Discussiones Mathematicae
Graph Theory 36 (2016) 805–817
doi:10.7151/dmgt.1908

ON THE EDGE-HYPER-HAMILTONIAN LACEABILITY OF BALANCED HYPERCUBES

Jianxiang Cao, Minyong Shi

School of Computer Science
Communication University of China, Beijing, China

e-mail: jxcao@126.com, myshi@cuc.edu.cn

AND

Lihua Feng [1]

School of Mathematics and Statistics
Central South University, Changsha, China

e-mail: fenglh@163.com

Abstract

The balanced hypercube BH_n, defined by Wu and Huang, is a variant of the hypercube network Q_n, and has been proved to have better properties than Q_n with the same number of links and processors. For a bipartite graph $G = (V_0 \cup V_1, E)$, we say G is edge-hyper-Hamiltonian laceable if it is Hamiltonian laceable, and for any vertex $v \in V_i, i \in \{0, 1\}$, any edge $e \in E(G - v)$, there is a Hamiltonian path containing e in $G - v$ between any two vertices of V_{1-i}. In this paper, we prove that BH_n is edge-hyper-Hamiltonian laceable.

Keywords: balanced hypercubes, hyper-Hamiltonian laceability, edge-hyper-Hamiltonian laceability.

2010 Mathematics Subject Classification: 05C38, 94C15.

References

[1] J.A. Bondy and and U.S.R. Murty, Graph Theory with Applications (Macmillan Press, London, 1976).
doi:10.1007/978-1-349-03521-2

[1] Corresponding author.

[2] R.X. Hao, R. Zhang, Y.Q. Feng and J.X. Zhou, *Hamiltonian cycle embedding for fault tolerance in balanced hypercubes*, Appl. Math. Comput. **244** (2014) 447–456. doi:10.1016/j.amc.2014.07.015

[3] S.Y. Hsieh, G.H. Chen and C.W. Ho, *Hamiltonian-laceability of star graphs*, Networks **36** (2000) 225–232. doi:10.1002/1097-0037(200012)36:4⟨225::AID-NET3⟩3.0.CO;2-G

[4] K. Huang and J. Wu, *Area efficient layout of balanced hypercubes*, International Journal of High Speed Electronics and System **6** (1995) 631–646. doi:10.1142/S0129156495000237

[5] K. Huang and J. Wu, *Balanced hypercubes*, in: Proceedings of the 1992 International Conference on Parallel Processing **1** (CRC Press, 1992) 153–159.

[6] M. Lewinter and W. Widulski, *Hyper-Hamilton laceable and caterpillar-spannable product graphs*, Comput. Math. Appl. **34** (1997) 99–104. doi:10.1016/S0898-1221(97)00223-X

[7] H.Z. Lv and H.P. Zhang, *Hyper-Hamiltonian laceability of balanced hypercubes*, Journal of Supercomputing **68** (2014) 302–314. doi:10.1007/s11227-013-1040-6

[8] H.Z. Lv, X. Li and H.P. Zhang, *Matching preclusion for balanced hypercube*, Theoret. Comput. Sci. **465** (2012) 10–20. doi:10.1016/j.tcs.2012.09.020

[9] G.J. Simmons, *Almost all n-dimensional rectangular lattices are Hamiltonian laceable*, in: Proceedings of the 9th Southeastern Conf. on Combinatorics Graph Theory and Computing (Boca Raton, Fla., 1978) 103–108.

[10] D.B. West, Introduction to Graph Theory (Prentice Hall, 2001).

[11] J. Wu and K. Huang, *The Balanced Hypercube: A cube-based system for fault-tolerant applications*, IEEE Trans. Comput. **46** (1997) 484–490. doi:10.1109/12.588063

[12] J. Xu, Topological Structure and Analysis of Interconnection Networks (Kluwer Academic Publishers, Dordrecht, 2001). doi:10.1007/978-1-4757-3387-7

[13] M. Xu, X.D. Hu and J.M. Xu, *Edge-pancyclicity and Hamiltonian laceability of balanced hypercubes*, Appl. Math. Comput. **189** (2007) 1393–1401. doi:10.1016/j.amc.2006.12.036

[14] M.C. Yang, *Bipanconnectivity of balanced hypercubes*, Comput. Math. Appl. **60** (2010) 1859–1867. doi:10.1016/j.camwa.2010.07.016

[15] J.X. Zhou, Z.L. Wu, S.C. Yang and K.W. Yuan, *Symmetric property and reliability of balanced hypercube*, IEEE Trans. Comput. **64** (2015) 876–881. doi:10.1109/TC.2014.2304391

Received 24 June 2015
Revised 5 December 2015
Accepted 5 December 2015