On Mycielskians of digraphs

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Let D be a digraph on vertices $v_1, \ldots, v_n$. The *Mycielskian* of D, denoted $M(D)$, is obtained from D by adding an independent set of vertices $V' = \{v'_1, \ldots, v'_n\}$ and one extra vertex x. For every arc (v_i, v_j) of D, the arcs (v_i, v'_j) and (v'_i, v_j) are added, and finally arcs from x to all vertices of V' are included. In a natural way, a sequence of digraphs $\{M_p(D)\}_{p \geq 0}$ is defined by $M_0(D) = D$, $M_1(D) = M(D)$, and $M_p(D) = M(M_{p-1}(D))$ for $p \geq 2$, where $M_p(D)$ is called the *p-th Mycielskian* of D.

For a digraph D, a set S of arcs is a *feedback arc set* if $D - S$ is acyclic, and the minimum size of such a set is denoted by $\tau_1(D)$. In this talk we focus on the parameter $\tau_1(M_p(D))$, as well as on the maximum number of arc-disjoint directed cycles in $M_p(D)$, denoted by $\nu_1(M_p(D))$, which is closely related to $\tau_1(M_p(D))$.

References

[1] B. Csonka, G. Simonyi, Shannon capacity, Lovász theta number and the Mycielski construction, *IEEE Trans. Inform. Theory* 2024 pp. 7632–7646.