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Comparing universal covers in polynomial time. (English) [Zbl 1142.68456](#)

Hirsch, Edward A. (ed.) et al., Computer science – theory and applications. Third international computer science symposium in Russia, CSR 2008 Moscow, Russia, June 7–12, 2008. Proceedings. Berlin: Springer (ISBN 978-3-540-79708-1/pbk). Lecture Notes in Computer Science 5010, 158-167 (2008).

Summary: The universal cover T_G of a connected graph G is the unique (possible infinite) tree covering G , i.e., that allows a locally bijective homomorphism from T_G to G . Universal covers have major applications in the area of distributed computing. It is well-known that if a graph G covers a graph H then their universal covers are isomorphic, and that the latter can be tested in polynomial time by checking if G and H share the same degree refinement matrix. We extend this result to locally injective and locally surjective homomorphisms by following a very different approach. Using linear programming techniques we design two polynomial time algorithms that check if there exists a locally injective or a locally surjective homomorphism, respectively, from a universal cover T_G to a universal cover T_H . This way we obtain two heuristics for testing the corresponding locally constrained graph homomorphisms. As a consequence, we have obtained a new polynomial time algorithm for testing (subgraph) isomorphism between universal covers, and for checking if there exists a role assignment (locally surjective homomorphism) from a given tree to an arbitrary fixed graph H .

For the entire collection see [\[Zbl 1136.68005\]](#).

MSC:

- 68R10** Graph theory (including graph drawing) in computer science
- 05C70** Edge subsets with special properties (factorization, matching, partitioning, covering and packing, etc.)
- 05C85** Graph algorithms (graph-theoretic aspects)
- 90C59** Approximation methods and heuristics in mathematical programming

Cited in 1 Review Cited in 2 Documents

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