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Asymptotic resolution of a question of Plesník

Fix $d \geq 3$. We show the existence of a constant $c > 0$ such that any graph of diameter at most d has average distance at most $d - c \frac{d^{3/2}}{\sqrt{n}}$, where n is the number of vertices. Moreover, we exhibit graphs certifying sharpness of this bound up to the choice of c . This constitutes an asymptotic solution to a longstanding open problem of Plesník. Furthermore we solve that open problem of Plesník exactly for digraphs in case the order is large compared with the diameter.