Schema Mappings: Structural Properties and Limits

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Abstract

A schema mapping is a high-level specification of the relationship between two database schemas. For the past fifteen years, schema mappings have played an essential role in the modeling and analysis of important data inter-operability tasks, such as data exchange and data integration. Syntactically, schema mappings are expressed in some schema-mapping language, which, typically, is a fragment of first-order logic or second-order logic. In the first part of the talk, we will introduce the main schema-mapping languages, will discuss the fundamental structural properties of these languages, and will then use these structural properties to obtain characterizations of various schema-mapping languages in the spirit of abstract model theory. In the second part of the talk, we will examine schema mappings from a dynamic viewpoint by considering sequences of schema mappings and studying the convergence properties of such sequences. To this effect, we will introduce a metric space that is based on a natural notion of distance between sets of database instances and will investigate pointwise limits and uniform limits of sequences of schema mappings. Among other findings, it will turn out that the completion of this metric space can be described in terms of graph limits arising from converging sequences of homomorphism densities.

Much of the material presented in this talk is drawn from [1, 2, 3, 4].

References

1 Balder ten Cate and Phokion G. Kolaitis. Structural characterizations of schema-mapping languages. In Ronald Fagin, editor, *Database Theory – ICDT 2009, 12th Int'l Conf., St. Petersburg, Russia, March 23-25, 2009, Proceedings*, volume 361 of *ACM International Conference Proceeding Series*, pages 63–72. ACM, 2009. `doi:10.1145/1514894.1514903`.

2 Balder ten Cate and Phokion G. Kolaitis. Structural characterizations of schema-mapping languages. *Commun. ACM*, 53(1):101–110, 2010. `doi:10.1145/1629175.1629201`.

3 Balder ten Cate and Phokion G. Kolaitis. Schema mappings: A case of logical dynamics in database theory. In Alexandru Baltag and Sonja Smets, editors, *Johan van Benthem on Logic and Information Dynamics*, pages 67–100. Springer, 2014. `doi:10.1007/978-3-319-06025-5_3`.

4 Phokion G. Kolaitis, Reinhard Pichler, Emanuel Sallinger, and Vadim Savenkov. Limits of schema mappings. In Wim Martens and Thomas Zeume, editors, *19th International Conference on Database Theory, ICDT 2016, Bordeaux, France, March 15-18, 2016*, volume 48 of *LIPIcs*, pages 19:1–19:17. Schloss Dagstuhl – Leibniz-Zentrum fuer Informatik, 2016. `doi:10.4230/LIPIcs.ICDT.2016.19`.