Problems Column

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COLORING OF $G^2 \setminus G$, FOR EUCLIDESIAN GRAPH G

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The problem appeared in telecommunication.
Graph $G = (V(G), E(G))$ is called *Euclidean* if and only if $V(G)$ is a finite subset of R^2 and $\{x, y\} \in E(G)$ if and only if $dist(x, y) \leq d$, where $d \in R$ is fixed. Let $S(G) = G^2 \setminus G$ e.g. The vertex set of $S(G)$ is $V(G)$ and there is an edge $\{x, y\}$ in $E(S(G))$ if and only if $\{x, y\} \notin E(G)$ and x, y have a common neighbor in G. We consider vertex coloring of the graphs $S(G)$, where G are Euclidean.

Problem 1. *Is there a polynomial algorithm, which gives the chromatic number of $S(G)$ for Euclidean graph G.*

The problem appeared in telecommunication. In practical applications standard approximate algorithms are used, but they do not use the geometric properties of $S(G)$ and they seem not to be the most effective.

For geometric reasons $\chi(S(G)) \leq 12$, where G is Euclidean, but on other hand it is difficulty to find Euclidean graph G such that $\chi(S(G)) > 6$.

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