

DISTRIBUTED DISCRETE EVACUATION IN GRAPHS WITH MULTIPLE EXITS

PIOTR BOROWIECKI

University of Zielona Góra

e-mail: p.borowiecki@issi.uz.zgora.pl

DARIUSZ DERENIOWSKI

Gdańsk University of Technology

e-mail: darderen@pg.edu.pl

ŁUKASZ KUSZNER

University of Gdańsk

e-mail: lukasz.kuszner@ug.edu.pl

In the *distributed discrete evacuation* problem, agents know the network topology and designated exit nodes but do not know the number or initial positions of other agents. Operating with local communication, the agents aim to minimize the time when the last agent reaches an exit.

We adopt the model of [1]. The input is a finite, simple, undirected graph $G = (V, E)$ with the vertex set V , the edge set E , and two distinguished nonempty vertex subsets H and X , called *homebases* and *exits*, respectively. Initially, each of the k agents resides in one of the homebases in H such that no two agents occupy the same homebase (i.e., $|H| = k$ and $H \cap X = \emptyset$). Each agent a priori knows the graph, the set X of exits, and its current position. However, no agent knows k or the set H of homebases.

The model is synchronous, i.e., the time taken by the evacuation process is divided into *steps* of unit duration. In each step, each agent first communicates with the other agents, then performs local computations, and finally decides on its action.

We present an overview of recent results [2] and open problems.

References

- [1] Piotr Borowiecki, Shantanu Das, Dariusz Dereniowski, Łukasz Kuszner, Distributed evacuation in graphs with multiple exits. In SIROCCO 2016, pp. 228–241.
- [2] Piotr Borowiecki, Dariusz Dereniowski, Łukasz Kuszner, A framework for distributed discrete evacuation strategies. arXiv:2504.14052 (2025).