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SENSITIVITY ANALYSIS FOR GENERAL VARIATIONAL INCLUSIONS INVOLVING DIFFERENCE OF OPERATORS

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Abstract. It is known that the general variational inclusions involving difference of two (or more) monotone operators are equivalent to the resolvent equations. We use this equivalent form to develop the sensitivity analysis for general variational inclusions. This technique does not require the differentiability of the given data. Some special cases are discussed. Results obtained in this paper continue to hold for these problems.

REFERENCES

[1] S. Adly and W. Oettli: *Solvability of generalized nonlinear symmetric variational inequalities,* J. Aust. Math. Soc., Series B, Appl. Math., **40**(1999), 289-300.
[2] H. Brezis: *Operateurs Maximaux Monotone*, Mathematical Studies, vol. 5, North-Holland, Amsterdam, 1973.
[3] G. P. Crespi and G. Giorgi: *Sensitivity analysis for variational inequalities,* J. Interdiscip. Math., **5**(2002), 165-176.
[4] S. Dafermos: *Sensitivity analysis in variational inequalities,* Math. Oper. Res., **13**(1988), 421-434.
[5] D. Kinderlehrer and G. Stampacchia: *An Introduction to Variational Inequalities and Their Applications*, Academic Press, London, England, 1980.
[6] J. Kyparisis: *Sensitivity analysis framework for variational inequalities,* Math. Program., **38**(1987), 203-213.
[7] J. Kyparisis: *Sensitivity analysis for variational inequalities and nonlinear complementarity problems,* Ann. Oper. Res., **27**(1990), 143-173.
[8] J. Liu: *Sensitivity analysis in nonlinear programs and variational inequalities via continuous selections,* SIAM J. Control Optim., **33**(1995), 1040-1060.
[9] A. Moudafi and M. A. Noor: *Sensitivity analysis for variational inclusions by Wiener-Hopf equation techniques,* Int. J. Stoch. Anal., **12**(1999), 223-232.
[10] A. Moudafi: *On the difference of two maximal monotone operators: Regularization and algorithmic approaches,* Appl. Math. Comput., **202**(2008), 446-452.
[11] A. Moudafi: *On critical points of the difference of two maximal monotone operators,* Afr. Mat., DOI 10.1007/s13370-013-0218-7(2013), 1-7.
[12] A. Moudafi and P. E. Mainge: *On the convergence of an approximate proximal method for DC functions,* J. Comput. Math., **24**(2006), 475-480.
[13] M. A. Noor: *General variational inequalities,* Appl. Math. Lett., **1**(1988), 119-122.
[14] M. A. Noor: *Wiener-Hopf equations and variational inequalities,* J. Optim. Theory Appl., **79**(1993), 197-206.
[15] M. A. Noor: *Sensitivity analysis for quasi-variational inequalities,* J. Optim. Theory Appl., **95**(1997), 399-407.
[16] M. A. Noor: *Sensitivity analysis framework for general quasi-variational inclusions,* Comput. Math. Appl., **44**(2002), 1175-1181.

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[17] M. A. Noor: *Some developments in general variational inequalities,* Appl. Math. Comput., **152**(2004), 199-277.
[18] M. A. Noor: *Sensitivity analysis of extended general variational inequalities,* Appl. Math. E-Notes, **9**(2009), 17-26.
[19] M. A. Noor and K. I. Noor: *Sensitivity analysis for quasi-variational inclusions,* J. Math. Anal. Appl., **236**(1999), 290-299.
[20] M. A. Noor and K. I. Noor: *Sensitivity analysis of some quasi variational inequalities,* J. Adv. Math. Stud., **6**(2013), 43-52.
[21] M. A. Noor, K. I. Noor and A. G. Khan: *Some iterative schemes for solving extended general quasi variational inequalities,* Appl. Math. Inf. Sci., **7**(2013), 917-925.
[22] M. A. Noor, K. I. Noor and A. G. Khan: *Parallel schemes for solving a system of extended general quasi variational inequalities,* Appl. Math. Comput. **245**(2014), 566-574.
[23] M. A. Noor, K. I. Noor and A. G. Khan: *Three step algorithms for solving extended general variational inequalities,* J. Adv. Math. Stud. **7**(2014), 38-49.
[24] M. A. Noor, K. I. Noor, K. I. and R. Kamal: *General variational inclusions involving difference of operators,* J. Inequal. Appl., **98**(2014), 16 pages.
[25] M. A. Noor, K. I. Noor, A. Hamdi and E. H. El-Shemas: *On difference of two monotone operators,* Optim. Lett., **3**(2009), 329-335.
[26] M. A. Noor, K. I. Noor, E. H. El-Shemas and A. Hamdi: *Resolvent iterative methods for difference of two monotone operators,* Int. J. Optim. Theory Methods Appl., **1**(2009), 15-25.
[27] Y. Qiu and T. L. Magnanti: *Sensitivity analysis for variational inequalities defined on polyhedral sets,* Math. Oper. Res., **14**(1989), 410-432.
[28] G. Stampacchia: *Formes bilineaires coercivites sur les ensembles convexes,* C. R. Math. Acad. Sci. Paris, **258**(1964), 4413-4416.
[29] R. L. Tobin: *Sensitivity analysis for variational inequalities,* J. Optim. Theory Appl., **48**(1986), 191-204.
[30] N. D. Yen and G. M. Lee: *Solution sensitivity of a class of variational inequalities,* J. Math. Anal. Appl., **215**(1997), 48-55.

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