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DESIGN OPTIMIZATION OF CIRCULAR ANTENNA ARRAY WITH ALGORITHM MFO

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Abstract— In this paper MFO algorithm is used to minimize losses so that signal reaches to its destination easy and process it better. MFO algorithm is like a insects, which moves in one way by maintain a single route with moon so that travel distance will be much longer. Due to this output will be minimum and response will be much better. However, it will solve the equations which will be beneficial for upcoming technology and produce the better results.

Keywords— Optimization, MFO Algorithm, and Nature inspired computing

I. INTRODUCTION

Optimization is a method to finding an alternative with the most cost effective or highest achievable performance under the given constraints, by maximize desired factors and minimizing undesired ones. In comparison, maximization means trying to attain the highest or maximum result or outcome without regard to cost or expense. Practice of optimization is restricted by the lack of full information, and the lack of time to evaluate what information is available (see bounded reality for details). In computer simulation (modeling) of business problems, optimization is achieved usually by using linear programming techniques of operations research.

II. FLOW CHART

- Function = (@) Function has value
- Feature = Numbers has size
- Repetiton of process = In maximum number
- Number = Numbers has values i.e. agents.
- Less edge = Bound Of Variable has lower limit
- High edge = Bound Of Variable has upper limit.
- When values combine with each other then iteration will be developed.
- Two number must define, less and high edge.

III. MOTH FLAME OPTIMIZER

Moth flame algorithm is a very effective way to reduce the values of equations in an easy form, due to which it helps in finding the better way of results as compared to other algorithms.

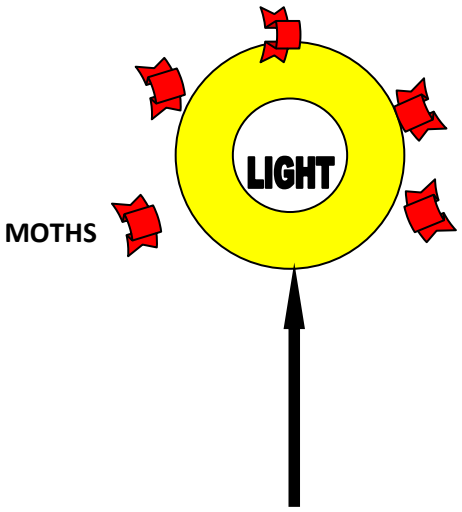

Fig .1 Moth Flame Optimization

Due to advancement in technology many new algorithms are available but MFO is newly technique. Like, the insects follow the light and travel with it, same as in this algorithm it follows the signal of antenna and travel in straight line. MFO algorithm

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also compared with some other algorithms like (PSO) particle swarm optimization, (GWO) grey wolf optimization, and (GN) genetic algorithm. MFO provide very effective performance during transmission of signals. It is also a population based algorithm.

IV. GEOMATERY

Pattern of radiation can be followed by array factor, which is given as follows:

$$\mathbf{AF}\ (\boldsymbol{\theta}, \emptyset) = \sum_{\mathbf{n=1}}^{\mathbf{N}} \quad \mathbf{In\ exp(j[ka\ sin(\theta)\ cos(\emptyset - \emptyset n) + an])}$$

Where

$$\mathbf{ka} = \frac{2\pi}{\lambda}\mathbf{a} = \sum_{\mathbf{i=1}}^{\mathbf{N}} \mathbf{di}$$

$$\boldsymbol{\phi n} = \frac{\mathbf{2\pi}\sum_{\mathbf{i=1}}^{\mathbf{N}} \mathbf{di}}{\mathbf{ka}}$$

$$\mathbf{an} = \mathbf{-k\,a\ \ sin(\theta)\ cos(\phi o - \phi n)}$$

In equations, In and A tells the amplitude and phase of the nth element. Also, An represents the arc separation (in terms of wavelength) between element n and element n–1 (d1 being the arc distance between the first (n ¼ 1) and last (n ¼ N) elements), /n is the angular position of the nth element in the x–y plane, / is the azimuth angle measured from the positive x - axis.

V. FITNESS FUNCTION

To solve complex equations we need fitness value, so that by using them we reach through outcome. Here is the fitness function from where variables will solve.

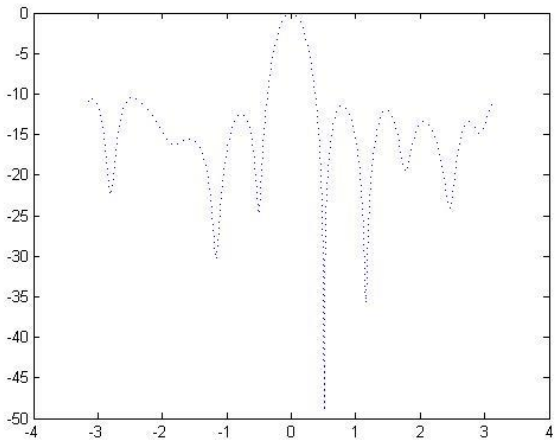
$$\mathbf{Fitness = 10\ log\ \{(W1F1 + W2F2)/\ |AF\ max\}^2}$$
$$\mathbf{F1 = \{AF\ (\phi nu1)|^2 + |AF(\phi nu2)\}^2}$$
$$\mathbf{F2 = max\ \{AF\ (\phi ms1)|^2\ ,\ |AF\ (\phi ms2)\}^2}$$

Array factor is minimized by two major angles i.e. nu1 & nu2. It also tells the side lobe level in which the values will be less and their performance will be better. Function F2 will decrease the values to its minimum level so it will be easier to find the results. W1 & W2 are weight factors. Current amplitude being search by solving problem of optimization.

VI. GRAPH & RESULTS 0F VARIABLES

1. Graph of 10 Variables

Gain



Angle in Radian

Fig. 2. Graph of 10 Variable

2. Result of 10 Variables

10 VARIABLE	
AMPLITUDE	SPACING
0.9777	0.9880
1.0000	0.3974
0.7335	0.7339
0.3922	0.3407
1.0000	0.3000
0.9964	0.9453
1.0000	0.5759
0.3754	0.9356
1.0000	0.3000
0.9310	0.7439

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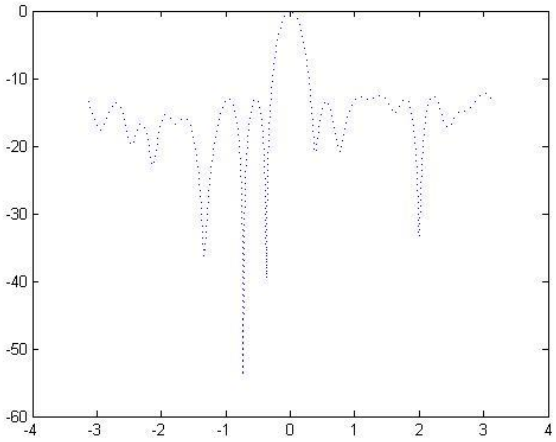
3. Graph of 12 Variables

Gain



Angle in Radian

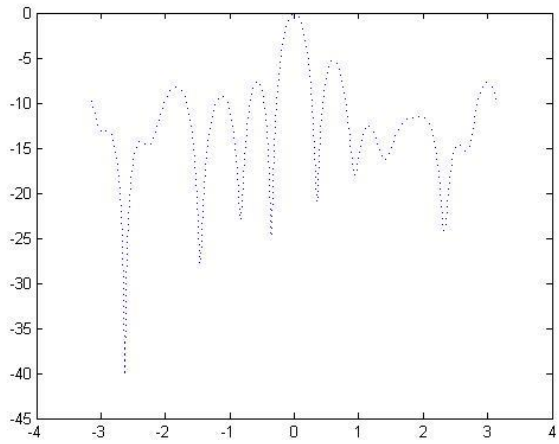
Fig. 3. Graph of 12 Variable

4. Result of 12 Variables

12 VARIABLE	
AMPLITUDE	SPACING
0.6641	1.0000
0.8097	0.3133
0.4173	0.4746
0.3803	0.8487
0.5559	0.6576
1.0000	0.9984
0.7446	0.7069
0.9071	0.8022
0.3685	0.8442
0.9161	0.6787
0.7036	0.6775
0.5669	0.4825

5. Result of Program

Gain



Angle in Radian

Fig. 4. Graph of Program

VII. CONCLUSION & FUTURE SCOPE

Conclusion:-

- By using new algorithm i.e. MOTH FLAME OPTIMIZATION algorithm, with this new results are formed and side lobe level and beam width may reduce in circular antenna array. Due to this response will be better.

Future Scope:-

- In future it also helps to solve complex arrays like hexagonal and spherical where solution is difficult to solve.
- New hybrid algorithms can be developed and applied to arrays.

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