















Fig. 5. Comparison of Localization Error Using PSO, BPSO, Modified BPSO, and SL-PSO Algorithm

- [2] S. Hasan and E. Curry, "Thingsonomy: Tackling variety in internet of things events," *IEEE Internet Computing*, vol. 19, no. 2, pp. 10–18, 2015.
- [3] X. Li, R. Lu, X. Liang, X. Shen, J. Chen, and X. Lin, "Smart community: an internet of things application," *IEEE Communications Magazine*, vol. 49, no. 11, pp. 68–75, 2011.
- [4] Z. Chen, F. Xia, T. Huang, F. Bu, and H. Wang, "A localization method for the internet of things," *The Journal of Supercomputing*, vol. 63, no. 3, pp. 657–674, 2013.
- [5] S. Cirani, L. Davoli, G. Ferrari, R. Léone, P. Medagliani, M. Picone, and L. Veltri, "A scalable and self-configuring architecture for service discovery in the internet of things," *IEEE Internet of Things Journal*, vol. 1, no. 5, pp. 508–521, 2014.
- [6] S. Raza, L. Wallgren, and T. Voigt, "Svelte: Real-time intrusion detection in the internet of things," *Ad hoc networks*, vol. 11, no. 8, pp. 2661–2674, 2013.
- [7] L. Zhou and H.-C. Chao, "Multimedia traffic security architecture for the internet of things," *IEEE Network*, vol. 25, no. 3, pp. 35–40, 2011.
- [8] S. Sivakumar and R. Venkatesan, "Meta-heuristic approaches for minimizing error in localization of wireless sensor networks," *Applied Soft Computing*, vol. 36, pp. 506–518, 2015.
- [9] J. Hightower and G. Borriello, "A survey and taxonomy of location systems for ubiquitous computing," *IEEE computer*, vol. 34, no. 8, pp. 57–66, 2001.
- [10] N. Bulusu, J. Heidemann, and D. Estrin, "Gps-less low-cost outdoor localization for very small devices," *IEEE personal communications*, vol. 7, no. 5, pp. 28–34, 2000.
- [11] D. Miorandi, S. Sicari, F. De Pellegrini, and I. Chlamtac, "Internet of things: Vision, applications and research challenges," *Ad Hoc Networks*, vol. 10, no. 7, pp. 1497–1516, 2012.
- [12] S. Pandey and S. Varma, "A range based localization system in multihop wireless sensor networks: A distributed cooperative approach," *Wireless Personal Communications*, vol. 86, no. 2, pp. 615–634, 2016.
- [13] M. Aziz, M.-H. Tayarani-N, and M. R. Meybodi, "A two-objective memetic approach for the node localization problem in wireless sensor networks," *Genetic Programming and Evolvable Machines*, vol. 17, no. 4, pp. 321–358, 2016.
- [14] M. X. Cheng and W. B. Wu, "A model-free localization method for sensor networks with sparse anchors," in *Communications (ICC), 2016 IEEE International Conference on*. IEEE, 2016, pp. 1–7.
- [15] A. Pal, "Localization algorithms in wireless sensor networks: Current approaches and future challenges," *Network protocols and algorithms*, vol. 2, no. 1, pp. 45–73, 2010.
- [16] G. Mao, B. Fidan, and B. D. Anderson, "Wireless sensor network localization techniques," *Computer networks*, vol. 51, no. 10, pp. 2529–2553, 2007.
- [17] A. Gopakumar and L. Jacob, "Localization in wireless sensor networks using particle swarm optimization," in *Wireless, Mobile and Multimedia Networks, 2008. IET International Conference on*. IET, 2008, pp. 227–230.
- [18] R. V. Kulkarni and G. K. Venayagamoorthy, "Particle swarm optimization in wireless-sensor networks: A brief survey," *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, vol. 41, no. 2, pp. 262–267, 2011.
- [19] I. F. M. Zain and S. Y. Shin, "Distributed localization for wireless sensor networks using binary particle swarm optimization (bpsi)," in *2014 IEEE 79th Vehicular Technology Conference (VTC Spring)*. IEEE, 2014, pp. 1–5.
- [20] R. V. Céspedes-Mota, G. Castañón, A. F. Martínez-Herrera, and L. E. Cárdenas-Barrón, "Optimization of the distribution and localization of wireless sensor networks based on differential evolution approach," *Mathematical Problems in Engineering*, vol. 2016, 2016.
- [21] J. Cota-Ruiz, P. Rivas-Perea, E. Sifuentes, and R. Gonzalez-Landaeta, "A recursive shortest path routing algorithm with application for wireless sensor network localization," *IEEE Sensors Journal*, vol. 16, no. 11, pp. 4631–4637, 2016.
- [22] J. Cheng and L. Xia, "An effective cuckoo search algorithm for node localization in wireless sensor network," *Sensors*, vol. 16, no. 9, p. 1390, 2016.
- [23] R. Cheng and Y. Jin, "A social learning particle swarm optimization algorithm for scalable optimization," *Information Sciences*, vol. 291, pp. 43–60, 2015.
- [24] J. Kennedy and R. Eberhart, "Particle swarm optimization," in *Neural Networks, 1995. Proceedings., IEEE International Conference on*, vol. 4, Nov 1995, pp. 1942–1948 vol.4.
- [25] S. Khezri, K. Faez, and A. Osmani, "Modified discrete binary pso based sensor placement in wsn networks," in *Computational Intelligence and Communication Networks (CICN), 2010 International Conference on*, Nov 2010, pp. 200–204.