

## On list backbone coloring of graphs

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Let  $H$  be a subgraph of  $G$  in a graph pair  $(G, H)$ . A backbone  $k$ -coloring for  $(G, H)$  is a proper coloring of  $G$  by the set of colors  $\{1, 2, \dots, k\}$ , adding a condition that colors assigned to adjacent vertices in  $H$  must differ by at least two. Let  $\chi_{BB}(G, H)$  be the smallest integer  $k$  for which  $(G, H)$  has a backbone  $k$ -coloring. A  $k$ -assignment  $L$  of  $G$  is a list assignment  $L$  with  $|L(v)| = k$  for each vertex  $v$ . If there is a backbone coloring  $c$  of  $G$  such that  $c(v) \in L(v)$ , then  $(G, H)$  is backbone  $L$ -colorable. Let  $ch_{BB}(G, H)$  be the smallest integer  $k$  such that  $G$  is backbone  $L$ -colorable for each  $k$ -assignment  $L$ . We show that  $ch_{BB}(G, T) = 5$  for each Halin graph  $G = T \cup C$ . Furthermore, we have that if  $L$  is a 4-assignment for a connected graph  $G$  which is outerplanar or with the maximum average degree less than  $\frac{8}{3}$ , then there is a spanning tree  $T$  of  $G$  such that  $(G, T)$  is backbone  $L$ -colorable.

Keywords: List backbone coloring, Halin graph, Maximum average degree, Outerplanar graph