

On Forward Difference and Computing Surface Areas of Interconnect Networks

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For any node u in a graph G and integer i , the surface area centered at u with distance i is defined to be the number of nodes in G whose distance to u is i . When the graph G is the topology of an interconnection network in parallel computing, the applications of surface areas include computing bounds for certain communication algorithms. We find one approach to finding closed-form solutions to the surface areas using forward differences and use the hypercube to illustrate our method. We then give examples of other interconnection networks that the method applies or may apply, and discuss when the method can be applied. In particular, we give a sufficient condition for when we can apply the method and conjecture that this condition is also a necessary one.

Keywords: graphs, interconnection networks, forward difference, surface area, closed-form solution