Discussiones Mathematicae
Graph Theory 35 (2015) 403–418
doi:10.7151/dmgt.1803

Full PDF

DMGT Page

ON MINIMAL GEODETIC DOMINATION IN GRAPHS

Hearty M. Nuenay[1]

and

Ferdinand P. Jamil[2]

Department of Mathematics and Statistics
MSU-Iligan Institute of Technology
Iligan City, Philippines

e-mail: ferdinand.jamil@g.msuiit.edu.ph

Abstract

Let G be a connected graph. For two vertices u and v in G, a u–v geodesic is any shortest path joining u and v. The closed geodetic interval $I_G[u, v]$ consists of all vertices of G lying on any u–v geodesic. For $S \subseteq V(G)$, S is a geodetic set in G if $\bigcup_{u,v \in S} I_G[u, v] = V(G)$.

Vertices u and v of G are neighbors if u and v are adjacent. The closed neighborhood $N_G[v]$ of vertex v consists of v and all neighbors of v. For $S \subseteq V(G)$, S is a dominating set in G if $\bigcup_{u \in S} N_G[u] = V(G)$. A geodetic dominating set in G is any geodetic set in G which is at the same time a dominating set in G. A geodetic dominating set in G is a minimal geodetic dominating set if it does not have a proper subset which is itself a geodetic dominating set in G. The maximum cardinality of a minimal geodetic dominating set in G is the upper geodetic domination number of G. This paper initiates the study of minimal geodetic dominating sets and upper geodetic domination numbers of connected graphs.

Keywords: minimal geodetic dominating set, upper geodetic domination number.

2010 Mathematics Subject Classification: 05C12.

References

[1]Research is fully supported by the Department of Science and Technology, Philippines, through the Accelerated Science and Technology Human Resource Development (ASTHRD) Scholarship Program.

[2]Corresponding author.

[1] S. Canoy Jr. and G. Cagaanan, *On the geodesic and hull numbers of graphs*, Congr. Numer. **161** (2003) 97–104.

[2] S. Canoy Jr. and G. Cagaanan, *On the geodetic covers and geodetic bases of the composition $G[K_m]$*, Ars Combin. **79** (2006) 33–45.

[3] G. Chartrand, F. Harary and P. Zhang, *Geodetics sets in graphs*, Discuss. Math. Graph Theory **20** (2000) 129–138.
doi:10.7151/dmgt.1112

[4] G. Chartrand, F. Harary and P. Zhang, *On the geodetic number of a graph*, Networks **39** (2002) 1–6.
doi:10.1002/net.10007

[5] I. Aniversario, F. Jamil and S. Canoy Jr., *The closed geodetic numbers of graphs*, Util. Math. **74** (2007) 3–18.

[6] S. Canoy Jr., G. Cagaanan and S. Gervacio, *Convexity, geodetic and hull numbers of the join of graphs*, Util. Math. **71** (2007) 143–159.

[7] S. Canoy Jr. and I.J. Garces, *Convex sets under some graph operations*, Graphs Combin. **18** (2002) 787–793.
doi:0.1007/s003730200065

[8] H. Escuardo, R. Gera, A. Hansberg, N. Jafari Rad and L. Volkmann, *Geodetic domination in graphs*, J. Combin. Math. Combin. Comput. **77** (2011) 89–101.

[9] T. Haynes, S.T. Hedetniemi and P. Slater, Fundamentals of Domination in Graphs (Marcel Dekker, Inc. New York, 1998).

[10] T. Haynes, S.M. Hedetniemi, S.T. Hedetniemi and M. Henning, *Domination in graphs applied to electrical power networks*, SIAM J. Discrete Math. **15** (2000) 519–529.
doi:10.1137/S0895480100375831

[11] F. Buckley and F. Harary, Distance in Graphs (Redwood City, CA: Addison-Wesley, 1990).

[12] M. Lemańska, *Weakly convex and convex domination numbers*, Opuscula Math. **24** (2004)) 181–188.

[13] J. Bondy and G. Fan, *A sufficient condition for dominating cycles*, Discrete Math. **67** (1987) 205–208.
doi:10.1016/0012-365X(87)90029-X

[14] E. Cockayne and S.T. Hedetniemi, *Towards a theory of domination in graphs*, Networks **7** (1977) 247–261.
doi:10.1002/net.3230070305

[15] H. Walikar, B. Acharya and E. Samathkumar, Recent Developments in the Theory of Domination in Graphs (Allahabad, 1979).

[16] T.L. Tacbobo, F.P.Jamil and S. Canoy Jr., *Monophonic and geodetic domination in the join, corona and composition of graphs*, Ars Combin. **112** (2013) 13–32.

Received 28 December 2013
Revised 25 June 2014
Accepted 1 August 2014