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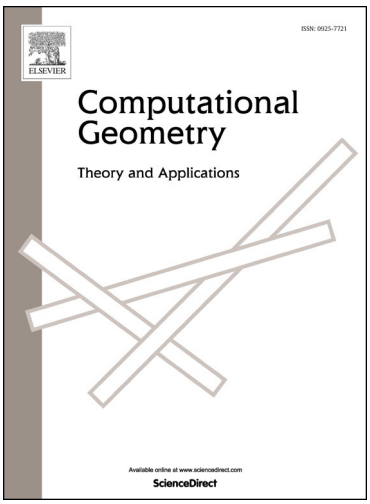

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Anna Lubiw, Jack Snoeyink, Hamideh Vosoughpour

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Visibility Graphs, Dismantlability, and the Cops and Robbers Game

Anna Lubiw* Jack Snoeyink† Hamideh Vosoughpour*

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Abstract

We study versions of cop and robber pursuit-evasion games on the visibility graphs of polygons, and inside polygons with straight and curved sides. Each player has full information about the other player's location, players take turns, and the robber is captured when the cop arrives at the same point as the robber. In visibility graphs we show the cop can always win because visibility graphs are *dismantlable*, which is interesting as one of the few results relating visibility graphs to other known graph classes. We extend this to show that the cop wins games in which players move along straight line segments inside any polygon and, more generally, inside any simply connected planar region with a reasonable boundary. Essentially, our problem is a type of pursuit-evasion using the link metric rather than the Euclidean metric, and our result provides an interesting class of infinite cop-win graphs.

1 Introduction

Pursuit-evasion games have a rich history both for their mathematical interest and because of applications in surveillance, search-and-rescue, and mobile robotics. In pursuit-evasion games one player, called the "evader," tries to avoid capture by "pursuers" as all players move in some domain. There are many game versions, depending on whether the domain is discrete or continuous, what information the players have, and how the players move—taking turns, moving with bounded speed, etc.

This paper is about the "cops and robbers game," a discrete version played on a graph, that was first introduced in 1983 by Nowakowski and Winkler [25], and Quilliot [26]. The cop and robber are located at vertices of a graph and take turns moving along edges of the graph. The robber is caught when a cop moves to the vertex the robber is on. The standard assumption is that both players have full information about the graph and the other player's

*Cheriton School of Computer Science, University of Waterloo, Waterloo ON, N2L 3G1, Canada. {alubiw, hvosough}@uwaterloo.ca

†Department of Computer Science, University of North Carolina, NC, USA. snoeyink@cs.unc.edu