

# Visual framework for bio-medical knowledge organization

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Here we propose our view on the problem of visualization of models and networks structure in system biology and present consistent set of three interconnected complementary categories of visual notation for it.

Importance of visualisation techniques is recognised by scientific community as shown by recent survey[1].

To be used as a strong background for knowledge gathering, representation and dissemination graphical notational system "...must: (i) allow representation of diverse biological objects and interactions; (ii) be semantically and visually unambiguous; (iii) be able to incorporate notations; (iv) allow software tools to convert a graphically represented model into mathematical formulas for analysis and simulation..."[2]. One of the main problems of all current notational schemes in system biology is their inability to resolve internal contradiction between requirement (i), (ii) and (iv). Representation of whole diversity of partially known biological objects and interactions on one hand and ability to be exported to mathematical formulas require different type of disambiguation. The problem could be resolved if we consider the whole system of several different cross-linked notations rather than specific type of diagram.

According our analysis all diagrams could be separated into three main categories according to their purpose and question to answer:

- **Phenomenological diagram:** Outline and context visualisation. Question: *What is the context?*
- **Biological diagram:** Experimental knowledge representation. Question: *What is the known fact?*
- **Mathematical diagram:** Model structure representation. Question: *What is the hypothesis?*

There is belief that the ability to represent as much details as possible is the main obstacle on the way to proper graphical notation. A lot of attention is paid to visualization of diagrams with different level of details via different type of zooming. The main difference of proposed system from zooming is a separation of diagrams based upon their purpose and content. All zooming techniques could be used in parallel to such separation within each individual category. To illustrate difference in analogy with GoogleEarth let us to consider phenomenological diagram as a tourist guide, as it does not keep scale and details other than sights. In this analogy biological map could be seen as topographical map and mathematical diagram as roadmap. All that types of

maps are indispensable in their own area but replacing of them with the only one type gives no benefit.

We have implemented the proposed categories as three contexts and plug-ins for Edinburgh Pathway Editor[3]

**References:**

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