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Extended formulations and a connection with communication protocols

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Abstact

We give an introduction to extended formulations, which are an important tool in integer programming and combinatorial optimization. Thanks to a celebrated result of Yannakakis, extended formulations are deeply connected with communication complexity, a branch of theoretical computer science, and in particular one can obtain such formulations from communication protocols. This result is constructive, but not efficient. We give a general theorem that, under reasonable assumptions, makes this result efficient. In particular we apply this to Yannakakis' extended formulation for the stable set polytope of perfect graphs, for which, to the best of our knowledge, an efficient construction was previously not known.