**Spider Monkey Optimization algorithm for numerical Optimization**

**Abstract:** Swarm intelligence is one of the most promising area for the researchers in the field of numerical optimization. Researchers have developed many algorithms by simulating the swarming behavior of various creatures like ants, honey bees, fish, birds and the findings are very motivating. In this paper, a new approach for numerical optimization is proposed by modeling the foraging behavior of spider monkeys. Spider monkeys have been categorized as fission–fusion social structure-based animals. The animals which follow fission–fusion social systems, split themselves from large to smaller groups and vice-versa based on the scarcity or availability of food. The proposed swarm intelligence approach is named as Spider Monkey Optimization (SMO) algorithm and can broadly be classified as an algorithm inspired by intelligent foraging behavior of fission–fusion social structure-based animals.

**Modified Monkey Optimization Algorithm for Solving Optimal Reactive Power Dispatch Problem**

**Abstract:** In this paper, a novel approach Modified Monkey optimization (MMO) algorithm for solving optimal reactive power dispatch problem has been presented. MMO is a population based stochastic meta-heuristic algorithm and it is inspired by intelligent foraging behavior of monkeys. This paper improves both local leader and global leader phases. The proposed (MMO) algorithm has been tested in standard IEEE 30 bus test system and simulation results show the worthy performance of the proposed algorithm in reducing the real power loss*.*

**Fitness based Position update in Spider Monkey Optimization Algorithm**

**Abstract:** Spider Monkey Optimization (SMO) technique is most recent member in the family of swarm optimization algorithms. SMO algorithm fall in class of Nature Inspired Algorithm (NIA). SMO algorithm is good in exploration and exploitation of local search space and it is well balanced algorithm most of the times. This paper presents a new strategy to update position of solution during local leader phase using fitness of individuals. The proposed algorithm is named as Fitness based Position Update in SMO (FPSMO) algorithm as it updates position of individuals based on their fitness. The anticipated strategy enhances the rate of convergence. The planned FPSMO approach tested over nineteen benchmark functions and for one real world problem so as to establish superiority of it over basic SMO algorithm.

**A Novel Binary Spider Monkey Optimization Algorithm for Thinning of Concentric Circular Antenna Arrays**

**Abstract:** This paper presents a novel binary algorithm named as binary spider monkey optimization (binSMO)for thinning of concentric circular antenna arrays (CCAA). The proposed algorithm has been adaptedfrom a recently developed nature inspired optimization method, spider monkey optimization (SMO).SMO works in continuous domain and as such is not suitable for application to binary optimizationproblems. The binSMO algorithm has been proposed with inclusion of logical operators in SMO forbinary thinning problem. Thinning of an antenna array reduces the maximum side lobe level (SLL)as well as cost and size of antenna array. Thinning of CCAA can be modelled as 0\_1 binary integeroptimization problem. The proposed binSMO is used to synthesize CCAA in order to reduce the SLLand at the same time keeping the percentage of thinning equal to or more than the desired level.Simulation examples of two ring and ten ring CCAA have been considered. The novel methodbinSMO gives reduced SLL as compared to the results available in literature of teacher learningbased optimization, biogeography-based optimization, modified particle swarm optimization, andfirefly algorithm. Moreover, the convergence rate of binSMO is faster than the other methods. Theresults prove the competence and superiority of binSMO to existing metaheuristic algorithms and ithas an ability to become an effective tool for solving binary optimization problems.

**A Novel Cluster-based Routing Protocol Wireless Sensor Networks using Spider Monkey Optimization**

**Abstract:** With rapid development, wireless sensor networks (WSNs) have been focused on improving the performance consist of energy efficiency, communication effectiveness, and system throughput. Many novel mechanisms have been implemented by adapting the social behaviors of natural creatures, such as bats, birds, ants, fish and honeybees. These systems are known as nature inspired systems or swarm intelligence in in order to provide optimization strategies, handle large-scale networks and avoid resource constraints. Spider monkey optimization (SMO) is a recent addition to the family of swarm intelligence algorithms by structuring the social foraging behavior of spider monkeys. In this paper, we aim to study the mechanism of SMO in the field of WSNs, formulating the mathematical model of the behavior patterns which cluster-based Spider Monkey Optimization (SMO-C) approach is adapted. In addition, our proposed methodology based on the Spider Monkey’s behavioral structure aims to improve the traditional routing protocols in term of low energy consumption and system quality of the network.

**Adaptive Step-size based Spider Monkey Optimization**

**Abstract:** Spider Monkey Optimization (SMO) algorithm is recent swarm intelligence based meta-heuristic technique to solve the continuous optimization problems. Many times, it shutters from the problem of slow convergence. To improve the exploitation abilities and evading premature convergence, a modified variant of SMO is proposed. The modified variant is known as adaptive step-size based spider monkey optimization (AsSMO) algorithm. In position update process of AsSMO, step-size is calculated by the fitness of a spider monkey. The prominent fit solutions will converge quickly in comparison to the non-prominent fit solutions. The proposed algorithm is compared with SMO and self-adaptive spider monkey optimization (SaSMO) over 15 benchmark functions and reported results show that AsSMO is a spiel variant among them.

**Ageist Spider Monkey Optimization Algorithm**

**Abstract:** Swarm Intelligence (SI) is quite popular in the field of numerical optimization and has enormous scope for research. A number of algorithms based on decentralized and self-organized swarm behavior of natural as well as artificial systems, have been proposed and developed in last few years. Spider Monkey Optimization (SMO) algorithm, inspired by the intelligent behavior of spider monkeys, is one such recently proposed algorithm. The algorithm along with some of its variants has proved to be very successful and efficient. A spider monkey group consists of members from every age group. The agility and swiftness of the spider monkeys differ on the basis of their age groups. This paper proposes a new variant of SMO algorithm termed as Ageist Spider Monkey Optimization (ASMO) algorithm which seems more practical in biological terms and works on the basis of age difference present in spider monkey population. Experiments on different benchmark functions with different parameters and settings have been carried out and the variant with the best suited settings is proposed. This variant of SMO has enhanced the performance of its original version. Also, ASMO has performed better in comparison to some of the recent advanced algorithms.

**Dynamic Stability Improvement of VSC-HVDC Connected Multi machine Power System by Spider Monkey optimization Based PI controller**

**Abstract:** This paper presents the application of spider monkey optimization-based PI controller to a VSC-HVDC based four machine power system. A PI controller, whose gains are selected by spider Monkey optimization technique, is used to minimize the power oscillations and to recover the dynamic stability of VSC-HVDC based four machine power systems. The proposed optimized PI controller is tested under different faults like three phase LLLG fault, Change of torque angle, etc. The comprehensive simulations are carried out in time domain in MATLAB/SIMULINK environment. The following figures depicts that optimized PI controller is more efficient than conventional PI controller.

**IMPROVING THE LOCAL SEARCH ABILITY OF SPIDER MONKEY OPTIMIZATION ALGORITHM USING QUADRATIC APPROXIMATION FOR UNCONSTRAINED OPTIMIZATION**

**Abstract:** Spider monkey optimization (SMO) algorithm, which simulates the food searching behavior of a swarm of spider monkeys, is a new addition to the class of swarm intelligent techniques for solving unconstrained optimization problems. The purpose of this article is to study the performance of SMO after incorporating quadratic approximation (QA) operator in it. The proposed version is named as QA-based spider monkey optimization (QASMO). An experimental study has been carried out to check the validity and applicability of QASMO. For validation purpose, the performance of QASMO is tested over a benchmark set of 46 scalable and nonsalable problems, and results are compared with the original SMO algorithm. In order to test the applicability of the proposed algorithm in solving real-life optimization problems, one of the most challenging optimization problems, namely, Lennard–Jones (LJ) problem is considered. LJ clusters containing atoms from three to ten have been taken into consideration, and results are presented. To the best of our knowledge, this is the first attempt to apply SMO and its proposed variant on a real-life problem. The results demonstrate that incorporation of QA in SMO has positive effects on its performance in terms of reliability, efficiency, and accuracy.

**Modified Spider Monkey Optimization**

**Abstract:** Spider Monkey Optimization is a well-known metaheuristic in the arena of nature inspired algorithms. It is basically known for its stagnation removal power in its original design. To balance the meta-heuristics mechanisms while preserving premature convergence, a new variant is developed which is named as Modified spider monkey optimization. In this paper, metropolis principle is used from simulated annealing which improves the global search capability of algorithm. In addition to this strength of spider monkey is used for maintaining the step size to enhance the convergence speed. The intended algorithm is tested over 10 benchmarks functions and compared with Spider monkey optimization, particle swarm optimization and one of its recent variant Self-adaptive spider monkey optimizations.

**Optimal Synthesis of Linear Antenna Arrays Using Modified Spider Monkey Optimization**

**Abstract:** This paper presents a novel optimization technique named as modified spider monkey optimization (MSMO) for the synthesis of linear antenna array (LAA). The proposed method is inspired from a recently developed spider monkey optimization (SMO) swarm intelligent technique. The competitiveness of SMO has been already proved using numerical optimization functions. To improve the performance of SMO, a MSMO algorithm based on dual-search strategy is proposed in this paper. This approach generates a new solution using a search equation selected randomly from a candidate pool consisting of two search strategies. The performance of the proposed method is tested by applying it to find the optimal solutions for standard benchmark functions. Further, the capability and effectiveness are also proved by using it for practical optimization problem, i.e., synthesis of LAA for three different cases. Experimental results show that MSMO outperforms other popular algorithms like particle swarm optimization, cuckoo search, firefly algorithm, biogeography-based optimization, differential evolution, tabu search and Taguchi method in terms of reduced side lobe level and faster convergence speed.

**Spider Monkey Optimization (SMO): A Novel optimization Technique in Electromagnetics**

**Abstract:** Introducing and using the spider monkey optimization (SMO) as an optimization technique for the electromagnetics and antenna community is the main goal of this paper. The SMO is a new swarm intelligence technique which models the foraging behavior of spider monkeys. To show the efficiency of the SMO, different examples are presented in this work. The optimization procedure is used to synthesize the array factor of a linear antenna array and to optimally design a coaxial feeding patch antenna for wireless applications. The obtained results show that SMO is efficient in reaching the optimum solutions with few numbers of experiments.

**Spider monkey optimization assisted particle filter for robust object tracking**

**Abstract:** Particle filters (PFs) are sequential Monte Carlo methods that use particle representation of state-space model to implement the recursive Bayesian filter for non-linear and non-Gaussian systems. Owing to this property, PFs have been extensively used for object tracking in recent years. Although PFs provide a robust object tracking framework, they suffer from shortcomings. Particle degeneracy and particle impoverishment brought by the resampling step result in abysmal construction of posterior probability density function (PDF) of the state. To overcome these problems, this work amalgamates two characteristics of population-based heuristic optimization algorithms: exploration and exploitation with PF implementing dynamic resampling method. The aim of optimization is to distribute particles in high-likelihood area according to the cognitive effect and improve quality of particles, while the objective of dynamic resampling is to maintain diversity in the particle set. This work uses very efficient spider monkey optimization to achieve this. Furthermore, to test the efficiency of the proposed algorithm, experiments were carried out on one-dimensional state estimation problem, bearing only tracking problem, standard videos and synthesized videos. Metrics obtained show that the proposed algorithm outplays simple PF, particle swarm optimization-based PF, and cuckoo search-based PF, and effectively handles different challenges inherent in object tracking.

**Spider Monkey Optimization: A Novel Technique for Antenna Optimization**

**Abstract:** The aim of this paper is to introduce and use the spider monkey optimization (SMO) as an optimization technique for the electromagnetics and antenna community. The SMO is a new swarm intelligence technique which models the foraging behavior of spider monkeys. To show the efficiency of the SMO, different examples are presented and the results are compared with the results obtained using other popular optimization techniques. The optimization procedure is used to synthesis the array factor of a linear antenna array and to optimally design an E-shaped patch antenna for wireless applications. By comparing to traditional optimization techniques that reported in the literature, it is evident that SMO is efficient in reaching the optimum solutions with a smaller number of experiments.

**Spider monkey optimization algorithm for constrained optimization problems**

**Abstract:** In this paper, a modified version of spider monkey optimization (SMO) algorithm for solving constrained optimization problems has been proposed. To the best of author’s knowledge, this is the first attempt to develop a version of SMO which can solve constrained continuous optimization problems by using the Deb’s technique for handling constraints. The proposed algorithm is named constrained spider monkey optimization (CSMO) algorithm. The performance of CSMO is investigated on the well-defined constrained optimization problems of CEC2006 and CEC2010 benchmark sets. The results of the proposed algorithm are compared with constrained versions of particle swarm optimization, artificial bee colony and differential evolution. Outcome of the experiment and the discussion of results demonstrate that CSMO handles the global optimization task very well for constrained optimization problems and shows better performance in comparison with compared algorithms. Such an outcome will be an encouragement for the research community to further explore the potential of SMO in solving benchmarks as well as real-world problems, which are often constrained in nature.

**Tournament Selection Based Probability Scheme in Spider Monkey Optimization Algorithm**

**Abstract:** In this paper, a modified version of Spider Monkey Optimization (SMO) algorithm is proposed. This modified version is named as Tournament selection-based Spider Monkey Optimization (TS-SMO). TS-SMO replaces the fitness proportionate probability scheme of SMO with tournament selection-based probability scheme with an objective to improve the exploration ability of SMO by avoiding premature convergence. The performance of the proposed variant is tested over a large benchmark set of 46 unconstrained benchmark problems of varying complexities broadly classified into two categories: scalable and non-scalable problems. The performance of TS-SO is compared with that of SMO. Results for scalable and non-scalable problems have been analyzed separately. A statistical test is employed to access the significance of improvement in results. Numerical and statistical results show that the proposed modification has a positive impact on the performance of original SMO in terms of reliability, efficiency and accuracy.

**A Boolean spider monkey optimization-based energy efficient clustering approach for WSNs**

**Abstract:** Wireless sensor network (WSN) consists of densely distributed nodes that are deployed to observe and react to events within the sensor field. In WSNs, energy management and network lifetime optimization are major issues in the designing of cluster-based routing protocols. Clustering is an efficient data gathering technique that effectively reduces the energy consumption by organizing nodes into groups. However, in clustering protocols, cluster heads (CHs) bear additional load for coordinating various activities within the cluster. Improper selection of CHs causes increased energy consumption and also degrades the performance of WSN. Therefore, proper CH selection and their load balancing using efficient routing protocol is a critical aspect for long run operation of WSN. Clustering a network with proper load balancing is an NP-hard problem. To solve such problems having vast search area, optimization algorithm is the preeminent possible solution. Spider monkey optimization (SMO) is a relatively new nature inspired evolutionary algorithm based on the foraging behavior of spider monkeys. It has proved its worth for benchmark functions optimization and antenna design problems. In this paper, SMO based threshold-sensitive energy-efficient clustering protocol is proposed to prolong network lifetime with an intend to extend the stability period of the network. Dual-hop communication between CHs and BS is utilized to achieve load balancing of distant CHs and energy minimization. The results demonstrate that the proposed protocol significantly outperforms existing protocols in terms of energy consumption, system lifetime and stability period.

**Analysis of Adaptive Lossless Image Compression using Hybrid Particle Swarm Optimization Spider Monkey Optimization (PSOSMO) Algorithm**

**Abstract:** The compression of image is actually playing an important role to compress the data in case of digital images. Mainly image compression is used to reduce the redundancy. It is done such that overall memory requirement and processing requirement and less time should be taken for transmitting the data from one place to other place. Image compression reduces the size in bytes without compromising the quality of the image. Spider Monkey Optimization (SMO) and Particle Swarm Optimization (PSO) are the two algorithms which are used for the image compression.

**Dengue Fever classification using SMO Optimization Algorithm**

**Abstract:** In today’s world, millions of cases of dengue are reported ever year. The number of cases has amplified, vexing many individuals. For prediction of dengue clinical methodology comprises of antigens and anti-bodies tests. The tests are conducted on the blood samples collected from the patients. In our proposed system we are stratifying dengue into Dengue Fever (DF), Dengue Hemorrhagic Fever (DHF) and healthy patients. The dataset [GDS5093] being referred in this proposed model are of acute dengue patients. Existing work uses PSO approach which achieved the accuracy of 90.91%, in order to achieve high accuracy, we are using optimization algorithms like Spider Monkey Optimization (SMO and to increase the optimality of the model, we have also used Probabilistic Neural Network (PNN). PNN uses feed forward technique for classification.

**Designing fuzzy rule base using Spider Monkey Optimization Algorithm in cooperative framework**

**Abstract:** The paper focusses on the implementation of cooperative Spider Monkey Optimization Algorithm (SMO) to design and optimize the fuzzy rule base. Spider Monkey Optimization Algorithm is a fission-fusion based Swarm Intelligence algorithm. Cooperative Spider Monkey Algorithm is an off-line algorithm used to optimize all the free parameters in a fuzzy rule base. The Spider Monkeys are divided into various groups the solution from each group represents a fuzzy rule. These groups work in a cooperative way to design the whole fuzzy rule base. Simulation on fuzzy rules of two nonlinear controllers is done with a parametric study to verify the performance of the algorithm. It is observed that the root means square error (RMSE) is least in the case of SMO than the other evolutionary algorithms applied in the literature to solve the problem of fuzzy rule designs like Particle Swarm Optimization (PSO), Ant Colony Optimization algorithm (ACO) algorithms.

**Disruption Operation-based Spider Monkey Optimization Algorithm**

**Abstract:** Spider monkey optimization (SMO) algorithm, is a neoteric Swarm Intelligence based algorithm, inducemented from the social comportment of spider monkeys, commonly known as fission-fusion social system. Despite of perpetuating an equilibrium state betwixt intensification and diversification by its own, SMO sometimes converges at a particular point due to its swarming nature. To overcome this problem, a new stage namely disruption stage is incorporated with SMO. The proffered variant is named Disruption operator-based spider monkey optimization (DiSMO) algorithm. In the incorporated stage, the disruption operator helps to scatter the swarms in convergence condition and according to the difference from the best solution, this operation is employed to entire solutions so that the solutions might attract or distract from the best solution. Further, the efficiency of the proffered strategy is estimated over 12 different benchmark functions and the outputs are being compared with basic SMO, its significant variant: power law based local search in SMO (PLSMO), and particle swarm optimization (PSO).

**Simulation of QoS Parameters in Cognitive Radio System Using SMO Algorithm**

**Abstract:** Cognitive radio (CR) is the current growing technology in wireless communication field and has increase the ability to use the frequency spectrum more properly. The main objective of cognitive radios is to sense the surrounding and use primary user’s vacant spaces and allot them to the secondary users without interference each other. This paper presents the optimal solution and optimizes the Quality of services (QoS) parameters to minimum i.e. smaller as compare other solutions which are induced by different optimization techniques Simulated Annealing (SA) and Genetic algorithm (GA). The proposed algorithm called spider monkey optimization algorithm (SMO). SMO is a swarm intelligence technique which works on foraging behavior of spider monkeys. SMO is tentative and lapse based synergetic iterative process. Spider monkeys have been categorized as fusion fission social structure (FHSS) based animals and they divides. into smaller subgroups and search food. The proposed algorithm has been used to optimize the performance of QoS parameters in terms of minimum power consumption, minimum bit error rate (BER), maximum throughput, minimum interference and maximum spectral efficiency. The simulation results show that the fitness scores obtained by the proposed algorithm i.e. SMO are better (smaller) than SA and GA algorithm in the optimization of QoS parameters of cognitive radio system. The proposed algorithm is better (smaller) than the existing algorithm.

**Spider Monkey Based Improve P&O MPPT Controller for Photovoltaic Generation System**

**Abstract:** Photovoltaic (PV) system uses maximum power point tracking (MPPT) technique to maximize its power output. This paper presents a swarm inspired optimization-based control method for the MPPT of a PV system. In particular, control methods of perturb and observe (P&O)-proportional integral (PI) and optimization of this controllers using spider monkey optimization (SMO) for MPPT control of PV generator are proposed. A well-known PI controller is tuned using spider monkey algorithm and tested on a simulated stand-alone PV system with local load. The proposed SMO based PI controller enhances the P&O MPPT technique to track the maximum power point (MPP) more rapidly and accurately. The design algorithm of this controller is presented with its simulation results. Simulation results under different environmental conditions are presented and discussed to verify the satisfactory performance of the proposed control, in which the optimized P&O-PI controller by SMO algorithms gives the better performance technique over the traditional control methods.

**Spider Monkey Optimization: a survey**

**Abstract:** Algorithms inspired by the intelligent social behavior of simple agents have become popular among the researchers in the recent years. These algorithms are able to find the solution of those real-world optimization problems, which otherwise cannot be solved easily by deterministic techniques. Spider Monkey Optimization (SMO) is one such algorithm which is inspired by the intelligent behavior of spider monkeys. SMO and its variants have been successful and effective in dealing with complex real-world optimization problems due to its high efficacy. This paper presents an intense review of SMO, its variants, applications and relative performance with other algorithms

**Spider Monkey Optimization Algorithm: Estimation of Frequency-Modulated (FM) Sound Waves**

**Abstract:** Spider Monkey Optimization (SMO) algorithm is most recent swarm intelligence-based nature inspired algorithm which mimics the intelligent behavior of spider monkeys while searching for food. Frequency-Modulated (FM) sound wave synthesis has an imperative function in more than a few contemporary music systems and to optimize the parameter of an FM synthesizer is an optimization problem with six dimensions. However, it is found that the SMO algorithm is good in comparison to another competitive population-based algorithm. Therefore, in this paper a self-adaptive Spider Monkey optimization (SMO) algorithm is presented to solve parameter estimation for frequency-modulated sound wave. The proposed strategy is self-adaptive in nature and therefore no manual parameter setting is required. The proposed technique is named as an Adaptive Spider Monkey optimization (ASMO) algorithm. ASMO gives better results for parameter estimation for frequency-modulated sound wave in comparison to other considered algorithms like basic SMO, ABC and DE.

**Spider Monkey Optimization Based Fuzzy-2D-PID Controller for Load Frequency Control in Two-Area Multi Source Interconnected Power System**

**Abstract:** This paper presents a novel fuzzy logic based Two Degree of Freedom Proportional, Integral and Derivative controller (F2DPID) for load frequency control (LFC) in an interconnected two area multi-source power system. Spider Monkey Optimization (SMO) algorithm is used to optimize the controller parameters. Superiority of the proposed controller in terms of dynamic performances is established by comparing the results with conventional PID, two degree of freedom PID and fuzzy logic based PID controller. Initially, the study is carried out by considering the power system without any nonlinearity and then the study is extended by including nonlinearities like Governor Dead Band (GDB) and Generation Rate Constraint (GRC) in the same power system. The result is analyzed in terms of various time domain specifications such as settling time, peak undershoot, and peak overshoot of frequency and tie-line power deviations for Step Load Perturbation (SLP) of 1% in area-1.