

## ON WEAKLY $m$ -CONTINUOUS FUNCTIONS

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**Abstract.** In this paper we introduce a new notion of weakly  $m$ -continuous functions as functions from a set satisfying some minimal conditions into a topological spaces. We obtain some characterizations and several properties of such functions. Moreover, we define strongly  $m$ -closed graphs,  $m$ -compactness and  $m$ -connectedness and investigate the relationship between their properties and weakly  $m$ -continuous functions.

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**Key words.**  $m$ -structure, strongly  $m$ -closed graph, weakly  $m$ -continuous,  $m$ -compact,  $m$ -connected.

### REFERENCES

- [1] ABD EL-MONSEF, M.E., EL-DEEB, S.N. and MAHMOUD, R.A.,  *$\beta$ -open sets and  $\beta$ -continuous mappings*, Bull. Fac. Sci. Assiut Univ., **12** (1983), 77–90.
- [2] ABD EL-MONSEF, M.E., MAHMOUD, R.A. and LASHIN, E.R.,  *$\beta$ -closure and  $\beta$ -interior*, J. Fac. Ed. Ain Shams Univ., **10** (1986), 235–245.
- [3] ARYA, S.P. and BHAMINI, M.P., *Some weak forms of semi-continuous functions*, Ganita, **33** (1982), 124–134.
- [4] COSTOVICI, GH., *Other elementary properties of the mappings of topological spaces*, Bul. Inst. Politehn. Iași, Sect. I, **26(30)** (1980), 19–21.
- [5] CROSSLEY, S.G. and HILDEBRAND, S.K., *Semi-closure*, Texas J. Sci., **22** (1971), 99–112.
- [6] DI MAIO, G. and NOIRI, T., *On  $s$ -closed spaces*, Indian J. Pure Appl. Math., **18** (1987), 226–233.
- [7] EL-DEEB, S.N., HASANEIN, I.A., MASHHOUR, A.S. and NOIRI, T., *On  $p$ -regular spaces*, Bull. Math. Soc. Sci. Math. R. S. Roumanie, **27(75)** (1983), 311–315.
- [8] ESPELIE, M.S. and JOSEPH, J.E., *Remarks on two weak forms of continuity*, Canad. Math. Bull., **25** (1982), 59–63.
- [9] HASANEIN, I.A., LONG, P.E. and MASHHOUR, A.S., *Functions with  $\alpha$ -closed graph and preclosed graph* (preprint).
- [10] HATICE YALVAC, T., *On weak continuity and weak  $\delta$ -continuity*, Anal. Numér. Théor. Approx., **19** (1990), 177–183.
- [11] JAFARI, S. and NOIRI, T., *On almost weakly continuous functions*, Demonstratio Math., **31** (1998), 437–442.
- [12] JANKOVIĆ, D.S.,  *$\theta$ -regular spaces*, Internat. J. Math. Math. Sci., **8** (1985), 615–619.
- [13] KAR, A., *Properties of weakly semi-continuous functions*, Soochow J. Math., **15** (1989), 65–77.
- [14] KAR, A. and BHATTACHARYYA, P., *Weakly semi-continuous functions*, J. Indian Acad. Math., **8** (1986), 83–93.
- [15] LEVINE, N., *A decomposition of continuity in topological spaces*, Amer. Math. Monthly, **68** (1961), 44–46.
- [16] LEVINE, N., *Semi-open sets and semi-continuity in topological spaces*, Amer. Math. Monthly, **70** (1963), 36–41.

- [17] LONG, P.E. and HERRINGTON, L.L., *Functions with strongly-closed graphs*, Boll. Un. Mat. Ital. (4), **12** (1975), 381–384.
- [18] MAKI, H., *On generalizing semi-open and preopen sets*, Report for Meeting on Topological Spaces Theory and its Applications, August 1996, Yatsushiro College of Technology, pp. 13–18.
- [19] MARCUS, S., *Sur les fonctions quasicontinues au sens de S. Kempisty*, Colloq. Math., **8** (1961), 47–53.
- [20] MASHHOUR, A.S., ABD EL-MONSEF, M.E. and EL-DEEP, S.N., *On precontinuous and weak precontinuous mappings*, Proc. Math. Phys. Soc. Egypt, **53** (1982), 47–53.
- [21] MASHHOUR, A.S., HASANEIN, I.A. and EL-DEEB, S.N.,  *$\alpha$ -continuous and  $\alpha$ -open mappings*, Acta Math. Hungar., **41** (1983), 213–218.
- [22] MUKHERJEE, M.N. and BASU, C.K., *On semi- $\theta$ -closed sets, semi- $\theta$ -connectedness and some associated mappings*, Bull. Calcutta Math. Soc., **83** (1991), 227–238.
- [23] NEUBRUNNOVÁ, A., *On certain generalizations of the notions of continuity*, Mat. Časopis, **23** (1973), 374–380.
- [24] NJÅSTAD, O., *On some classes of nearly open sets*, Pacific J. Math., **15** (1965), 961–970.
- [25] NOIRI, T., *On weakly continuous mappings*, Proc. Amer. Math. Soc., **46** (1974), 120–124.
- [26] NOIRI, T., *Between continuity and weak continuity*, Boll. Un. Mat. Ital. (4), **9** (1974), 647–654.
- [27] NOIRI, T., *Properties of some weak forms of continuity*, Internat. J. Math. Math. Sci., **10** (1987), 97–111.
- [28] NOIRI, T., *Weakly  $\alpha$ -continuous functions*, Internat. J. Math. Math. Sci., **10** (1987), 483–490.
- [29] NOIRI, T., *A note on weakly quasi continuous functions*, Internat. J. Math. Math. Sci., **12** (1989), 413–415.
- [30] NOIRI, T. and POPA, V., *Properties of  $\beta$ -continuous functions*, Res. Rep. Yatsushiro Nat. Coll. Tech., **22** (2000), 79–84.
- [31] PARK, J.H. and HA, H.Y., *A note on weakly quasi continuous functions*, Internat. J. Math. Math. Sci., **19** (1996), 767–772.
- [32] PARK, J.H., LEE, B.Y. and SON, M.J., *On  $\delta$ -semiopen sets in topological space*, J. Indian Acad. Math., **19** (1997), 59–67.
- [33] PAUL, R. and BHATTACHARYYA, P., *Quasi-precontinuous functions*, J. Indian Acad. Math., **14** (1992), 115–126.
- [34] PAUL, R. and BHATTACHARYYA, P., *Properties of quasi-precontinuous functions*, Indian J. Pure Appl. Math., **27** (1996), 475–486.
- [35] POPA, V., *Weakly continuous multifunctions*, Boll. Un. Mat. Ital. A(5), **15** (1978), 379–388.
- [36] POPA, V., *Characterizations of weakly continuous functions (Romanian)*, Stud. Cerc. Mat., **34** (1982), 277–280.
- [37] POPA, V., *Sur quelques conditions suffisantes pour la quasicontinuité*, Glasnik Mat., **21(41)** (1986), 149–152.
- [38] POPA, V. and NOIRI, T., *On weakly quasicontinuous functions*, Glasnik Mat., **24(44)** (1989), 391–399.
- [39] POPA, V. and NOIRI, T., *Almost weakly continuous functions*, Demonstratio Math., **25** (1992), 241–251.
- [40] POPA, V. and NOIRI, T., *Weakly  $\beta$ -continuous functions*, Anal. Univ. Timișoara, Ser. Mat. Inform., **32** (1994), 83–92.
- [41] POPA, V. and NOIRI, T., *On the definition of some generalized forms of continuity under minimal conditions*, (submitted).

- [42] POPA, V. and STAN, C., *On a decomposition of quasicontinuity in topological spaces* (Romanian), Stud. Cerc. Mat., **25** (1973), 41–43.
- [43] PORTER, J. and THOMAS, J., *On  $H$ -closed and minimal Hausdorff spaces*, Trans. Amer. Math. Soc., **138** (1969), 159–170.
- [44] RAYCHAUDHURI, S. and MUKHERJEE, M.N., *On  $\delta$ -almost continuity and  $\delta$ -preopen sets*, Bull. Inst. Math. Acad. Sinica, **21** (1993), 357–366.
- [45] ROSE, D.A., *Weak continuity and almost continuity*, Internat. J. Math. Math. Sci., **7** (1984), 311–318.
- [46] ROSE, D.A., *A note on Levine's decomposition of continuity*, Indian J. Pure Appl. Math., **21** (1990), 985–987.
- [47] SEN, A.K. and BHATTACHARYYA, P., *On weakly  $\alpha$ -continuous functions*, Tamkang J. Math., **24** (1993), 445–460.
- [48] VELÍČKO, N.V.,  *$H$ -closed topological spaces*, Amer. Math. Soc. Transl., **78** (1968), 103–118.

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