In recent years, China's logistics operation to maintain the rebound trend, with the recovery of the real economy, logistics demand is growing rapidly, logistics supply service system and supply chain to further improve, but the logistics cost has been high, how to reduce logistics costs and improve customer satisfaction has been the industry's concern. Research shows that transportation costs account for a large part of logistics costs, of which fuel and road costs account for about 70% of the transportation costs, and customer satisfaction also decreases with the increase of time and cost.

In order to solve the above problems, this study abstracts the practical situation into a multi-objective optimization vehicle routing problem (VRP), which is solved by an improved particle swarm algorithm (PSO) with the optimization objectives of lowest total cost and highest satisfaction.The VRP is how to organize the vehicles to complete all the delivery tasks at the smallest total cost or the shortest total time, given a series of shipping and receiving points, and to return to the starting point.The PSO PSO mimics bird flock foraging by using a single particle as a single individual in the flock, and the algorithm gives the particle (individual) memory and the ability to seek the optimal solution through interaction with other particles in the flock.

Since the VRP problem is a classical NP-hard problem and it is difficult to obtain an optimal solution for large-scale problems using an exact solver, a modified particle swarm algorithm is used in this study. In this study, the chaotic mapping method is used to initialize the particle swarm in order to improve the diversity of the particle swarm; the Lévy flight algorithm and the roulette wheel algorithm are used to improve the exploration and learning ability of the particles; and the k-opt method is used to optimize the historically optimal solution in order to improve the quality of the solution.

In this study, urban congestion data from Gaode, Homberger dataset and Solomon vehicle dataset are used to verify the validity of the results and compare them with the classical algorithms Genetic Algorithm (GA) and Ant Colony Algorithm (ACO).