1145-90-959 **Steffen Borgwardt*** (steffen.borgwardt@ucdenver.edu), University of Colorado Denver, Dep. of Mathematical and Statistical Sciences, 1201 Larimer Street, Suite 4000, Denver, CO 80204, and **Charles Viss**. *A Polyhedral Model for Enumeration and Optimization over the Set of Circuits.*

Circuits play a fundamental role in linear programming. For instance, circuits are used as step directions in various augmentation schemes for solving linear programs, or to leave degenerate vertices in a run of the simplex method. There are significant challenges when implementing these approaches: The set of circuits of a polyhedron may be of exponential size and it is highly sensitive to the representation of the polyhedron.

We devise a universal framework for enumerating the set of circuits, and optimizing over it, for a polyhedron given in any representation: we model a polyhedral set in which the circuits of the original polyhedron are encoded as vertices. Previous methods in the literature assume that a polyhedron is given in standard form; our framework is a direct generalization. We demonstrate its value through proving that a transformation to standard form may introduce exponentially many new circuits.

We then discuss further advantages of the new polyhedral model. It enables the direct enumeration of specific subsets of circuits, as well as optimization over the set of circuits, or a subset thereof. In particular, this leads to the efficient computation of a steepest-descent circuit direction or the construction of a conformal sum with additional properties. (Received September 17, 2018)