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Counting homomorphisms modulo prime

A wide range of graph problems can be encoded as questions about the existence or the number of homomorphisms between graphs. The problem of exact counting of graph homomorphisms has been extensively studied. We study the complexity of the related problem of counting homomorphisms from an input graph to a fixed graph H modulo a prime number p . The properties of modular counting may be very different from those of exact counting. However, it was shown that in many cases the two problems have the same complexity. These include counting homomorphisms to square-free graphs modulo 2, and counting homomorphisms to trees modulo an arbitrary prime p . In this talk, we improve upon the previous results by significantly simplifying the existing proofs and classifying the complexity of counting homomorphisms to square-free graphs H modulo an arbitrary prime p provided H has a vertex whose degree is not 1 modulo p .