1 Product Structure of Bounded Degree Planar Graphs

1.1 Introduction

The usage of product structure theory to study planar graphs has been a very active area of research since Dujmovic et al first showed that planar graphs have bounded queue number using product structure theory [**?**]. Since then, this result has gone on to lead to improvements in graph colouring[], adjacency labelling[], and more. These results have pushed additional interest into the research of product structure theorems for other graph classes and for more specialized ones. In particular, we focus on bounded-degree planar graphs in hopes of improving the product structure theorem for this highly applicable graph class.

1.2 Problem 3

Given a planar graph G with maximum degree Δ, is it true that G is contained in the product

$$H \boxtimes P \boxtimes K_c$$

for a graph H with treewidth 3, a path P, and the complete graph K_c where c is bounded by some function of Δ?

1.3 Related Work

This problem looks to tighten the bound on $\text{tw}(H)$ to close the bound on the product structure of bounded-degree planar graphs. The problem was initially shown to be true for $\text{tw}(H) = 3$ by Dujmovic et al in the same paper that the general planar graph product structure theorem was proven[**?**].It was then shown that the case for $\text{tw}(H) = 1$ is false[**?**], the proof of which relies on. Tightening this bound would immediately improve results in [].

References