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COMPUTATIONAL COMPLEXITY OF THE VERTEX COVER PROBLEM IN THE CLASS OF PLANAR TRIANGULATIONS

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We study the computational complexity of the vertex cover problem in the class of planar graphs (planar triangulations) admitting a planar representation whose faces are triangles. It is shown that the problem is strongly NP-hard in the class of 4-connected planar triangulations in which the degrees of all vertices are of order $O(\log n)$, where n is the number of vertices, and in the class of planar 4-connected Delaunay triangulations based on the Minkowski triangular distance. A pair of vertices in such a triangulation is adjacent if and only if there is an equilateral triangle $\nabla(p, \lambda)$ with $p \in \mathbb{R}^2$ and $\lambda > 0$ whose interior does not contain triangulation vertices and whose boundary contains this pair of vertices and only it, where $\nabla(p, \lambda) = p + \lambda\nabla = \{x \in \mathbb{R}^2 \colon x = p + \lambda a,\ a \in \nabla\}$; here, ∇ is the equilateral triangle with unit sides such that its barycenter is the origin and one of the vertices belongs to the negative y-axis.

Keywords: computational complexity, Delaunay triangulation, Delaunay TD-triangulation.

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