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Embedding Incomplete Binary Trees into Incomplete Hypercubes

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Abstract

It has been proved that an incomplete binary tree cannot be embedded into an incomplete hypercube with dilation 1 and expansion 1. By applying some properties of inorder traversal, the authors present an embedding scheme with dilation 2, edge-congestion 2 and expansion ratio (N+1)/N, where N is the number of nodes in an incomplete binary tree. The authors prove that this embedding is optimal under the constraint of expansion ratio (N+1)/N. With this embedding scheme, a method is developed that can be used to simulate a binary tree on an incomplete hypercube effectively. Under the distributed environment, the mapping addresses of neighbouring nodes in an incomplete binary tree can be identified in constant time without repeating the mapping work. Furthermore, experimental results show that this scheme is much better than the corresponding best known dilation 1 embedding scheme in terms of hardware costs and implementation. Even in total time costs (addressing time, computation time and transmission time), this approach is quite competitive.

Key words：Embedding; Incomplete binary tree; Incomplete hypcraibe;

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