Date

BIG NODE

- Definitions:

  L = Set of all nodes whose core value $\geq \Theta$.

  S = Set of all nodes not in L.

- Invariant:

  Maximum core value of any node is $= \Theta$.

- Case 1: $u \in L, v \in L$, Insertion

[MCD(u)++ ; MCD(v)++ ;]

Since insertion of an edge cannot decrease any node's core value. So, no node from L can go to S. Hence, L remains same.

- Case 2: $u \in L, v \in L$, Deletion

~~(i)~~ [MCD(u)-- ; MCD(v)-- ;]

(i) If $MCD(u) \geq \Theta$ then nothing.

Since, after deletion of an edge $MCD(u) \geq \Theta$ means that it has more than equal to Θ neighbors whose core value is $\geq \Theta$. So, core value of $u = \Theta$.

Hence, L remains same.

(ii) If $MCD(u) < \Theta$ then run my algo. Argument 1. Argument 2.

- Argument 1: Any node whose true core value is Θ then MCD of that node is also true because any neighbor with true core value $> \Theta$ contributes exactly equal to any neighbor with Θ core value. Since, MCD is true algorithm will update them correctly.

- Argument 2: Any node whose true core value $> \Theta$. Then after algorithm terminates, true MCD $\leq$ MCD. Since, true MCD $\geq \Theta$. So, MCD $\geq \Theta$. So, this node will not have its core value decreased by algorithm.

- Case 3: $u \in S$, $v \in S$, Insertion

(i) If $\min(k(u), k(v)) = \theta$ then $MCD(u)$++; $MCD(v)$++;
Same argument as in case 1.

(ii) If $\min(k(u), k(v)) < \theta$ then run my algo.
Since, no node whose core value $\geq \theta$ is involved, my algorithm will give correct core value updates.

- Case 4: $u \in S$, $v \in S$, Deletion

(i) If $\min(k(u), k(v)) < \theta$ then run my algo.
Same argument as Case 3 (ii)

(ii) If $\min(k(u), k(v)) = \theta$ then run my algo.
Argument 1. Argument 2.

- Case 5: $u \in S$, $v \in L$, Insertion

(i) If $k(u) = \theta$ then $MCD(u)$++; $MCD(v)$++;
Same argument as in Case 1.

(ii) If $k(u) < \theta$ then run my algo.
Same argument as in Case 3 (ii)

- Case 6: $u \in S$, $v \in L$, Deletion

(i) If $k(u) < \theta$ then run my algo. Same argument as in Case 3 (ii).

(ii) If $k(u) = \theta$ then run my algo.
Argument 1. Argument 2.