Using Hyperstars to Create Facial-Defining Inequalities of General Binary Integer Programs

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Abstract—Theoretical results relating to the facial structure of the general binary integer-programming polytope \( \text{conv}\{x \in \{0, 1\}^n : Ax \leq b\} \) where \( A \in \mathbb{R}^{m \times n} \), and \( b \in \mathbb{R}^m \) are presented. A conflict hypergraph is constructed and some induced hyperstars create valid inequalities of \( P_\text{bip} \). These inequalities are further shown to produce large dimensional faces. Some computational results show the benefit of using hyperstar inequalities for the project allocation problem.

Keywords—Hypergraphs, Hyperstars, Polyhedral theory, Integer programming, Project allocation problem

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