

Accepted Manuscript

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PII: S0304-3975(17)30409-7
DOI: <http://dx.doi.org/10.1016/j.tcs.2017.05.010>
Reference: TCS 11175

To appear in: *Theoretical Computer Science*

Received date: 16 January 2016
Revised date: 13 May 2017
Accepted date: 15 May 2017

Please cite this article in press as: C.V.G.C. Lima et al., Generalized threshold processes on graphs, *Theoret. Comput. Sci.* (2017), <http://dx.doi.org/10.1016/j.tcs.2017.05.010>

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Generalized Threshold Processes on Graphs

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Abstract

We consider an iterative irreversible process on graphs. Starting with some initial set S of vertices of a given graph G , this process iteratively adds to S all vertices u of G outside of S for which the intersection of the current set S with the neighborhood $N_G(u)$ of u in G belongs to a collection $\tau(u)$ of subsets of $N_G(u)$ given for each vertex u .

Inspired by discrete convexity notions, we study the corresponding interval number, where only one iteration is executed, and the hull number, where the number of iterations is unbounded. Special choices of the function τ allow to include several well studied graph processes and parameters within this framework.

Our contributions comprise hardness results for very restricted cases, linear time algorithms for trees, and a probabilistic upper bound.

Keywords: Irreversible Threshold Processes · Target Set · Dynamic Monopoly

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