A single particle structure of particle swarm optimization was analyzed which is found to have some properties of a Chaos-Hopfield neural net work. A new model of particle swarm optimization is presented. The model is a deterministic Chaos-Hopfield neural network swarm which is different from the existing one with stochastic parameters. Its search orbits show an evolution process of inverse period bifurcation from chaos to periodic orbits then to sink. In this evolution process, the initial chaos-like search expands the optimal scope, and inverse period bifurcation determines the stability and convergence of the search. Moreover, the convergence is theoretically analyzed. Finally, the numerical simulation shows the basic procedure of the proposed model and verifies its efficiency.