

Bibliography

- [1] D. Ghosh, D. Chakraborty, Analytical fuzzy plane geometry I, *Fuzzy Sets and Systems* 209 (2012) 66–83.
- [2] D. Chakraborty, D. Ghosh, Analytical fuzzy plane geometry II, *Fuzzy Sets and Systems* 243 (2014) 84–109.
- [3] D. Ghosh, D. Chakraborty, Analytical fuzzy plane geometry III, *Fuzzy Sets and Systems* 283 (2016) 83–107.
- [4] D. Ghosh, D. Chakraborty, An introduction to analytical fuzzy plane geometry, Vol. 381, *Studies in Fuzziness and Soft Computing*, Springer, 2019.
- [5] J. J. Buckley, E. Eslami, Fuzzy plane geometry I: points and lines, *Fuzzy Sets and Systems* 86 (2) (1997) 179–187.
- [6] J. J. Buckley, E. Eslami, Fuzzy plane geometry II: circles and polygons, *Fuzzy Sets and Systems* 87 (1) (1997) 79–85.
- [7] J. Qiu, M. Zhang, Fuzzy space analytic geometry, in: *Machine Learning and Cybernetics, 2006 International Conference on*, IEEE, 2006, pp. 1751–1755.
- [8] L. A. Zadeh, Toward extended fuzzy logic—a first step, *Fuzzy Sets and Systems* 160 (21) (2009) 3175–3181.

- [9] D. Ghosh, D. Chakraborty, A study on parametric form of fuzzy line, *Uncertainty in Mathematics* (2013) 1–11.
- [10] J. M. Prewitt, Object enhancement and extraction, *Picture Processing and Psychopictorics* 10 (1) (1970) 15–19.
- [11] J. H. Han, L. Kóczy, T. Poston, Fuzzy hough transform, *Pattern Recognition Letters* 15 (7) (1994) 649–658.
- [12] K. P. Philip, E. L. Dove, D. D. McPherson, N. L. Gotteiner, W. Stanford, K. B. Chandran, The fuzzy Hough transform-feature extraction in medical images, *IEEE Transactions on Medical Imaging* 13 (2) (1994) 235–240.
- [13] J. Basak, S. K. Pal, Theoretical quantification of shape distortion in fuzzy Hough transform, *Fuzzy Sets and Systems* 154 (2) (2005) 227–250.
- [14] S. M. Bhandarkar, A fuzzy probabilistic model for the generalized Hough transform, *IEEE Transactions on Systems, Man, and Cybernetics* 24 (5) (1994) 745–759.
- [15] H.-J. Zimmermann, *Fuzzy set theory—and its applications*, 4th Edition, Springer, New York, 2001.
- [16] G. J. Klir, B. Yuan, *Fuzzy sets and fuzzy logic: theory and applications*, Vol. 574, Prentice Hall PTR New Jersey, 1995.
- [17] P. E. Hart, How the Hough transform was invented, *IEEE Signal Processing Magazine* 26 (6) (2009) 18–22.
- [18] R. O. Duda, P. E. Hart, Use of Hough transform to detect curves and lines in pictures, *Communications of the ACM* 15 (1972) 11–15.

- [19] D. H. Ballard, Generalizing the Hough transform to detect arbitrary shapes, *Pattern Recognition* 13 (2) (1981) 111–122.
- [20] D. Obradović, Z. Konjović, E. Pap, I. J. Rudas, Fuzzy geometry in linear fuzzy space, in: *Intelligent Systems: Models and Applications*, Springer, 2013, pp. 137–153.
- [21] B. B. Chaudhuri, Some shape definitions in fuzzy geometry of space, *Pattern Recognition Letters* 12 (9) (1991) 531–535.
- [22] B. Pham, Representation of fuzzy shapes, in: *International Workshop on Visual Form*, Springer, 2001, pp. 239–248.
- [23] A. Rosenfeld, “geometric properties” of sets of lines, *Pattern Recognition Letters* 16 (5) (1995) 549–556.
- [24] M. Löffler, M. Kreveld, Geometry with imprecise lines, *Collection of Abstracts* (2008) 133.
- [25] K. Gupta, S. Ray, Fuzzy plane projective geometry, *Fuzzy Sets and Systems* 54 (2) (1993) 191–206.
- [26] D. Chakraborty, S. Das, Fuzzy geometry: Perpendicular to fuzzy line segment, *Information Sciences* 468 (2018) 213–225.
- [27] D. Ghosh, D. Chakraborty, On general form of fuzzy lines and its application in fuzzy line fitting, *Journal of Intelligent & Fuzzy Systems* 29 (2) (2015) 659–671.
- [28] S. Das, D. Chakraborty, Conceptualizing fuzzy line as a collection of fuzzy points, *Information Sciences* (2022).

- [29] T. D. Clark, J. N. Mordeson, L. Neilson, M. J. Wierman, Fuzzy geometry: applied to comparative politics, *Critical Review. The Society for Mathematics of Uncertainty*, ser 2 (2008) 1–12.
- [30] A. Rosenfeld, S. Haber, The perimeter of a fuzzy set, *Pattern Recognition* 18 (2) (1985) 125–130.
- [31] A. Bogomolny, On the perimeter and area of fuzzy sets, *Fuzzy Sets and Systems* 23 (2) (1987) 257–269.
- [32] S. Guangjun, H. Zhongxiao, W. Chunjuan, The research of fuzzy segment query under the spatial database, *Journal of Computers* 5 (2) (2010) 291.
- [33] H. Liu, D. J. Brown, G. M. Coghill, Fuzzy qualitative robot kinematics, *IEEE Transactions on Fuzzy Systems* 16 (3) (2008) 808–822.
- [34] A. Esogbue, B. Liu, Cluster validity for fuzzy criterion clustering, *Computers & Mathematics with Applications* 37 (11-12) (1999) 95–100.
- [35] D. Ghosh, D. Chakraborty, A study on fuzzy triangle and fuzzy trigonometric properties, in: *Mathematics and Computing: Selected Contributions*, ICMC 2018, Varanasi, India, January 9-11, Vol. 253, Springer, 2018, pp. 341–359.
- [36] X. Yuan, Z. Shen, Notes on “fuzzy plane geometry I, II”, *Fuzzy Sets and Systems* 121 (3) (2001) 545–547.
- [37] A. Rosenfeld, Fuzzy rectangles, *Pattern Recognition Letters* 11 (10) (1990) 677–679.
- [38] A. Rosenfeld, Fuzzy plane geometry: Triangles, *Pattern Recognition Letters* 15 (12) (1994) 1261–1264.

- [39] A. Rosenfeld, The diameter of a fuzzy set, *Fuzzy Sets and Systems* 13 (3) (1984) 241–246.
- [40] A. Rosenfeld, Fuzzy geometry: An overview, in: IEEE International Conference on Fuzzy Systems, IEEE, 1992, pp. 113–117.
- [41] A. Rosenfeld, Fuzzy geometry: An updated overview, *Information Sciences* 110 (3-4) (1998) 127–133.
- [42] D. Guha, D. Chakraborty, A new approach to fuzzy distance measure and similarity measure between two generalized fuzzy numbers, *Applied Soft Computing* 10 (1) (2010) 90–99.
- [43] A. Rosenfeld, Distances between fuzzy sets, *Pattern Recognition Letters* 3 (4) (1985) 229–233.
- [44] B. B. Chaudhuri, A. Rosenfeld, On a metric distance between fuzzy sets, *Pattern Recognition Letters* 17 (11) (1996) 1157–1160.
- [45] D. Gadjiev, A. Rustanov, Fuzzy topology and fuzzy geometry of the topological concepts, in: IOP Conference Series: Materials Science and Engineering, Vol. 1001, IOP Publishing, 2020, p. 012071.
- [46] D. Dubois, H. Prade, On distances between fuzzy points and their use for plausible reasoning, in: International Conference on Systems, Man and Cybernetics, 1983, pp. 300–303.
- [47] I. Bloch, On fuzzy distances and their use in image processing under imprecision, *Pattern Recognition* 32 (11) (1999) 1873–1895.
- [48] A. Rosenfeld, The fuzzy geometry of image subsets, in: Readings in Fuzzy Sets for Intelligent Systems, Elsevier, 1993, pp. 633–639.

- [49] S. K. Pal, A. Ghosh, Fuzzy geometry in image analysis, *Fuzzy Sets and Systems* 48 (1) (1992) 23–40.
- [50] M. El-Ghoul, Folding of fuzzy graphs and fuzzy spheres, *Fuzzy Sets and Systems* 58 (3) (1993) 355–363.
- [51] B. P. Dolan, D. O'Connor, A fuzzy three sphere and fuzzy tori, *Journal of High Energy Physics* 10 (2003) 060.
- [52] A. El-Ahmady, A. Al-Rdade, Folding of fuzzy hyperboloid, *Indian Journal of Science and Technology* 6 (8) (2013) 5013–5018.
- [53] L. A. Zadeh, Fuzzy sets, *Information and Control* 8 (3) (1965) 338–353.
- [54] R. Lowen, Convex fuzzy sets, *Fuzzy Sets and Systems* 3 (3) (1980) 291–310.
- [55] E. E. Ammar, Some properties of convex fuzzy sets and convex fuzzy cones, *Fuzzy Sets and Systems* 106 (3) (1999) 381–386.
- [56] Y.-R. Syau, C.-Y. Low, T.-H. Wu, A note on convex fuzzy processes, *Applied Mathematics Letters* 15 (2) (2002) 193–196.
- [57] Q. Li, S. Guo, Fuzzy geometric object modelling, in: *Fuzzy Information and Engineering*, Springer, 2007, pp. 551–563.
- [58] P. V. C. Hough, Method and means for recognizing complex patterns, US Patent 3069654 (1962).
- [59] D. H. Ballard, C. M. Brown, Computer vision prentice-hall inc, Englewood Cliffs, New Jersey (1982) 313–437.
- [60] J. Sklansky, On the Hough technique for curve detection, *IEEE Transactions on Computers* 27 (10) (1978) 923–926.

- [61] S. Basalamah, Histogram based circle detection, International Journal of Computer Science and Network Security 12 (8) (2012) 40–43.
- [62] C. Kimme, D. Ballard, J. Sklansky, Finding circles by an array of accumulators, Communications of the ACM 18 (2) (1975) 120–122.
- [63] A. O. Djekoune, K. Messaoudi, M. Belhocine, A new modified Hough transform method for circle detection, in: IJCCI, 2013, pp. 5–12.
- [64] R. K. Yip, P. K. Tam, D. N. Leung, Modification of Hough transform for circles and ellipses detection using a 2-dimensional array, Pattern Recognition 25 (9) (1992) 1007–1022.
- [65] W. O. Barbosa, A. W. Vieira, On the improvement of multiple circles detection from images using Hough transform, TEMA (São Carlos) 20 (2019) 331–342.
- [66] P. Bhattacharya, A. Rosenfeld, I. Weiss, Point-to-line mappings as Hough transforms, Pattern Recognition Letters 23 (14) (2002) 1705–1710.
- [67] J. Illingworth, J. Kittler, A survey of the Hough transform, Computer Vision, Graphics, and Image Processing 44 (1) (1988) 87–116.
- [68] P. L. Palmer, M. Petrou, J. Kittler, A Hough transform algorithm with a 2d hypothesis testing kernel, CVGIP: Image Understanding 58 (2) (1993) 221–234.
- [69] V. F. Leavers, Which Hough transform?, CVGIP: Image Understanding 58 (2) (1993) 250–264.
- [70] P. Mukhopadhyay, B. B. Chaudhuri, A survey of Hough transform, Pattern Recognition 48 (3) (2015) 993–1010.

- [71] D. Obradović, Z. Konjović, E. Pap, I. J. Rudas, Linear fuzzy space based road lane model and detection, *Knowledge-Based Systems* 38 (2013) 37–47.
- [72] S. Chambon, Detection of points of interest for geodesic contours: Application on road images for crack detection, in: International Joint Conference on Computer Vision Theory and Applications, VISAPP, 2011, p. sp.
- [73] Q. Zou, Y. Cao, Q. Li, Q. Mao, S. Wang, Cracktree: Automatic crack detection from pavement images, *Pattern Recognition Letters* 33 (3) (2012) 227–238.
- [74] B. Yu, A. K. Jain, Lane boundary detection using a multiresolution Hough transform, in: Proceedings of International Conference on Image Processing, Vol. 2, IEEE, 1997, pp. 748–751.
- [75] K. Mineta, K. Unoura, T. Ikeda, Development of a lane mark recognition system for a lane keeping assist system (No. 2003-01-0281) (2003).
- [76] N. Suetake, E. Uchino, K. Hirata, Generalized fuzzy Hough transform for detecting arbitrary shapes in a vague and noisy image, *Soft Computing* 10 (12) (2006) 1161–1168.
- [77] A. Pietrowcew, Face detection in colour images using fuzzy Hough transform, *OPTOELECTRONICS review* (3) (2003) 247–252.
- [78] R. Soodamani, Z. Q. Liu, A novel fuzzy Hough transform for shape representation, in: 1998 IEEE International Conference on Fuzzy Systems Proceedings. IEEE World Congress on Computational Intelligence (Cat. No. 98CH36228), Vol. 2, IEEE, 1998, pp. 1605–1608.
- [79] R. Soodamani, Z.-Q. Liu, A fuzzy Hough transform approach to shape description, *International Journal of Image and Graphics* 2 (04) (2002) 603–616.

- [80] O. Strauss, Use the fuzzy Hough transform towards reduction of the precision/uncertainty duality, *Pattern Recognition* 32 (11) (1999) 1911–1922.
- [81] K. Vaheesan, C. Chandrakumar, S. Mathavan, K. Kamal, M. Rahman, A. Al-Habaibeh, Tiled fuzzy Hough transform for crack detection, in: Twelfth International Conference on Quality Control by Artificial Vision 2015, Vol. 9534, International Society for Optics and Photonics, 2015, p. 953411.
- [82] M. Safi, H. R. Maleki, E. Zaeimazad, A geometric approach for solving fuzzy linear programming problems, *Fuzzy Optimization and Decision Making* 6 (4) (2007) 315–336.
- [83] D. Ghosh, R. Raushan, G. Somani, A fuzzy regression technique through same-points in fuzzy geometry, in: International Conference on Mathematics and Computing, Springer, 2018, pp. 216–224.
- [84] D. Chakraborty, A. Chatterjee, Aishwaryaprajna, Multi-objective fuzzy geometric programming problem using fuzzy geometry, in: Trends in Mathematics and Computational Intelligence, Springer, 2019, pp. 123–129.
- [85] D. Chakraborty, V. P. Singh, A method to solve separable fuzzy nonlinear programming problem, *International Journal of Operational Research* 29 (3) (2017) 360–375.
- [86] D. Ghosh, D. Chakraborty, A new method to obtain fuzzy pareto set of fuzzy multi-criteria optimization problems, *Journal of Intelligent & Fuzzy Systems* 26 (3) (2014) 1223–1234.
- [87] D. Ghosh, D. Chakraborty, A method for capturing the entire fuzzy non-dominated set of a fuzzy multi-criteria optimization problem, *Fuzzy Sets and Systems* 272 (2015) 1–29.

- [88] D. Ghosh, D. Chakraborty, Fuzzy ideal cone: a method to obtain complete fuzzy non-dominated set of fuzzy multi-criteria optimization problems with fuzzy parameters, in: 2013 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE), IEEE, 2013, pp. 1–8.
- [89] S. Raut, M. Pal, Fuzzy intersection graph: a geometrical approach, *Journal of Ambient Intelligence and Humanized Computing* (2021) 1–25.
- [90] R. A. Aliev, Decision making on the basis of fuzzy geometry, in: Fundamentals of the Fuzzy Logic-Based Generalized Theory of Decisions, Springer, 2013, pp. 217–230.
- [91] E. Pap, D. Obradović, Z. Konjović, Modelling by fuzzy approach uncertainties in image analysis, in: 2014 IEEE 15th International Symposium on Computational Intelligence and Informatics (CINTI), IEEE, 2014, pp. 11–14.
- [92] M. Jocić, D. Obradović, Z. Konjović, E. Pap, 2d fuzzy spatial relations and their applications to dicom medical images, in: 2013 IEEE 11th International Symposium on Intelligent Systems and Informatics (SISY), IEEE, 2013, pp. 39–44.
- [93] I. Bloch, Fuzzy sets for image processing and understanding, *Fuzzy Sets and Systems* 281 (2015) 280–291.
- [94] I. Bloch, Fuzzy relative position between objects in images: a morphological approach, in: Proceedings of 3rd IEEE International Conference on Image Processing, Vol. 2, IEEE, 1996, pp. 987–990.
- [95] R. Wang, W. Cao, W. Wan, Location discovery based on fuzzy geometry in passive sensor networks, *International Journal of Digital Multimedia Broadcasting* 2011 (2011).

- [96] O. Ibáñez, O. Cordón, S. Damas, A cooperative coevolutionary approach dealing with the skull–face overlay uncertainty in forensic identification by craniofacial superimposition, *Soft Computing* 16 (5) (2012) 797–808.
- [97] Y. Li, Q. Huang, W. Xie, X. Li, A novel visual codebook model based on fuzzy geometry for large-scale image classification, *Pattern Recognition* 48 (10) (2015) 3125–3134.
- [98] J. Han, S. Guo, C. Feng, The fuzzy measure and application of a kind of circular fuzzy number, in: 2010 International Conference on Computational Intelligence and Software Engineering, IEEE, 2010, pp. 1–4.
- [99] S. Mayburov, Commutative fuzzy geometry and geometric quantum mechanics, in: *Journal of Physics: Conference Series*, Vol. 1051, IOP Publishing, 2018, p. 012022.
- [100] W.-I. Lee, C.-W. Chen, C.-Y. Chen, Y.-C. Sui, Application of half-circle fuzzy numbers and development of triangular fuzzy numbers to fuzzy control, in: Selected Topics in Applied Computer Science, 2010, pp. 335–340.
- [101] R. Wang, W. Cao, W. Wan, Y. Li, Fuzzy geometric localization for triangular grid deployment in passive sensor networks, in: 2010 International Conference on Audio, Language and Image Processing, IEEE, 2010, pp. 1739–1743.
- [102] M. Asasian, Meaningful forms and fuzzy geometry I: Mpb & mgp, *Asian Research Journal of Mathematics* (2018) 1–10.
- [103] M. El-Ghoul, Fuzzy retraction and folding of fuzzy-orientable compact manifold, *Fuzzy Sets and Systems* 105 (1) (1999) 159–163.

- [104] L. Khatib, P. Morris, R. Morris, F. Rossi, A. Sperduti, K. B. Venable, Solving and learning a tractable class of soft temporal constraints: Theoretical and experimental results, *AI Communications* 20 (3) (2007) 181–209.
- [105] M. Jooyandeh, A. M. Khorasani, Fuzzy voronoi diagram, in: Computer Society of Iran Computer Conference, Springer, 2008, pp. 82–89.
- [106] J. Mohammadreza, M. Ali, M. Maryam, Uncertain voronoi diagram, *Information Processing Letters* 109 (13) (2009) 709–712.
- [107] B. Kosko, Fuzziness vs. probability, *International Journal of General System* 17 (2-3) (1990) 211–240.
- [108] B. Kosko, The probability monopoly, *IEEE Transactions on Fuzzy Systems* 2 (1) (1994) 32–33.
- [109] M. Savoj, S. A. Monadjemi, Iris localization using circle and fuzzy circle detection method, *World Academy of Science, Engineering and Technology* (61) (2012) 2.
- [110] S.-M. Chen, New methods for subjective mental workload assessment and fuzzy risk analysis, *Cybernetics & Systems* 27 (5) (1996) 449–472.
- [111] S.-J. Chen, S.-M. Chen, Fuzzy risk analysis based on similarity measures of generalized fuzzy numbers, *IEEE Transactions on Fuzzy Systems* 11 (1) (2003) 45–56.
- [112] C. H. Hsieh, Similarity of generalized fuzzy numbers with graded mean integration representation, Proceeding 8th International Fuzzy Systems Association World Congress, 1999 2 (1999) 551–555.

- [113] H.-S. Lee, An optimal aggregation method for fuzzy opinions of group decision, in: IEEE SMC'99 Conference Proceedings 1999 IEEE International Conference on Systems, Man, and Cybernetics (Cat. No. 99CH37028), Vol. 3, IEEE, 1999, pp. 314–319.
- [114] S.-H. Wei, S.-M. Chen, A new approach for fuzzy risk analysis based on similarity measures of generalized fuzzy numbers, *Expert Systems with Applications* 36 (1) (2009) 589–598.
- [115] S. Das, D. Chakraborty, L. T. Kóczy, Linear fuzzy rule base interpolation using fuzzy geometry, *International Journal of Approximate Reasoning* 112 (2019) 105–118.
- [116] S. Das, D. Chakraborty, L. T. Kóczy, Process of inversion in fuzzy interpolation model using fuzzy geometry, in: 2020 IEEE International Conference on Fuzzy Systems (FUZZ-IEEE), IEEE, 2020, pp. 1–8.
- [117] D. Ghosh, D. Gupta, T. Som, Analytical fuzzy space geometry I, *Fuzzy Sets and Systems* 421 (2021) 77–110.
- [118] J. J. Buckley, Y. Qu, Solving fuzzy equations: A new solution concept, *Fuzzy Sets and Systems* 39 (3) (1991) 291–301.
- [119] R. C. Silva, C. Cruz, J. L. Verdegay, A. Yamakami, A survey of fuzzy convex programming models, in: *Fuzzy Optimization*, Springer, 2010, pp. 127–143.

1. D. Ghosh, **Diksha Gupta** and T. Som, “Analytical fuzzy space geometry I,” *Fuzzy Sets and Systems* **421**, 77-110, (2021).
2. D. Ghosh, **Diksha Gupta** and T. Som, “Analytical fuzzy space geometry II,” *Fuzzy Sets and Systems*, (Accepted).
3. **Diksha Gupta**, D. Ghosh and T. Som, “Analytical fuzzy space geometry III,” *Fuzzy Sets and Systems*, (Communicated).
4. **Diksha Gupta**, D. Ghosh, C. Jain and T. Som, “Hough transform generalization for detecting fuzzy lines and fuzzy circles,” *Computational and Applied Mathematics*, (Under review).