Shortness Coefficient of Cyclically 4-Edge-Connected Cubic Graphs

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The shortness coefficient of a class of graphs is the limit of the infimum over all graphs in the class of the ratio of the length of the longest cycle in such a graph and the number of vertices in that graph.

Grünbaum and Malkevitch proved that the shortness coefficient of cyclically 4-edge-connected cubic planar graphs is at most $\frac{76}{77}$. Recently, this was improved to $\frac{359}{366}(< \frac{52}{53})$ and the question was raised whether this can be strengthened to $\frac{41}{42}$, a natural bound inferred from one of the Faulkner-Younger graphs. We prove that the shortness coefficient of cyclically 4-edge-connected cubic planar graphs is at most $\frac{37}{38}$. We also show that $\frac{45}{46}$ is an upper bound for the shortness coefficient of cyclically 4-edge-connected cubic graphs that are (i) planar with face lengths bounded above by some constant larger than 22, or (ii) of genus g for any prescribed $g \geq 0$. Finally, for the shortness coefficient of general cyclically 4-edge-connected cubic graphs we prove a theorem that implies the recently given upper bound $\frac{7}{8}$ of Máčajová and Mazák.

This is joint work with On-Hei S. Lo, Jens M. Schmidt, and Carol T. Zamfirescu.

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