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On colouring graphs from lists inducing no triangles

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We shall discuss an observation that Bernshteyn's proof [2] of the breakthrough result of Molloy [3] that triangle-free graphs are choosable from lists of size $(1+o(1))\Delta/\log\Delta$ can be adapted to yield a stronger result. In particular, one may prove that such list sizes are sufficient to colour any graph of maximum degree Δ provided that vertices sharing a common colour in their lists do not induce a triangle in G, which encompasses all cases covered by Molloy's theorem. This was thus far known to be true for lists of size $(1000+o(1))\Delta/\log\Delta$, as implies a more general result due to Amini and Reed [1]. In the same vein, it can also proven that lists of length $2(r-2)\Delta\log_2\log_2\Delta/\log_2\Delta$ are sufficient if one replaces the triangle by any K_r with $r\geqslant 4$, which pushes slightly the multiplicative factor of $200r$ from Bernshteyn's result [2] down to $2(r-2)$. All bounds mentioned are also valid within the more general setting of correspondence colourings.

[1] O. Amini, B. Reed, List Colouring Constants of Triangle Free Graphs, Electronic Notes in Discrete Mathematics 30 (2008) 135–140.

[2] A. Bernshteyn, The Johansson-Molloy theorem for DP-coloring, Random Struct. Alg. 54 (2019) 653–664.

[3] M. Molloy, The list chromatic number of graphs with small clique number, J. Combin. Theory Ser. B 134 (2019) 264–284.

[4] J. Przybyło, On triangle-free list assignments, arXiv:2203.02980.