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On the multi-colored Ramsey numbers of cycles. (English) Zbl 1242.05174

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Summary: For a graph $L$ and an integer $k \geq 2$, $R_k(L)$ denotes the smallest integer $N$ for which for any edge-coloring of the complete graph $K_N$ by $k$ colors there exists a color $i$ for which the corresponding color class contains $L$ as a subgraph.

J. A. Bondy and P. Erdős [J. Comb. Theory, Ser. B 14, 46-54 (1973; Zbl 0248.05127)] conjectured that, for an odd cycle $C_n$ on $n$ vertices,

$$R_k(C_n) = 2^{k-1}(n-1) + 1 \quad \text{for } n > 3.$$  

They proved the case when $k = 2$ and also provided an upper bound $R_k(C_n) \leq (k+2)!n$. Recently, this conjecture has been verified for $k = 3$ if $n$ is large. In this note, we prove that for every integer $k \geq 4$,

$$R_k(C_n) \leq k2A_k n + o(n) \quad \text{as } n \to \infty.$$  

When $n$ is even, Y. Sun, Y. Yang, F. Xu and B. Li [Graphs Comb. 22, No. 2, 283-288 (2006; Zbl 1099.05062)] gave a construction, showing that $R_k(C_n + n) \geq (k-1)n - 2k + 4$. Here we prove that if $n$ is even, then

$$R_k(C_n) \leq kn + o(n) \quad \text{as } n \to \infty.$$  

MSC:

05C55 Generalized Ramsey theory
05C38 Paths and cycles
05C15 Coloring of graphs and hypergraphs

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edge-coloring; color class

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References:

[9] Y. Kohayakawa M. Simonovits J. Skokan The 3-colored Ramsey number of odd cycles · Zbl 1203.05100


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