Integral Farkas type Lemmas for systems with equalities and inequalities

Quentin Louveaux, 07/12/2007.

A central result in the theory of integer optimization states that a system of linear diophantine equations $A x = b$ has no integral solution if and only if there exists a vector in the dual lattice, $y^T A$ integral such that $y^T b$ is fractional. We extend this result to systems that both have equations and inequalities \{$A x = b, \ C x \leq d$\}. We show that a certificate of integral infeasibility is a linear system with $\text{rank}(C)$ variables containing no integral point. The result also extends to the mixed integer setting.

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