The accumulation points of threefold canonical thresholds

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Abstract

In this talk, we will briefly introduce the minimal model program and Sarkisov program. Then, we move to the study the set of 3-fold canonical thresholds. The following is my main result:

If $k \geq 2$ is a positive integer and $\mathrm{ct}(X, S)$ is a threefold canonical threshold with $\frac{1}{k} < \mathrm{ct}(X, S) < \frac{1}{k-1}$ where S is a Q-Cartier prime divisor of a projective 3-fold X, then we conclude that the numerator of the difference $\mathrm{ct}(X, S) - \frac{1}{k}$ has an upper bound in terms of k provided that the numerator of rational number $\mathrm{ct}(X, S)$ is large. More precisely, if a, m, p, q are positive integers such that $\mathrm{ct}(X, S) = \frac{a}{m} = \frac{1}{k} + \frac{q}{p}$, we obtain $q \leq 6k^2$ when $a \geq 18k^3(2k + 1)$. In particular, $\frac{1}{k}$ is the unique accumulation point of the set of 3-fold canonical thresholds in the open interval $(\frac{1}{k}, \frac{1}{k-1})$. This implies the ascending chain condition for the set of canonical thresholds in dimension 3.

The argument relies on the classification of divisorial contractions that contract divisors to points in dimension 3 by several works of Kawamata, Hayakawa and Kawakita and Yamamoto.