

The thickness of the Kronecker product of graphs*

Xia Guo 

School of Mathematical Sciences, Xiamen University, Xiamen, P. R. China

Yan Yang † 

School of Mathematics, Tianjin University, Tianjin, P. R. China

Received 7 May 2019, accepted 10 May 2020, published online 22 October 2020

Abstract

The thickness of a graph G is the minimum number of planar subgraphs whose union is G . In this paper, we present sharp lower and upper bounds for the thickness of the Kronecker product $G \times H$ of two graphs G and H . We also give the exact thickness numbers for the Kronecker product graphs $K_n \times K_2$, $K_{m,n} \times K_2$ and $K_{n,n,n} \times K_2$.

Keywords: Thickness, Kronecker product graph, planar decomposition.

Math. Subj. Class.: 05C10

*Supported by the National Natural Science Foundation of China under Grant No. 11401430. The authors are grateful to Bojan Mohar for helpful comments after the second author gave a talk on this topic in Beijing, March 2019. Especially, Bojan Mohar helped us to state the upper bound in Theorem 2.1 in an improved form. The authors also thank the referees for their helpful comments and suggestions.

†Corresponding author.

E-mail addresses: guoxia@stu.xmu.edu.cn (Xia Guo), yanyang@tju.edu.cn (Yan Yang)

Debelina Kroneckerjevega produkta grafov*

Xia Guo 

School of Mathematical Sciences, Xiamen University, Xiamen, P. R. China

Yan Yang [†] 

School of Mathematics, Tianjin University, Tianjin, P. R. China

Prejeto 7. maja 2019, sprejeto 10. maja 2020, objavljeno na spletu 22. oktobra 2020

Povzetek

Debelina grafa G je najmanjše število njegovih ravninskih podgrafov, katerih unija je G . V tem članku določimo ostro spodnjo in ostro zgornjo mejo za debelino Kroneckerjevega produkta $G \times H$ dveh grafov G in H . Natančno določimo tudi debeline Kroneckerjevega produkta grafov $K_n \times K_2$, $K_{m,n} \times K_2$ in $K_{n,n,n} \times K_2$.

Ključne besede: Debelina, Kroneckerjev produkt grafov, ravninska razgradnja.

Math. Subj. Class.: 05C10

*Podprto s strani National Natural Science Foundation of China z dotacijo št. 11401430. Avtorja sta hvaležna Bojanu Moharju za koristne pripombe, ki jih je dal potem, ko je drugi avtor govoril o tej temi v Pekingu marca 2019. Posebej nama je Bojan Mohar pomagal bolje oblikovati zgornjo mejo v Izreku 2.1. Avtorja se želita zahvaliti tudi recenzentom za njihove koristne predloge in pripombe.

[†]Kontaktni avtor.

E-poštna naslova: guoxia@stu.xmu.edu.cn (Xia Guo), yanyang@tju.edu.cn (Yan Yang)