ASYMPTOTIC RESURGENCE VIA INTEGRAL CLOSURES AND LINEAR PROGRAMS

MICHAEL DIPASQUALE

Abstract. The symbolic powers of an ideal I, denoted $I^{(s)}$, are an important geometric analogue of taking regular powers. There is significant interest in the *containment problem*; that is studying which pairs (r, s) satisfy that $I^{(s)} \subset I^r$. A celebrated result of Ein,Lazarsfeld, and Smith and Hochster and Huneke states that $I^{(hr)} \subset I^r$ if I is an ideal with big height h in a regular ring. In an effort to quantify these containment results more precisely, the notions of resurgence and asymptotic resurgence of an ideal were introduced by Bocci and Harbourne and Guardo, Harbourne, and Van Tuyl. We show that the asymptotic resurgence of an ideal can be computed using integral closures, which leads to a characterization of asymptotic resurgence as the maximum of finitely many Waldschmidt-like constants. For monomial ideals these constants can be computed by solving linear programs over the symbolic polyhedron introduced by Cooper, Embree, Ha, and Hoefel. This makes it reasonable to compute the asymptotic resurgence of many monomial ideals, leading to some interesting examples related to combinatorial optimization where asymptotic resurgence and resurgence are different. This is joint work with Chris Francisco, Jeff Mermin, and Jay Schweig.