A DSD COUNT SORT

On the unweighted graph, first we calculate the degree of all nodes and sort them by *Count Sort*. In other words, we record 0-d_{max} vertex set of each degree, and update the degrees of remaining nodes and these vertex sets after each iteration. In each round of scanning, we only need to scan all the sets in the range of $[\lfloor LowBound_1 \rfloor, \lceil LowBound_2 - 1 \rceil]$, which are exactly the nodes to be deleted in the next iteration. $LowBound_1$ is the bound before updating $\rho(\mathcal{H})$ while $LowBound_2$ is the bound after updating $\rho(\mathcal{H})$. Although nodes with degree less than $LowBound_1$ will appear after deleting nodes in each iteration, we can just put them into the set $\lfloor LowBound_1 \rfloor$. Throughout the process, we check all the nodes sets in the range of $[0, d_{max}]$ and only repeat searching $\lfloor LowBound_1 \rfloor$ T times. It is obvious to know d_{max} and T are both lower than N. So the time complexity of checking node set of each degree is $O(N)$ on unweighted graph. Therefore, the time complexity of BoundCut on unweighted graph is $O(M + N)$. On the weighted graph, after each iteration, we have to traverse the remaining nodes to find the nodes that can be deleted in the next iteration. Then the time complexity of BoundCut on an unweighted graph is $O(M + TN)$, where T is the number of iterations until it stops.

Table 5: Dataset source and density of algorithms:(a)boudncut(w_BoundCut,uw_BoundCut).(b)approximation algorihtms on weighted graph(fraudar,BoundCut+fraudar,wgreedy++)(c)exact algorithms(maxflow,BoundCut+maxflow)(d)uw_greedy++ (e)BoundCut+uw_greedy++

Dataset	Source	Type	BoundCut	app	exact	uw_greedy++	b+g
ca-HepPh	Stanford's SNAP database	scholar collaboration network	119	119	119	119	119
comm-EmailEnron	Stanford's SNAP database	communication	37.316	37.344	37.344	37.337	37.337
ca-AstroPh	Stanford's SNAP database	scholar collaboration network	28.481	29.616	32.11	29.552	29.552
PP-Pathways	Stanford's SNAP database	protein interaction network	74.159	77.995	77.995	77.995	77.995
soc-Twitter_ICWSM	konect	social network	25.678	25.683	25.69	25.686	25.685
soc-sign_slashdot	Stanford's SNAP database	social network	39.376	42.132	42.132	42.132	42.132
rating-StackOverflow	konect	social network	20.209	20.209	20.21	20.209	20.209
soc-sign_epinion	Stanford's SNAP database	social network	80.168	85.599	85.637	85.589	85.589
ego-twitter	Stanford's SNAP database	social network	59.281	68.414	69.622	68.414	68.414
soc-Youtube	Stanford's SNAP database	social network	45.545	45.58	45.599	45.576	45.577
comm-WikiTalk	Stanford's SNAP database	communication	114.139	114.139	114.139	114.139	114.139
nov_user_msg_time	We own it privately.	social network	278.815	278.815	278.815	278.815	278.815
cit-Patents	AMiner scholar datasets	scholar collaboration network	132.776	135.706	137.261	135.706	135.706
soc-Twitter_ASU	ASU	social network	593.847	593.847	593.847	593.847	593.847
soc-Livejournal	Livejournal	social network	104.596	104.601	104.609	104.603	104.603
soc-Orkut	Stanford's SNAP database	social network	227.861	227.872	227.874	227.872	227.872
soc-SinaWeibo	Network Repository	social network	164.967	165.193	165.415	165.196	165.191
follower-twitter	konect	social network	1558.5	1643.3	1643.3	1643.3	1643.3
wang-tripadvisor	konect	rating network	13.442	13.873	14.082	–	–
rec-YelpUserBusiness	Network Repository	rating network	87.825	87.912	87.921	–	–
bookcrossing	konect	rating network	92.148	92.322	92.374	–	–
librec-ciaodvd-review	konect	rating network	233.553	233.59	233.597	–	–
movielens-10m	konect	rating network	1351.35	1351.35	1351.35	–	–
epinions	konect	rating network	595.302	595.314	595.316	–	–
libimseti	konect	social network	1645.71	1645.73	1645.73	–	–
rec-movielens	Network Repository	rating network	1801.16	1801.16	1801.16	–	–
yahoo-song	konect	rating network	46725.2	46725.2	46725.2	–	–