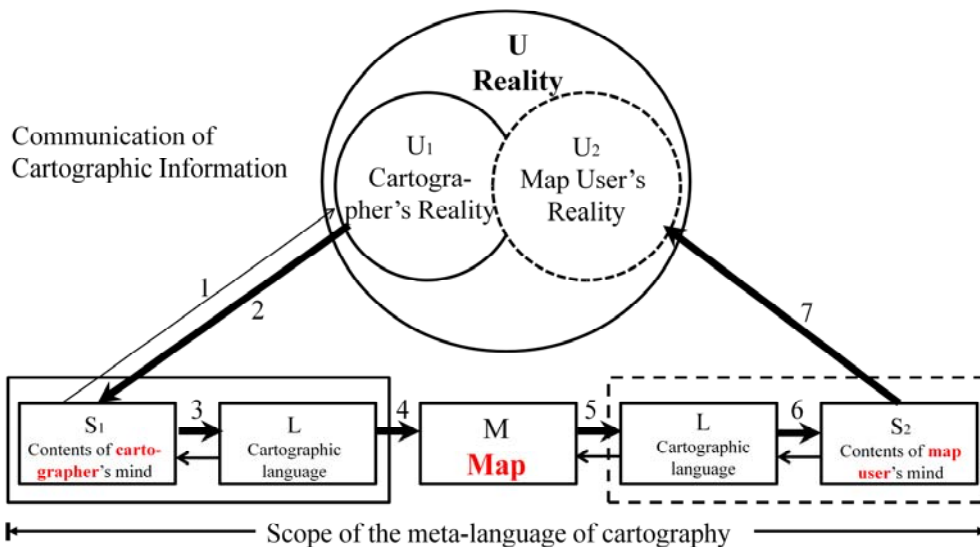
Pravda J. (1990) Zaklady koncepcie mapoveho jazyka.- Bratislava (Geografický ústav SAV), 1990.- 168 s.

Ramirez R. (1993) Development of a Cartographic Language, Ch. 8, pp. 92-112 // LNCS0716. Spatial Information Theory: A Theoretical Basis for GIS.- European Conference, COSIT1993. Frank Andrew U., Campari Irene (Eds.).- Springer, 1993.- 477 (486) p.

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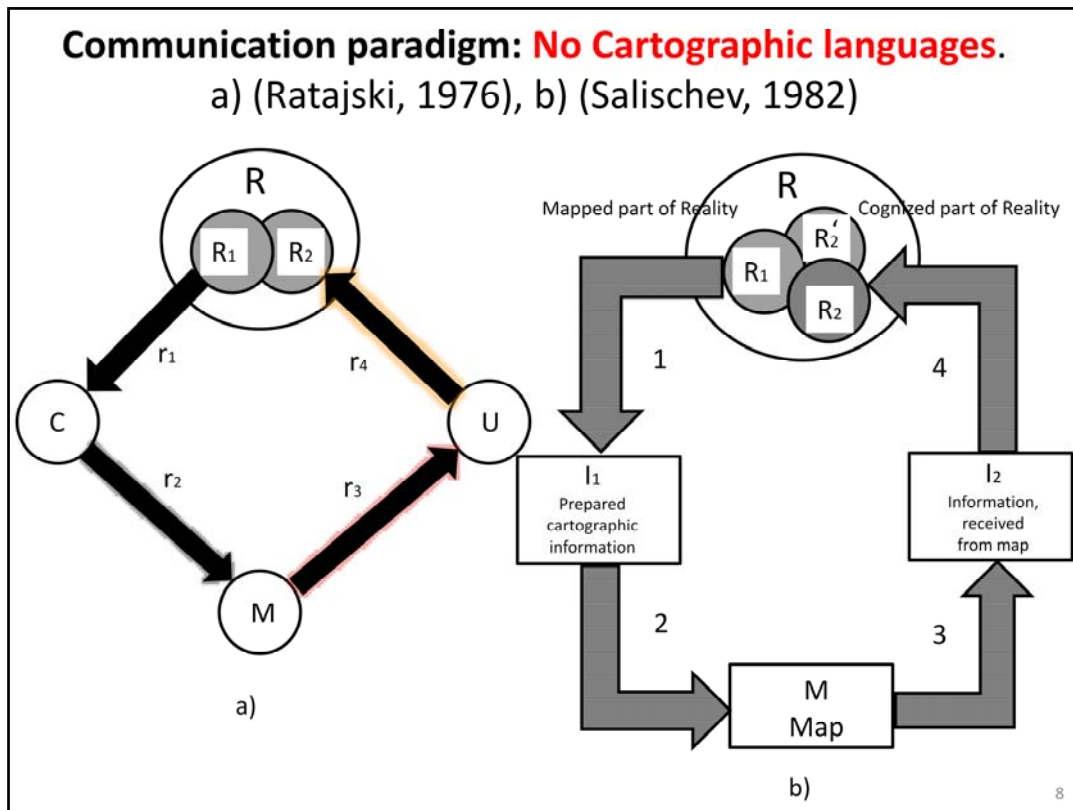
Hansgeorg SCHLICHTMANN, Alexander WOLODTSCHENKO and Jan PRAVDA selected three conceptualizations of map language.
Language paradigm was popular in Eastern Europe at the end of last century.
It is **crosscutting** cartography

Communication paradigm: **Two Cartographic languages**



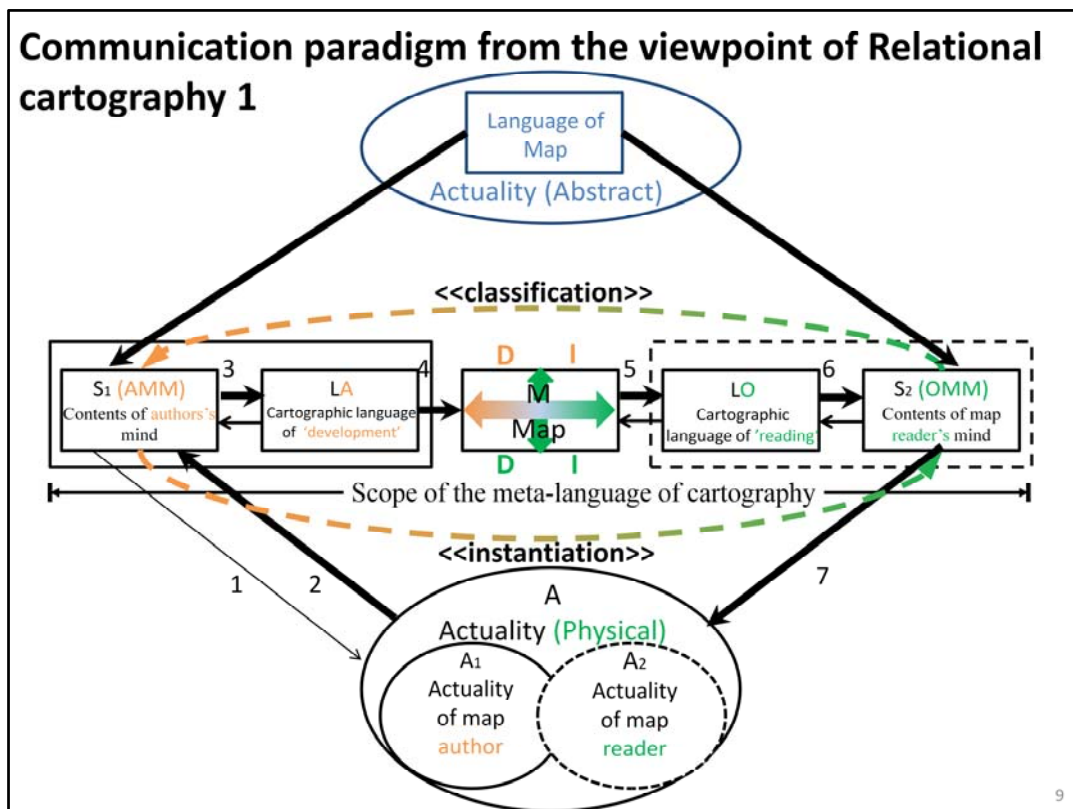
Kolachny, 1969) Cartographic Information – A Fundamental Concept and Term in Modern Cartography.- Cartogr. J., Vol. 6, Iss. 1, pp. 47-49

(Kolachny, 1969) is well known in cartographic society. We highlighted in red two cartographic languages



a – scheme of cartographic communication process (Ratajski, 1976, p. 8). R – reality, R_1 – mapped part of reality (established by cartographer), r_1 – information, required to create map, C - cartographer (map creator), M - map, r_2 - information that placed in map, U – user (consumer, reader) of map, r_3 – information, received by map user (reader), r_4 - information about reality, refracted based on the knowledge and experience of the map user (reader), R_2 – cognized part of reality (on the basis of map and mental activity);

b – scheme of cartographic method of cognition of reality (Salischev, 1982b, p. 263). R – reality, 1 – receiving of information I_1 as result of observation of some part of reality D_1 , 2 - processing of information I_1 and construction of map, 3 – studying map M to extract information I_2 from it, 4 - use the received information for presenting D_2 , D'_2 about modeled in the form of map the real part of world.

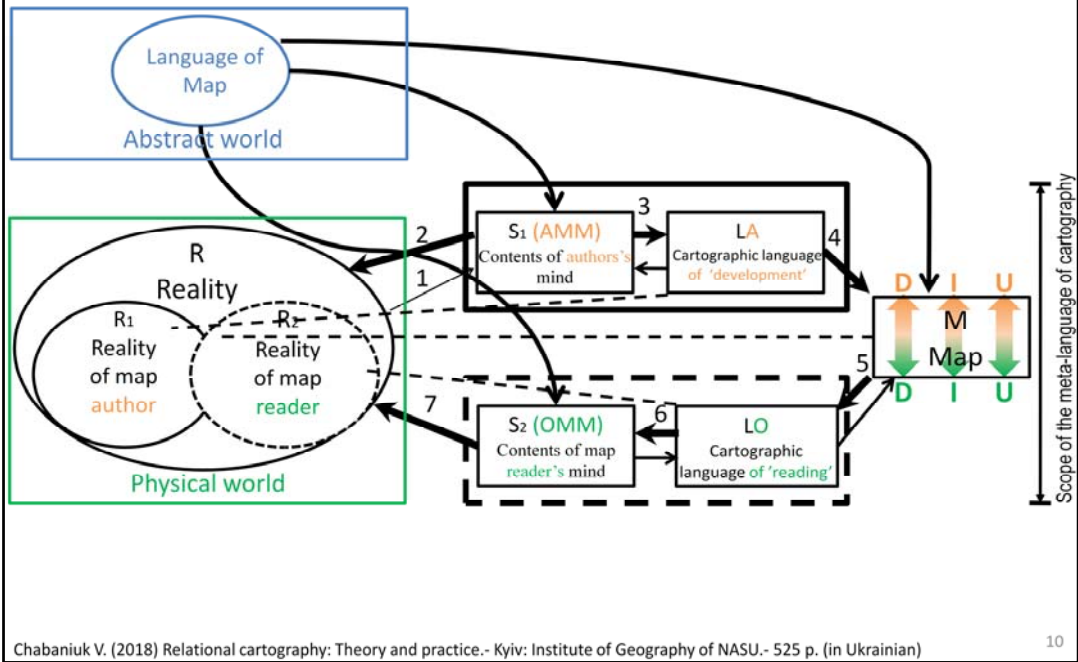


Communication paradigm from (Kolachny, 1969) is presented with the usage of Relational cartography

Chabaniuk V. (2018) Relational cartography: Theory and practice.- Kyiv: Institute of Geography of NASU.- 525 p. (in Ukrainian)

D – Datalogics, I – Infologics, AMM – Application Map Model, OMM – Operational Map Model, A – Application stratum (orange color), O – Operational stratum (green color), LA – Application Language, LO – Operational Language
 Classification/instantiation relation exist between A and O strata

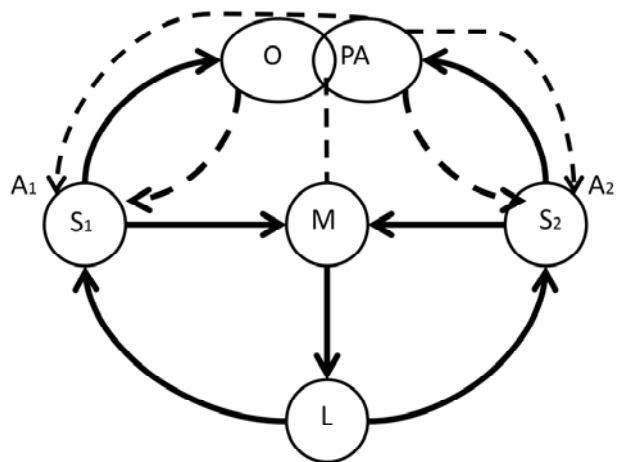
Communication paradigm from the viewpoint of Relational cartography 2



Usefulness U level Additionally to D and I is shown

System model 'making-using maps' (Liuty, 1988; Fig. 5)

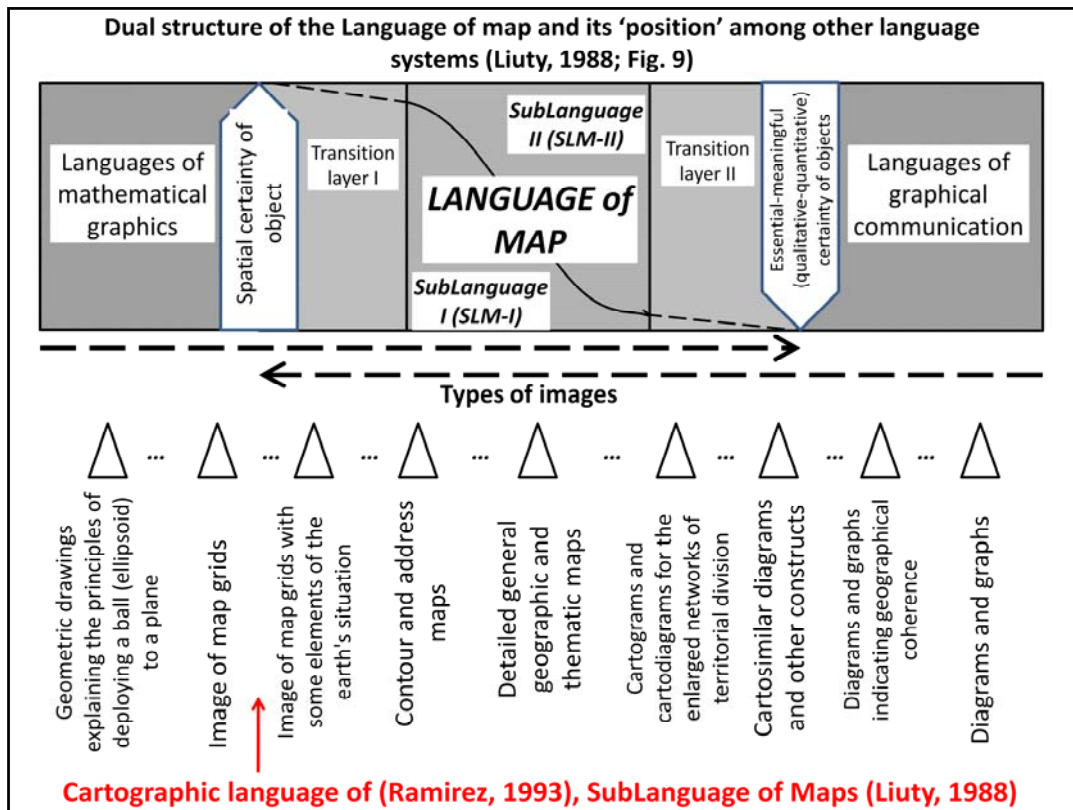
O - object (reality),
 PA – practical activity,
 S₁ - subject-cartographer,
 S₂ - subject-consumer (user) of map,
 M - map (text of language),
 L – language of map (system),
 A₁, A₂ – activators (objective conditions of human practice, determining the appeal of subjects to language of map , to cartographic forms of communication, modeling and cognition)



Liuty A.A. (1988) Language of map: essence, system, functions.- M.: IG USSR AS, 1988.- 292 p. (in Russian)

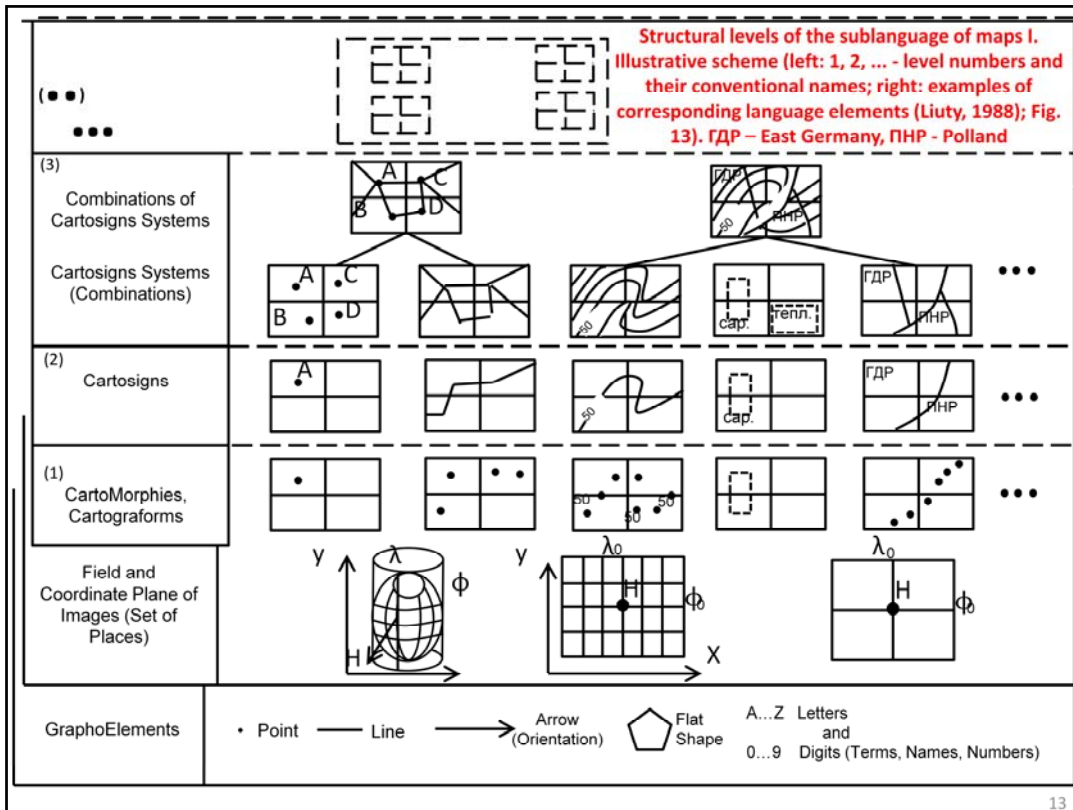
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(Liuty, 1988): O - object (reality), PA – practical activity, S₁ - subject-cartographer, S₂ - subject-consumer (user) of map, M - map (text of language), L – language of map (system), A₁, A₂ – activators (objective conditions of human practice, determining the appeal of subjects to language of map, to cartographic forms of communication, modeling and cognition). Circles show elements of system, ovals overlapping - elements of system external environment, solid arrows – relations and interactions in system and exits from it, dashed arrows - influences of environment (inputs and feedbacks) on system; dotted line marked indirect nature of the relation “map - object (reality)”.

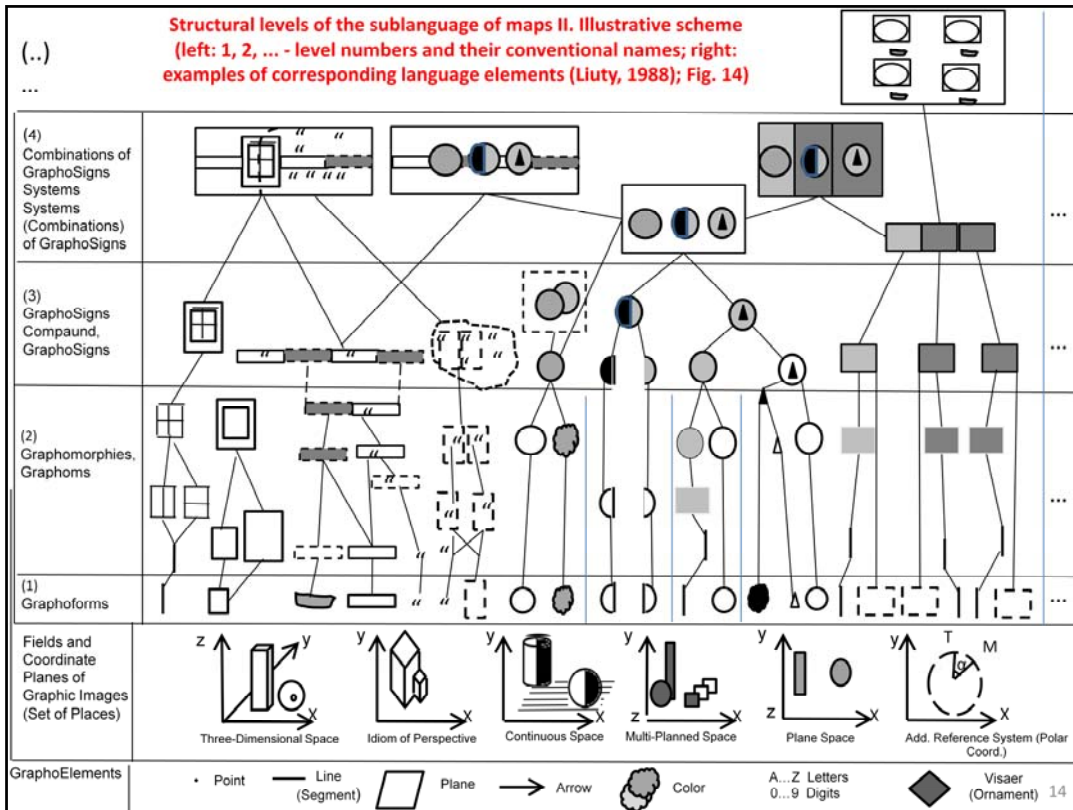


Correspondence between Cartographic language of Ramirez and Language of maps of Liuty

Liuty A.A. (1988) Language of map: essence, system, functions.- M.: IG USSR AS, 1988.- 292 p. (in Russian)



Hierarchy of SubLanguage of maps I



Hierarchy of SubLanguage of maps II

Modern system model 'maps making-using'

O – Object (Reality) (Liuty, 1988; Fig. 5)

PA – Practical Activity (Liuty, 1988; Fig. 5)

L - (Map) Language (Liuty, 1988; Fig. 5)

AL – Application Language

AMD – Application Map of Developer

AMC – Application Map of Consumer

(user-expert (author))

OMC – Operational Map of Cartographer

OMU – Operational Map of User

S₁₃ – computer and cartographic

architects

S₁₂ – computer and cartographic

designers

S₁₁ – programmers and cartographers

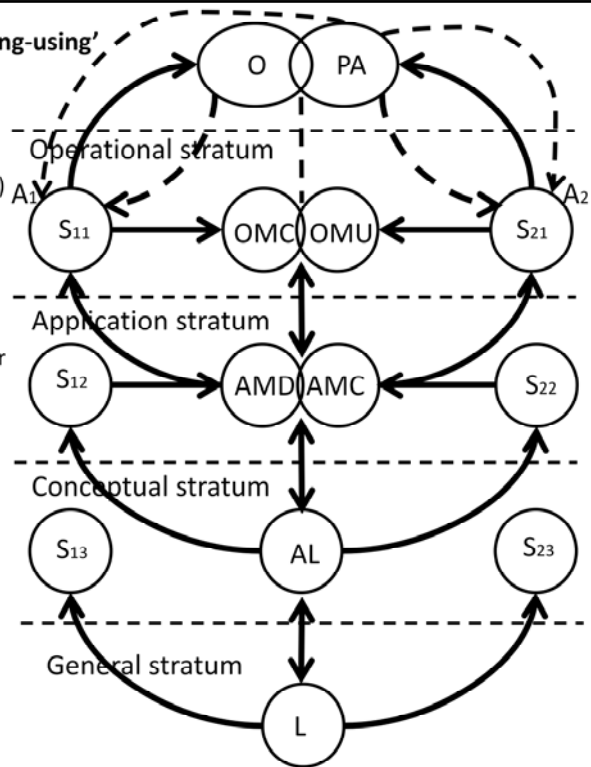
(Liuty, 1988; Fig. 5)

S₂₁ – user (Liuty, 1988; Fig. 5)

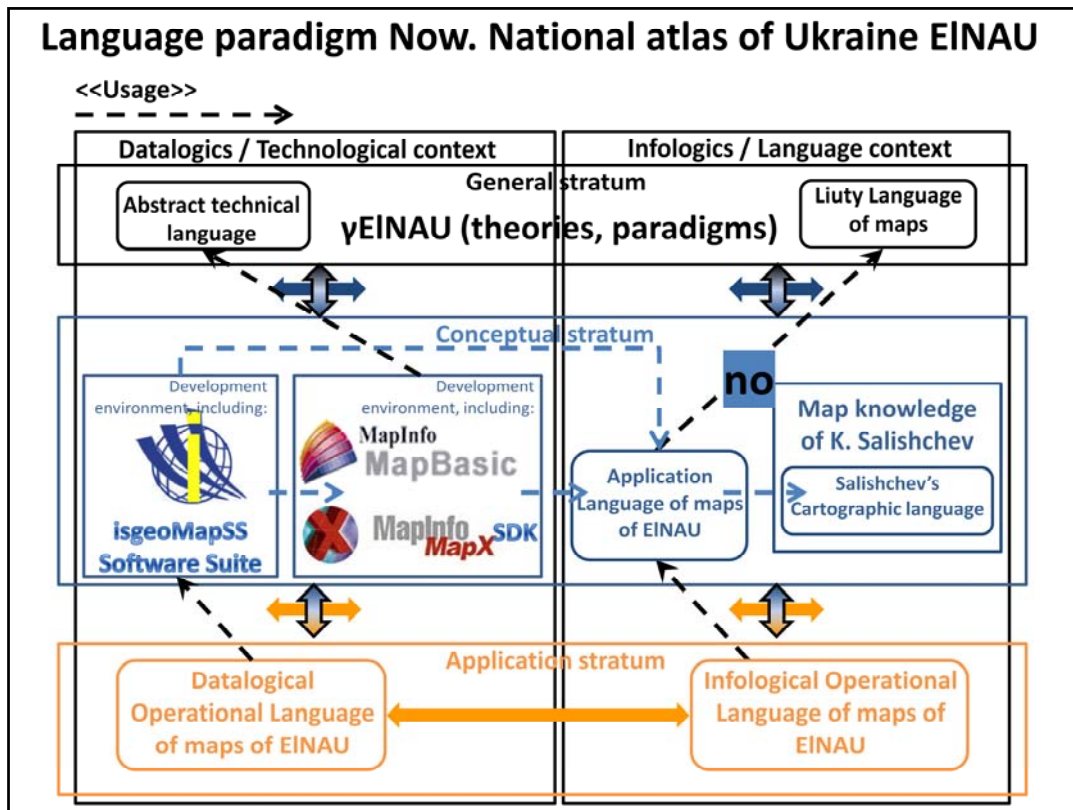
S₂₂ – user-expert (author)

S₂₃ – user-planner (coordinator)

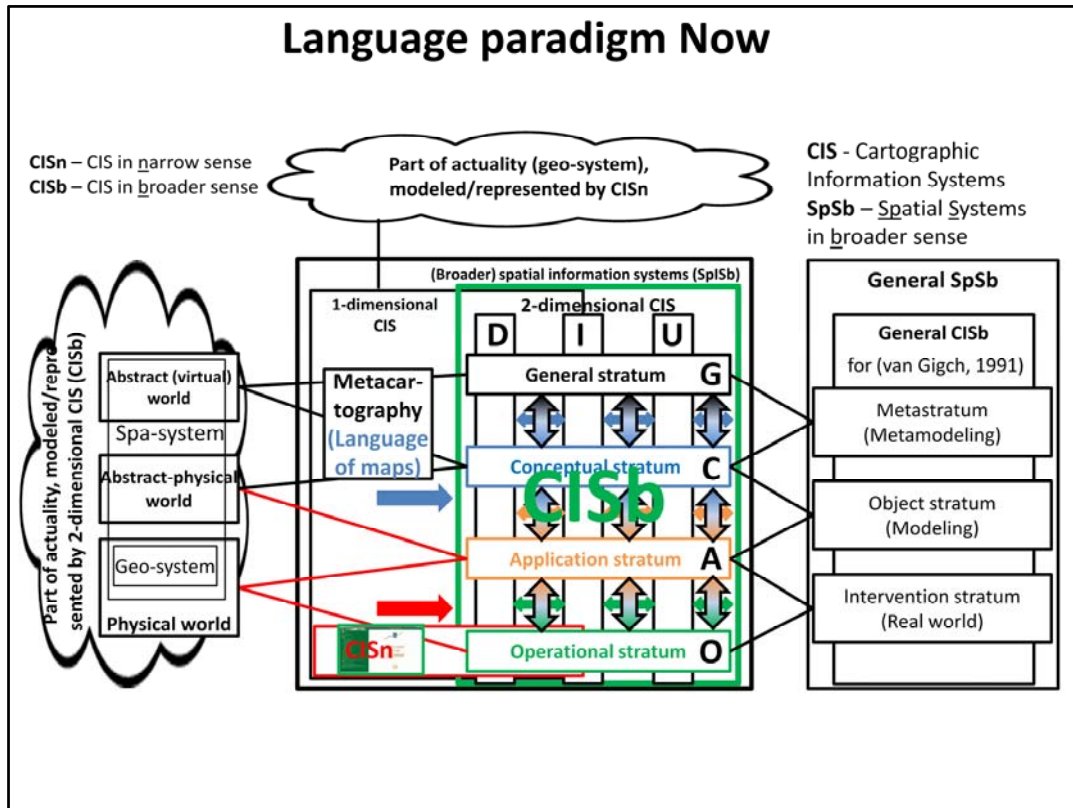
[OMC+OMU=Map (Liuty, 1988; Fig. 5)]



Chabaniuk, Dyshlyk, 2016b) Towards relational cartography, pp. 114-123 // Collection of scientific papers of Western Geodetic Society of USGS, 15 Issue II (32).- Lviv Polytechnic Press, 2016



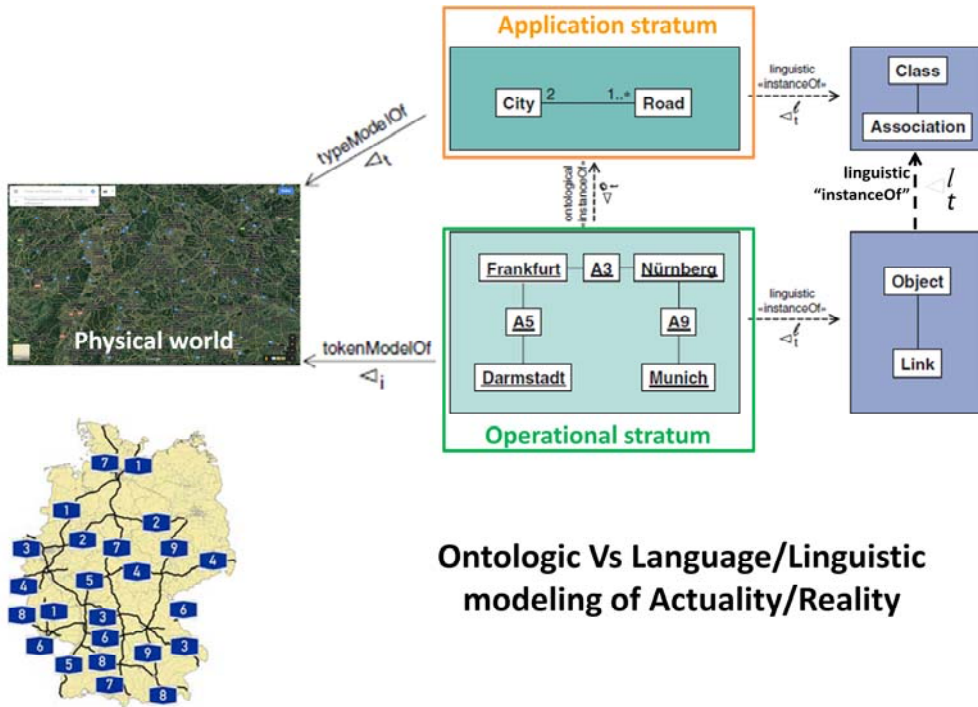
In Electronic version of National Atlas of Ukraine (NAU, 2007/2010) were used Application and Operational Languages of Maps



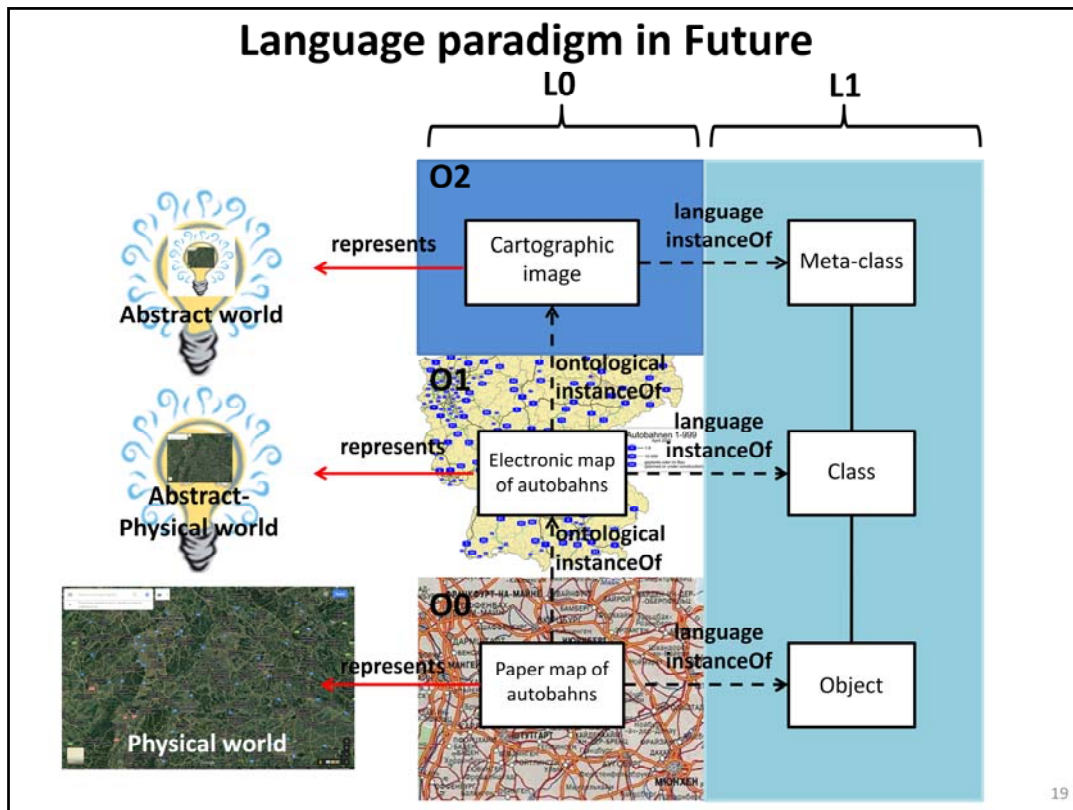
D, I, U levels are defined before.

Strata: G – General, C – Conceptual, A – Application, O - Operational

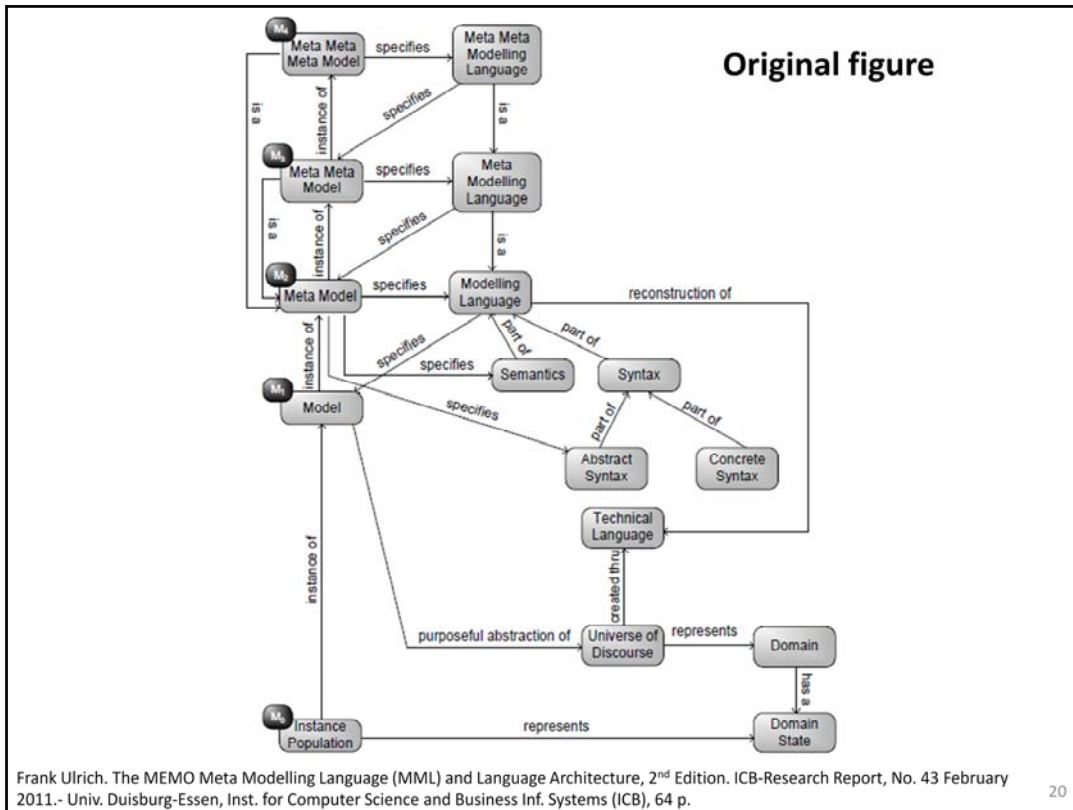
Language paradigm in Future

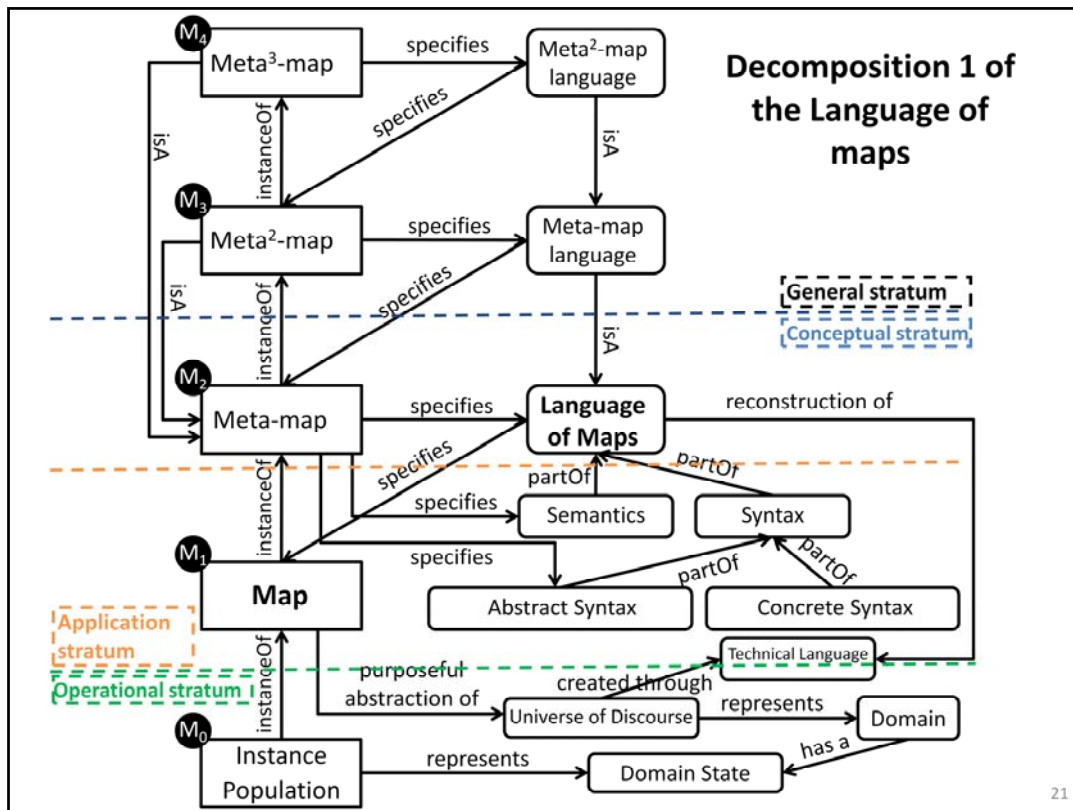


Ontologic Vs Language/Linguistic modeling of Actuality/Reality



Following Kühne T. (2006) Matters of (meta-)modeling.- Softw. Syst. Modeling, 5, pp. 369–385.

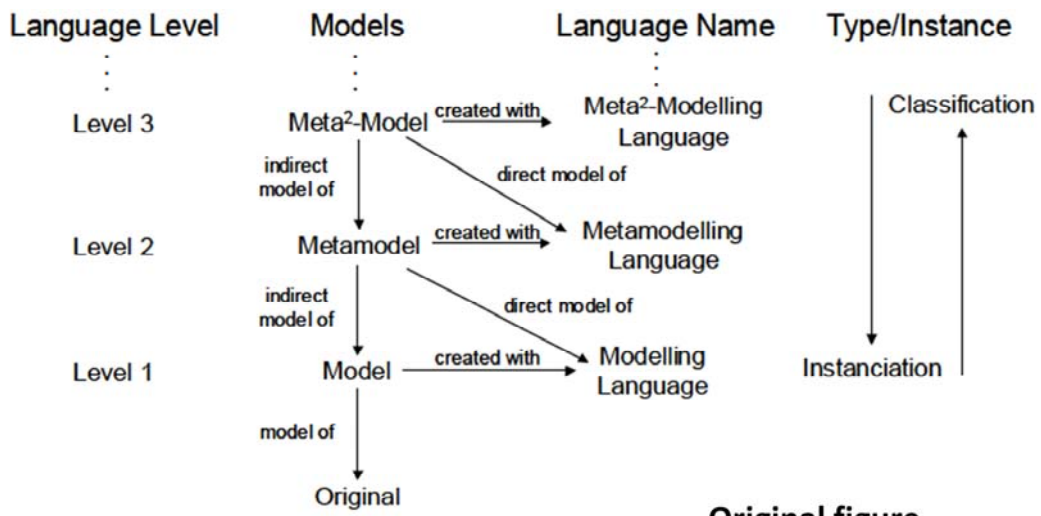




Frank Ulrich. The MEMO Meta Modelling Language (MML) and Language Architecture, 2nd Edition. ICB-Research Report, No. 43 February 2011.- Univ. Duisburg-Essen, Inst. for Computer Science and Business Inf. Systems (ICB), 64 p.

Comparison of slides 20 and 21 will answer on changes we made.

Metamodeling based on language stack (Karagiannis, Kühn, 2002; Fig. 3)

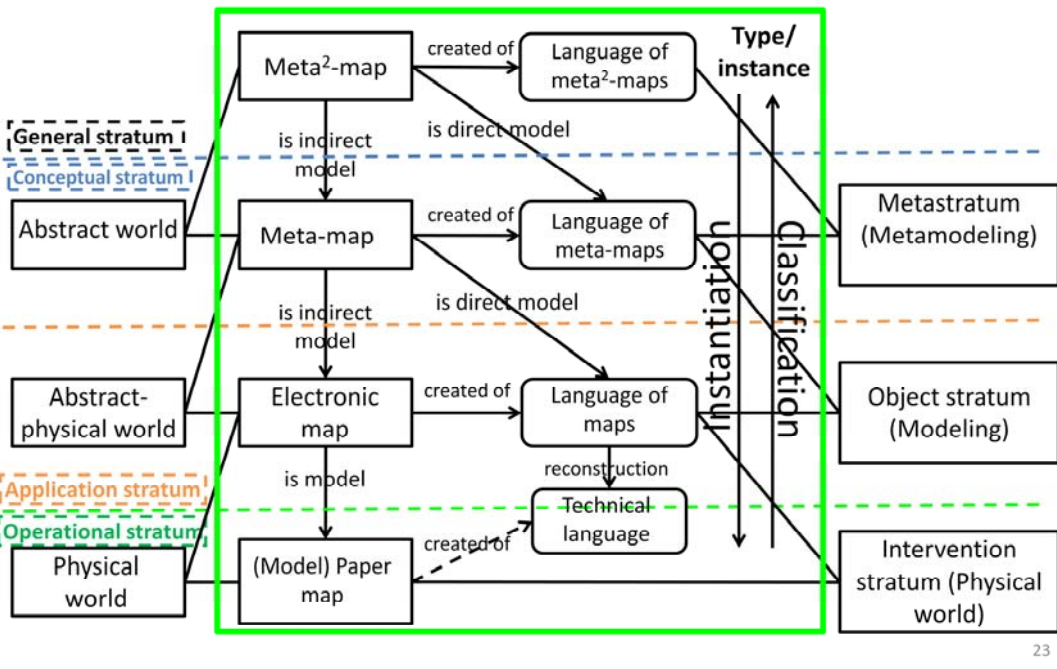


Original figure

(Karagiannis, Kühn, 2002) Metamodeling Platforms, pp. 182-195.- In K. Bauknecht, A. Min Tjoa, & G. Quirchmayer (Eds). Proceedings of the Third International Conference EC-Web at DEXA 2002. Berlin: Springer-Verlag. 22

Language paradigm in Future

Decomposition 2 of the Language of maps



Conclusions

The evolution of the Language of maps and the Language paradigm of cartography as crosscutting and at the same time intersecting constructions of theoretical cartography are considered. Three periods of evolution are distinguished: past, now, and future.

In the past period of evolution - the last quarter of the past century, attention was paid to work (Ramirez, 1993). The main source here is the monograph (Liuty, 1988), which sets out the full Language of maps at that time.

In the now period of evolution, the system of "maps making-using" of A. Luty's has been updated. It is shown that in modern times the Language of maps is a hierarchical linguistic or semiotic system of several levels, with which the general, conceptual, application and operational languages of maps are consistent.

In the near future, the Language of maps should become one of the two bases of system cartography as a theory of cartography. The second basis of cartography theory should be one of Subject cartographies. The Language of maps can become one of the bases of **System cartography** through **combination with Relational cartography** or through the **integration into Model-Based Engineering (MBE)**.