CN Quiz2

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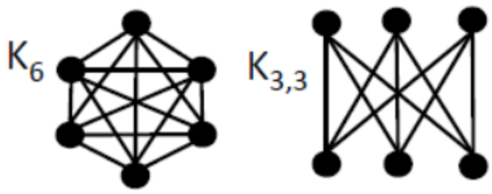
1. Write pros and cons of "edge list" and "adjacency matrix".

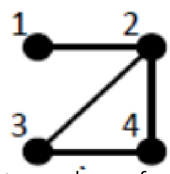
	pros	cons
edge list	1. Simple constructions 2. Saving memory space (<N^2)	1. Difficult to tell where is a edge. 2. Have to list all the nodes to check the edges. 3. Not that easy to add/delete and edge.
adjacency matrix	1. Easy to judge whether there is an edge between two nodes. 2. Fast access time to check an edge. 3. Easy to add/delete an edge.	1. Difficult constructions 2.Waste of memory space when the graph is sparse. O(N^2)

2. Are these planar? Why?



K_6: It is NOT a planar network because it cannot be turned into without having edges cross. The graph can be made from K_5 by adding a node which connected to other 5 nodes, so we can say it is an expansion of K_5, which is definitely not a planar.

$K_{3,3}$: This is also NOT a planar network, because $K_{3,3}$ has the same nodes and edges like graph UG (shown in slides). It's just a transformation of UG, so according to Kuratowski's theorem, it is not a planar.



$$A = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{pmatrix}$$

3. Compute mean degree, density and L_3 of the right net:

Since $\sum_{i=1}^{n} k_i = 2m$, we can easily know from the graph that number of edges m=4,

So, we can calculate mean degree: $c = \frac{1}{4}\sum_{i=1}^{4} ki = \frac{8}{4} = 2$

After that we can get the density $\rho = \frac{2m}{n(n-1)} = \frac{2}{3}$

We need A^3 to calculate L_3: $A^3 = \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}^3 = \begin{bmatrix} 0 & 3 & 1 & 1 \\ 3 & 2 & 4 & 4 \\ 1 & 4 & 2 & 3 \\ 1 & 4 & 3 & 2 \end{bmatrix}$

At last, we can get L_3 according to : $L_3 = \sum_{i=1}^{n} [A^3]_{ii} = 0 + 2 + 2 + 2 = 6$