# Exploration and Rendezvous in Temporal Graphs

**Thomas Erlebach**
Department of Computer Science, Durham University, Durham, UK

## Abstract

Given a temporal graph $\mathcal{G}$ and a start vertex $v$ in $\mathcal{G}$, the temporal exploration problem (TEXP) is the problem of determining a temporal walk that starts at $v$ and visits all vertices of $\mathcal{G}$, with the objective of minimizing the time when the last unvisited vertex is reached. Studies have investigated the (parameterized) complexity and approximability of TEXP and the worst-case number of time steps required to complete an exploration. While many upper and lower bounds have been obtained for different settings, there are still some large gaps that pose interesting open problems. In this talk, we will give an overview of known results and techniques as well as open problems. Furthermore, we will discuss recent results (from joint work with Konstantinos Dogeas, Frank Kammer, Johannes Meintrup, and William K. Moses Jr) about exploiting symmetries in temporal graphs to get faster exploration. We view the number of automorphism orbits of the temporal graph as a new parameter, termed the orbit number, that may also be useful in other contexts. Finally, we show how a subroutine for quickly exploring a single orbit of the graph can be exploited to solve a certain rendezvous problem with two agents using a near-linear number of time steps in every always-connected temporal graph.

**2012 ACM Subject Classification** Theory of computation → Graph algorithms analysis; Mathematics of computing → Discrete mathematics

**Keywords and phrases** Dynamic graphs, parameterized algorithms, orbit number

**Digital Object Identifier** 10.4230/LIPIcs.SAND.2024.1

**Category** Invited Talk

© Thomas Erlebach;
licensed under Creative Commons License CC-BY 4.0
3rd Symposium on Algorithmic Foundations of Dynamic Networks (SAND 2024).
Editors: Arnaud Casteigts and Fabian Kuhn; Article No. 1; pp. 1:1–1:1

Leibniz International Proceedings in Informatics
Schloss Dagstuhl – Leibniz-Zentrum für Informatik, Dagstuhl Publishing, Germany