Bipartite Perfect Matching is in quasi-NC

Bipartite, a graph theory with ‘n’ nodes and ‘m’ edges is used to depict perfect matching. A matching in G is a set M<=E such that each ‘v’ belongs to ‘V’ incident to atmost one ‘e’ belongs to ‘M’

For perfect matching: in G is a set M<=E such that each ‘v’ belongs to ‘V’ incident to exaclty one ‘e’ belongs to ‘M’

Algorithms for Perfect Matching & Search Perfect Matching:

- ➔ A fast randomised parallel algorithm (RNC) for perfect matching.
- ➔ An RNC algorithm for search PM.
- ➔ Another RNC algorithm using isolation lemma.

A randomised algorithm can be aligned on a computer for fast and huge number of nodes. The operations need not be perfect but for the samples that fit in will do. But our algorithm is un-randomised. NC is the class of problem with uniform polynomial size circuits with poly-logarithmic depth. For poly-logarithmic depth circuit solving perfect matching, nothing better than exponential size was known. Deterministic parallel algorithm is used for non-randomised samples. K33 free graphs is used for those sample with exponentially many perfect matching’s. Planar bipartite graph is only on a plane. Bipartite perfect matching and search perfect matching are a type of general case in quasi NC. Search PM on bipartite graph have uniform circuits of depth O(log2 n) and size 2 raised to O(log2 n). It should have same number of vertices to get perfect matching.

If given weight G has no PM the det(Aw)=0 for any W. If G have a PM then det(Aw) may still be 0 due to the cancellations. But picking a suitable W can give a non-zero PM. A weight function W is isolating if G has a unique minimum weight PM with respect to W. If W is isolating then det(Aw) is not equal to 0 because the minimum weight term in det(Aw) does not cancel with other term which are strictly higher power of 2. For this purpose we choose smaller weights modulo. We would like to choose a weight function from Wt that gives non zero circulation to as many cycles as possible. We cannot do this for all cycles, so we work in stages starting with short cycles.