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(hehuiwu2@illinois.edu), Department of Mathematics, University of Illinois at

Urbana-Champaign, 1409 W Green Street, Urbana, IL 61801, and Xuding Zhu. Decomposition of

sparse graphs using forests and a graph with bounded degree.

From the Matroid Union Theorem by Edmonds and Nash-Willams, the Tree Packing Theorem will immediately follow: a graph decomposes into k forests if and only if the arboricity $\max_{H\subseteq G}\lceil |E(H)|/(|V(H)|-1)\rceil$ is at most k. We consider the fractional arboricity $\max_{H\subseteq G}\frac{|E(H)|}{|V(H)|-1}$. The Nine Dragon Tree(NDT) Conjecture, posted by Montassier et al., states that if the fractional arboricity of a graph is at most $k+\frac{d}{k+d+1}$, then the graph decomposes into k+1 forests, with one of them having maximum degree at most d.

For $d \ge k+1$, we prove a sharp sparseness condition for decomposability into k forests and a graph having maximum degree at most d. Consequences are that every graph with fractional arboricity at most k+d/(k+d+1) has such a decomposition. For $d \le k+1$, we prove that every graph with fractional arboricity at most k+d/(2k+2) decomposes into k+1 forests, with one of them having maximum degree at most d. This implies the NDT Conjecture for the case d=k+1. Also, for k=1, we prove that the NDT Conjecture is true for $d \le 6$. (Received September 19, 2010)