In rehabilitation of patients with motor impairments, brain machine interface are used to provide a direct communication pathway between the brain and an external device. Brain machine interfaces (BMI) are designed using the electrical activity of the brain detected by scalp EEG electrodes. One of the popular techniques for designing BMI is classification of EEG signals extracted during imaginary mental tasks. In this paper a classification algorithm using a Particle Swarm Optimization Neural Network is presented. Five different mental tasks from two subjects were studied; a combination of two tasks is studied for task classification for each subject. Principal component analysis is used to extract the features. These features are used for training and testing the neural network. Classification accuracies varied from 77.5% to 100% for the 10 different task combinations for each of the subjects. The results obtained validate the performance of the PSO algorithm for mental task classification.
Particle Swarm Optimization (PSO) is the swarm intelligent technique developed to generate optimal solutions for the problem in the N-dimensional space. Every particle in the dimensional space has its own position, velocity and fitness value determined by the optimization function. Every particle has the best position of its own known as particle best and the overall best position of the whole swarm is known as the global best. Initially, the random solutions are generated followed by the computation process to determine the fitness value. Based on the computed fitness value, the position and Particle swarm optimization (PSO) is a population-based stochastic approach for solving continuous and discrete optimization problems. In particle swarm optimization, simple software agents, called particles, move in the search space of an optimization problem. The position of a particle represents a candidate solution to the optimization problem at hand. Each particle searches for better positions in the search space by changing its velocity according to rules originally inspired by behavioral models.