The use of graph theory in system analysis

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It is common to analyse complex problems using a systems approach. In such approaches a problem is divided into carefully selected sub-problems that are easier described and investigated. The behaviour of the system as a whole is then explained from the state of the system elements and the interactions between them. System descriptions explaining the values of the system elements and changes therein may be regarded as (conceptual) models of reality. Conceptual models often provide the argumentation regarding what should and should not be researched. An obvious problem applying a systems approach is getting agreement, among users of the same (conceptual) model, on the constituent elements and how they should hang together. Increasing the grip on the conceptual modeling process could greatly improve communication between researchers and users and thus enhance the effectiveness of knowledge development projects.

Knowledge graph theory is a promising method to increase this grip. Interconnected vertices and edges together constitute a graph. Labeling of the vertices and edges yields a so-called knowledge graph. Contrary to most other qualitative reasoning or knowledge representation techniques, knowledge graph theory works with an ontology of relations as its main toolbox. This, combined with common algorithms that may be applied to normal graphs, e.g. path analysis, make knowledge graph theory a powerful tool in conceptual modeling processes. Procedures have been developed to objectify the transformation of (scientific) texts into conceptual diagrams. Algorithms have been implemented in software to display, analyse and aid interpretation of the resulting knowledge graphs. In the presentation an introductory overview is presented.