Dynamics of Continuous, Discrete and Impulsive Systems
Series **A:** *Mathematical Analysis* **21 (2014)** 231-242
 http://www.watam.org

CONVERGENCE OF ITERATES OF UNIFORMLY L-LIPSCHITZIAN AND GENERALIZED ASYMPTOTICALLY NONEXPANSIVE MAPPINGS IN CAT(0) SPACES

Suthep Suantai[1] and Prasit Cholamjiak[2,*]

[1]Department of Mathematics, Faculty of Science,
Chiang Mai University, Chiang Mai 50200, Thailand

[2]School of Science, University of Phayao,
Phayao 56000, Thailand

*Corresponding author email: prasitch2008@yahoo.com

Abstract. We study strong and Δ-convergence of a modified S-type iteration process inspired by Agarwal, O'Regal and Sahu (2007) for uniformly L-Lipschitzian and generalized asymptotically nonexpansive mappings in CAT(0) spaces.

Keywords. Strong convergence; Δ-convergence; CAT(0) space; S-type iteration process; Generalized asymptotically nonexpansive mapping.

AMS subject classification: 47H10, 54H25.

References

[1] R.P. Agarwal, D. O'Regan, D.R. Sahu, Iterative construction of fixed points of nearly asymptotically nonexpansive mappings, *J. Nonlinear Convex Anal.*, **8**, (2007), 61-79.

[2] M.R. Bridson, A. Haefliger, Metric Spaces of Non-positive Curvature, Grundelhren der Mathematischen Wissenschaften 319, Springer-Verlag, Berlin, Germany, (1999).

[3] S.S. Chang, L. Wang, H.W. Joseph Lee, C.K. Chan, L. Yang, Demiclosed principle and Δ-convergence theorems for total asymptotically nonexpansive mappings in CAT(0) spaces, *Appl. Math. Comput.*, **219**, (2012), 2611-2617.

[4] Y.J. Cho, L. Ćirić, S. Wang, Convergence theorems for nonexpansive semigroups in CAT(0) spaces, *Nonlinear Anal.*, **74**, (2011), 6050-6059.

[5] A. Cuntavepanit, B. Panyanak, Strong convergence of modified Halpern iterations in CAT(0) spaces, *Fixed Point Theory Appl.*, **2011**, (2011), Art. ID 869458, 11 pages, doi:10.1155/2011/869458.

[6] S. Dhompongsa, W.A. Kirk, B. Sims, Fixed points of uniformly lipschitzian mappings, *Nonlinear Anal.*, **65**, (2006), 762-772.

[7] S. Dhompongsa, B. Panyanak, On Δ-convergence theorems in CAT(0) spaces, *Comput. Math. Appl.*, **56**, (2008), 2572-2579.

[8] H. Fukhar-ud-din, Strong convergence of an Ishikawa-type algorithm in CAT(0) spaces, *Fixed Point Theory Appl.*, **2013**, 2013:207.

[9] K. Goebel, W.A. Kirk, A fixed point theorem for asymptotically nonexpansive mappings, *Proc. Amer. Math. Soc.*, **35**, (1972), 171-174.

[10] S.H. Khan, M. Abbas, Strong and Δ-convergence of some iterative schemes in CAT(0) spaces, *Comput. Math. Appl.*, **61**, (2011), 109-116.

[11] A.R. Khan, M.A. Khamsi, H. Fukhar-ud-din, Strong convergence of a general iteration scheme in CAT(0) spaces, *Nonlinear Anal.*, **74**, (2011), 783-791.

[12] W.A. Kirk, Geodesic geometry and fixed point theory II, in: Proceeding of the International Conference in Fixed Point Theory and Applications, Valencia, Spain, (2003), 113-142.

[13] W.A. Kirk, B. Panyanak, A concept of convergence in geodesic spaces, *Nonlinear Anal.*, **68**, (2008), 3689-3696.

[14] T. Laokul, B. Panyanak, Approximating fixed points of nonexpansive mappings in CAT(0) spaces, *Int. J. Math. Anal.*, **3**, (2009), 1305-1315.

[15] W. Laowang, B. Panyanak, Strong and Δ-convergence theorems for multivalued mappings in CAT(0) spaces, *J. Ineq. Appl.*, **2009**, (2009), Art. Id 730132, 16 pages.

[16] B. Nanjaras, B. Panyanak, Demiclosed principle for asymptotically nonexpansive mappings in CAT(0) spaces, *Fixed Point Theory Appl.*, **2010**, (2010), Art. ID 268780, 14 pages.

[17] W. Phuengrattana, S. Suantai, Fixed point theorems for a semigroup of generalized asymptotically nonexpansive mappings in CAT(0) spaces, *Fixed Point Theory Appl.*, **2012**, 2012:230.

[18] W. Phuengrattana, S. Suantai, Existence theorems for generalized asymptotically nonexpansive mappings in uniformly convex metric spaces, *J. Convex Anal.* (in press).

[19] S. Saejung, Halpern's iteration in CAT(0) spaces, *Fixed Point Theory Appl.*, **2010**, (2010), Art. Id 471781, 13 pages, doi:101155/2010/471781.

[20] S. Saejung, S. Suantai, P. Yotkaew, A note on "Common fixed point of multistep Noor iteration with errors for a finite family of generalized asymptotically quasi-nonexpansive mappings", *Abstr. Appl. Anal.*, **2009**, (2009), Art. Id 283461, 9 pages, doi:10.1155/2009/283461.

[21] A. Şahin, M. Başarır, On the strong convergence of a modified S-iteration process for asymptotically quasi-nonexpansive mappings in a CAT(0) space, *Fixed Point Theory Appl.*, **2013**, 2013:12.

[22] N. Shahzad, H. Zegeye, Strong convergence of an implicit iteration process for a finite family of generalized asymptotically quasi-nonexpansive maps, *Appl. Math. Comput.*, **189**, (2007), 1058-1065.

[23] L.Y. Shi, R.D. Chen, Y.J. Wu, Δ-convergence problems for asymptotically nonexpansive mappings in CAT(0) spaces, *Abstr. Appl. Anal.*, **2013**, (2013), Art. Id 251705, 6 pages, doi:10.1155/2013/251705.

[24] J.F. Tang, S.S. Chang, H.W. Joseph Lee, C.K. Chan, Iterative algorithm and Δ-convergence theorems for total asymptotically nonexpansive mappings in CAT(0) spaces, *Abstr. Appl. Anal.*, **2012**, (2012), Art. Id 965751, 11 pages, doi:101155/2012/965751.

[25] K.K. Tan, H.K. Xu, The nonlinear ergodic theorem for asymptotically nonexpansive mappings in Banach spaces, *Proc. Amer. Math. Soc.*, **114**, (1992), 399-404.

Received January 2014; revised March 2014.

email: journal@monotone.uwaterloo.ca
http://monotone.uwaterloo.ca/∼journal/