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# A NOTE ON SMALL DIRECTED GRAPHS AS NEIGHBORHOOD GRAPHS

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Let $G$ be a directed graph, let $v$ be its vertex. By $N_G(v)$, [1] denoted the subgraph of $G$ induced by the set of all terminal vertices of edges of $G$ whose initial vertex is $v$. The graph $N_G(v)$ will be called the neighborhood graph of $v$ in $G$.

In [1], $\mathcal{H}$ denotes the class of all digraphs $H$ with the property that there exists a digraph $G$ such that $N_G(v) \simeq H$ for each vertex $v$ of $G$. [1] studied digraphs which belong to $\mathcal{H}$ and have at most three vertices. In this note we will make some corrections.

In [1], before formulating his theorem Zelinka introduced an auxiliary concept. Let $m$, $n$ be positive integers. He denoted $V(m,n)$ to be the set of all $n$-dimensional vectors $(v_1, \ldots, v_n)$ where $v_i \in \{0, 1, \ldots, m-1\}$ for $i = 1, 2, \ldots, n$. If we perform additions or subtractions with coordinates of these vectors, we consider them modulo $m$.

Zelinka in [1] stated the following theorem and proved it. His proof is very nice and correct, except in some cases it needs correction:

**Theorem.** *Let $H$ be a directed graph with at most three vertices. Then $H \in \mathcal{H}$ if and only if the number of double edges of $H$ is not 2.*

Comments or Corrections. The proof of this theorem requires the following corrections:

The graph $G$ for $H_i$ will be denoted by $G_i$ for $i = 1, 2, \ldots, 14$.

In $G_4$ the corresponding $H_4$ should be the following graph (see Fig. 1):

The graph $G_7$ should be the following graph, corresponding to $H_7$ (see Fig. 2):

In $G_9$ the corresponding $H_i$ should be $H_{10}$ and in $G_{10}$, the corresponding $H_i$ should be $H_9$.

The graph $G_{11}$ should be the following corresponding to $H_{11}$ (see Fig. 3):

$H_4$

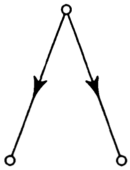

Fig. 1

$G_7$

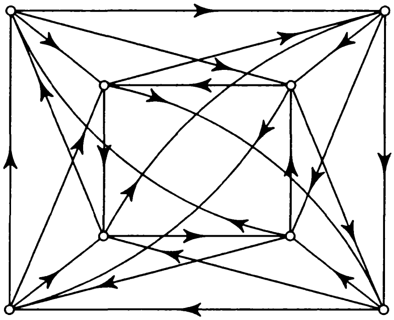

Fig. 2

$G_{11}$

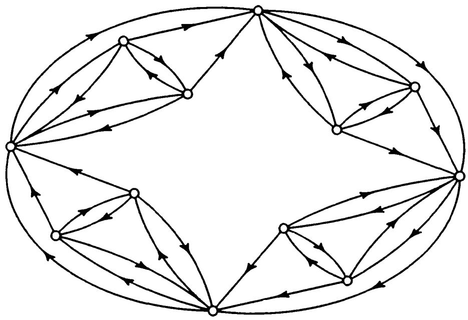

Fig. 3

The graph $G_{13}$ should be a complete directed graph of five vertices; deleting the edges of a directed Hamiltonian cycle.

*References*

[1] *Zelinka, B.*: Small directed graphs as neighborhood graphs. Czech. Math. J. *38 (113)* (1988).

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