**Anarchic Society Optimization**

**Introduction**

Anarchic is derived from the Greek Word *anarkos* meaning “no boss” and Anarchia means “lack of government”. The term Anarchism refers to a political opinión and movement believing that any political power and authority are obsece and unnecessary and that any government should be overthrown and replaced with free associations and volunteer groups. Because the Anarchism believes that the government causes a nation’s social misteries. Overall, Anarchists are opposed to any authority and consider individual freedom. This emphasis results in opposition to any external authority, especially government, which is construed as a barrier for free individual growth and excellence.

Anarchism contains a variety of branches. According to the Communist Anarchism, human is inherently social, and society and its individuals benefit each other. Human and society conformity is posible when negating the powerful social institutions, especially government.

According to the view of Anarchists, a society can be managed without the need of the central government and only based on individuals or volunteer groups. In this case, individuals or groups will be able to determine the right direction without being ordered by a ruling power and only based on their others’ previous experiences. Although this viewpoint has not been prosperous in stable management of a society so far, it can be used as a basis for developing optimization methods in engeneering sciences.

In this method, each individual selects his next position according to the personal, group and historical experiences. Finally, after a number of moves, at least one of the group members would reach a near-optimal answer. Employing this algorithm causes the total decisión space to be fully searched and prevents being stuck at local optima. [<https://books.google.com.mx/books?id=5HIqDwAAQBAJ&pg=PA38&lpg=PA38&dq=anarchic+society+optimization&source=bl&ots=xldzU41dAr&sig=ACfU3U2jqmGfQWa3wXeCiU-2h-OlmJmP7w&hl=es-419&sa=X&ved=2ahUKEwjxppLX7b7pAhUPQK0KHQOvAukQ6AEwC3oECAoQAQ#v=onepage&q=anarchic%20society%20optimization&f=false>]

Socio-inspired algorithms are one such very recent and upcoming class of optimization algorithms, which use the idea of simulating and mimicking social learning of humans (or social evolution). The notion of Cultural Algorithms [36] was first introduced by Reynolds as early as which states that individuals evolve much faster through cultural evolution than through biological or genetic evolution alone. Humans adapt to mannerisms and behaviours by observing/imitating other individuals which helps them improve their intelligence quickly and achieve shared goals. The tendency to cooperate and function together as a cohesive group adds to their collective intelligence. [<https://www.sciencedirect.com/science/article/pii/S0167739X17317259?casa_token=xCyTKNzfvyQAAAAA:ipX128Av5rL6UlmIk2P5-L0_AUoNekuiLXk84BmiAS8G1kWC31nwfbX-MxVUyg5Sxo4Fa6a6uLNA>]

Within the socio-inspired algorithms, we can categorized them taking the social phenomenon that models as basis:

* Cooperative interaction in order to improve their overall behavior.
* Competition between the individuals in the pursuit to be the strongest or its self-goal.
* Learning from others based on their behavior, or on the response of the self-behavior
* Cooperation and competition.
* Giving support to the fitest individual.
* Following of ideologies or beliefs to achieve their goals.

Anarchy, defined as a system in which participants can seize and defend resources without regulation from above, is not chaos but rather a spontaneous order. However, anarchy is fragile and may dissolve either into formless "amorphy" or into a more organized system such as hierarchy. Under anarchy, each contestant balances between productive exploitation of the current resource base and fighting to acquire or defend resources. Anarchy is sustainable only when there are strongly diminishing returns to fighting effort (the "decisiveness parameter" is sufficiently low) and incomes exceed the viability minimum. These considerations explain many features of animal and human conflict. [<https://www.journals.uchicago.edu/doi/pdfplus/10.1086/261974>]

**Problem**

**Nowadays Aplications**

This algorithm has been investigated for solving electrical and industrial engeneering problems and optimizing water networks and resevoir operation.

* Shayeghi & Dadashpour applied the ASO algorithm for optimizing a problem in the electronic field, compared with other methods such as PSO, and proved that the ASO algorithm was superior in convergence and computation efficiency.
* Ahmadi-Javid & Hooshangi-Tabrizi used the ASO algorithm for optimal problems with two objective functions in the field of industrial engineering. They demonstrated the superiority of this algorithm to PSO.
* Ahmadi-Javid & Hooshangi-Tabrizi applied the ASO algorithm for permutation scheduling flow problems with a linear objective function, showing the effectiveness of the ASO algorithm in such an application.

Karun-4 resevoir

The operations of a single-reservoir hydropower system (Karun-4 reservoir) and a four reservoir

system with the objective of maximizing the profits of releases are optimized. The objective

function values of the ASO algorithm and the genetic algorithm (GA) for Karun-4 reservoir are 1.254 and 1.535, respectively. The objective function value from the ASO algorithm is very close to the global optimum (1.213) from the non-linear programming (NLP). The optimal solution of the ASO algorithm for the four-reservoir system covers 93.88% of the NLP value, while the GA model only accounts for 91.86% of the global optimum, indicating that the ASO algorithm does have better performance.

For this problema has been used classical methods like Non-Linear Programming (NLP), Differential DP, Multi-objective DP, Stochastic DP (this two are subject to the curse of dimensionality and discretization of reservoir storage and inflow). But this models have some computational assumptions ehich reduce their efficency and flecibility.

And so evolutionary and heuristic methods like GA, PSO, Honey-bee Mating Optimization (HBMO), Intelligent Water Drops (IWD) algorithm, Biography-Based Optimization (BBO), Firefly Algorithm (FA), Water Cycle Algorithm (WCA)

Karun-4 reservoir is located in Chaharmahal and Bakhtiari (geographic coordinates: 35°310’ N, 50°240’ E). The reservoir was built for hydroelectric power generation. Figure 4 shows the area-volume-elevation relationships of Karun-4 reservoir.

**Variants**

PASO (Parallel Anarchic Society Optimization)

* Performance improvement of cloud security