











in the driver assistance system and automatic robotic navigation, the execution time of these algorithms should be considerably reduced as possible. Since particle swarm optimization is an iterative algorithm, the computation time of our proposed method is high. Our future work will be focused on reducing computation time.

#### REFERENCES

- [1] Nayar Shree K. and Srinivasa G. Narasimhan, Vision in bad weather. Computer Vision, the Proceedings of the Seventh IEEE International Conference. Vol. 2, 1999.
- [2] S.G. Narasimhan and S. K.Nayar, Contrast restoration of weather degraded images. PAMI. 25: 713-724, 2003.
- [3] Schechner Y.Y., Narasimhan S.G., Nayar S.K., Instant dehazing of images using polarization. IEEE Computer Society Conf. on Computer Vision and Pattern Recognition. pp. 325-332, 2001.
- [4] Fattal R. Single image dehazing. Int. Conf. on Computer Graphics and Interactive Techniques archive ACM SIGGRAPH. pp. 1-9, 2008.
- [5] Tarel, J.P., Hautiere, N. Fast visibility restoration from a single color or gray level image. IEEE Int. Conf. on Computer Vision. pp. 2201-2208, 2009.
- [6] He K., Sun J., Tang X. Single image haze removal using dark channel prior. IEEE Int. Conf. on Computer Vision and Pattern Recognition. pp. 1956-1963, 2009.
- [7] Padmini, T. N., and T. Shankar. "De-Hazing using Guided and L 0 Gradient Minimization filters." *Indian Journal of Science and Technology* 9.37, 2016.
- [8] Guo, Fan, Hui Peng, and Jin Tang. "Genetic algorithm-based parameter selection approach to single image defogging." *Information Processing Letters* 116.10: 595-602, 2016.
- [9] Zhang, Wenbo, and Xiaorong Hou. "Estimation algorithm of atmospheric light based on ant colony optimization." *Proceedings of the 2017 International Conference on Intelligent Systems, Metaheuristics & Swarm Intelligence*. ACM, 2017.
- [10] Tripathi, Abhishek Kumar, and Sudipta Mukhopadhyay. "Removal of fog from images: A review." *IETE Technical Review* 29.2: 148-156, 2012
- [11] Padmini, T. N., and T. Shankar. "A Review on visibility restoration of degraded images under inclement weather conditions." 2016.
- [12] Singh, Dilbag, and Vijay Kumar. "Comprehensive survey on haze removal techniques." *Multimedia Tools and Applications* 77.8: 9595-9620, 2018.
- [13] Codruta Orniana Ancuti and Cosmin Ancuti. Single Image Dehazing by Multi-Scale Fusion. IEEE transactions on image processing. 22(8), 2013.
- [14] Braik, Malik, Alaa F. Sheta, and Aladdin Ayesh. "Image Enhancement Using Particle Swarm Optimization." *World congress on engineering*. Vol. 1, 2007.
- [15] Gorai, Apurba, and Ashish Ghosh. "Hue-preserving color image enhancement using particle swarm optimization." *Recent Advances in Intelligent Computational Systems (RAICS)*, IEEE, 2011.
- [16] Al-Ameen, Zohair. "Visibility Enhancement for Images Captured in Dusty Weather via Tuned Tri-threshold Fuzzy Intensification Operators." *International Journal of Intelligent Systems and Applications* 8.8:10, 2016.
- [17] Choi, Lark Kwon, Jaehee You, and Alan Conrad Bovik. "Referenceless prediction of perceptual fog density and perceptual image defogging." *IEEE Transactions on Image Processing* 24.11: 3888-3901, 2015.