COM3105 Advanced Algorithms

Homework 2

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Question *(5 points)*

Given a simple graph $G = (V, E)$ (no loops or multiple edges), consider the following deterministic algorithm:

- start with an arbitrary partition.
- If moving a vertex from one part to the other increases the number of crossing edges, we will move it.
- We do this until there is no such vertex left.

Why does this algorithm terminate?
What can you say about the number of edges crossing when the algorithm terminates?

Answer

Termination of the Algorithm:
The algorithm terminates because at each step, we either find a vertex that can be moved to increase the number of crossing edges, or we reach a point where no such vertex exists. In the latter case, we have found a local optimum with respect to the crossing edges, and the algorithm stops.

Number of Crossing Edges at Termination:
When the algorithm terminates, the number of edges crossing the partition is at a local minimum. However, this does not guarantee that it is the global minimum. The final partition may still have a significant number of crossing edges, depending on the initial configuration and the structure of the graph.
