Optimized to current weight value in linear antenna array by using chaotic optimization technique for WI-MAX application

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***Abstract* - In this paper we are using chaotic, optimizing technique for synthesis of broadside and end-fire linear antenna array in WI MAX technology .Directivity is defined as the ratio of radiation intensity in given direction to the average radiation intensity in that direction .Our focus in this research to increase the directivity and reduce the side lobe levels. A new chaotic optimizing algorithm has been introduced to decrease the side lobe levels by reducing radiated power and increase the radiation intensity for long distance communication. Simulation result shows that the CHAOTIC optimizing algorithm by achieving much greater reduction in side lobe levels and much more improved beam width. The optimized current weight value and inter element spacing. As compared to WO, and PSO optimizing techniques.**

***Keywords* - Linear antenna array, Array factor, PSO, Chaotic algorithm, WI-Max**

I.INTRODUCTION

With the advent of technology and recent developments in communication, wireless communication has reached to high level of communication. Recent updates in wireless communication were not possible without application of smart antennas. Use of smart antennas is one of the vital characteristic that has led to third and fourth generation standard developments. However, smart antenna theory always driven by the antenna array and so do the wireless communication. With antenna pattern synthesis there come speed and robustness to the existing system thereby improvising transmission parameters[2]. Along with this radio wave propagation is a matter of research that accounts to faster and reliable transmission, since wireless is generated from the roots of radio communication. However, there is a long way to go and research will contribute entirely for new upgrades in it. The primary objective of this paper is to study the effect of linear array antenna on WI-MAX technology and then the optimization of a linear array antenna using chaotic for side lobe level reduction thereby improving the radiation intensity[8].

II.THEORY

In this section a brief description of chaotic optimization technique, flow chart of chaotic algorithm is discussed.

Chaotic Optimization

Chaos states disorder and irregularities within a system. In order to enforce non-chaotic behaviour, it is imperative to design a control of chaos. Two possibilities exist in order to accomplish a system that does not converge to an attractor or diverge to an edge as given in figure1 [3]. The first possibility is to detect whenever a chaotic system is about to arise and design a feedback system in order to bypass the chaotic region. In order to find the global minima, the population needs not converge, but stay robust. Robustness is critical in order to map the solution space. Even when the objective function has converged, the ordering of the individual solutions is diverse. Therefore the approach proposed is to keep the solutions diverse throughout the evolution, by generating a distance between the solutions spread instead of the objective function of the solution. In order to do this, intelligence has to be incorporated within the solutions. The overriding approach is to incorporate population dynamics within the solutions in order to organize a feasible propagation approach. The processes required to have a controlled propagation is described in the following sections. The methodology introduces the approach in terms of discrete optimization, specifically permutation based as a means to describe the different processes. In this approach individual solutions is diverse. Therefore the approach proposed is to keep the solutions diverse throughout the evolution, by generating a distance between the solutions spread instead of the objective function of the solution. In order to do this, intelligence has to be incorporated within the solutions. The overriding approach is to incorporate population dynamics within the solutions in order to organize a feasible propagation approach[13]. The processes required to have a controlled propagation is described in the following sections. The methodology introduces the approach in terms of discrete optimization, specifically permutation based as a means to describe the different processes.

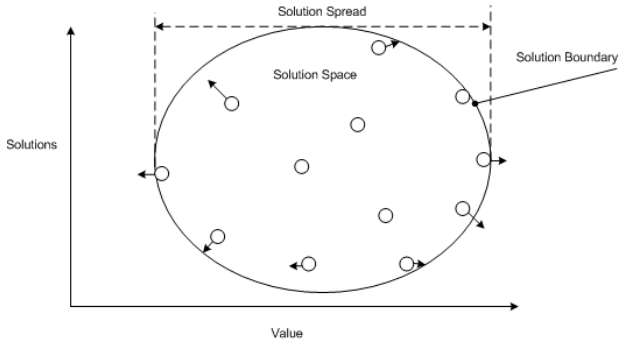


Figure 1: Conceptual diagram of attraction and edge

Flow Chart Of Choitic Optimizing Algorithm

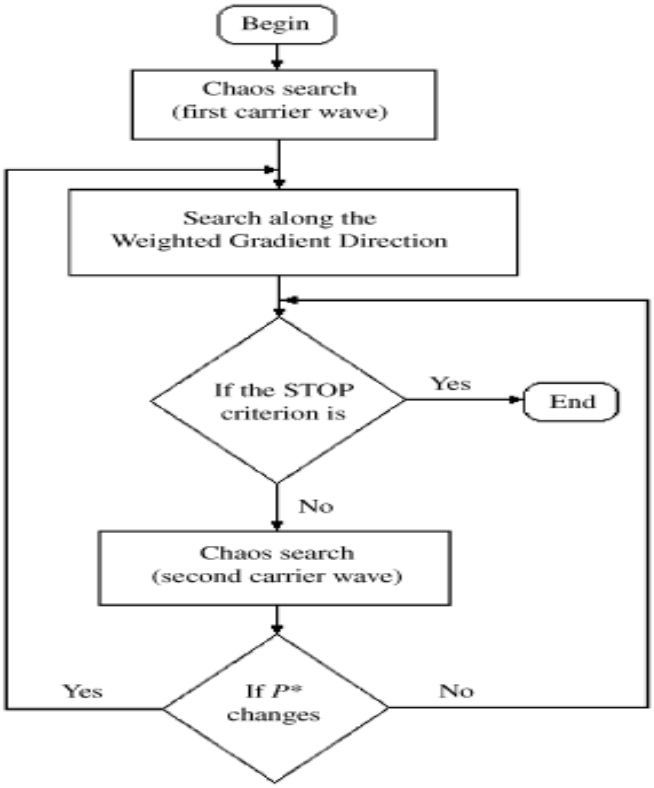


Figure 2: Flow chart of chaotic optimization [3]

III. PROBLEM FORMULATION

For wireless communication directivity is important factor for long distance communication. By using antenna array the directive is increase but it also introduces additional side lobes levels. Side lobe levels contain total wastage of energy and increases interference and noise level. For increase the long distance communication directivity must be high and radiated power is low. To decrease the sides lobe level a new optimization called as chaotic technique is proposed in this work.

IV RESULTS

To illustrate the optimizing technique described above for synthesis of linear antenna array for WI-MAX technology the following parameter are consider which is given in table 1.The radiation pattern of without optimizing technique is shown in figure 3. The radiation pattern of PSO with reduce side lobe levels is shown in figure 4.The radiation pattern of chaotic with reduce side lobe levels is shown in figure 5. Table 2 gives the comparison between of WTO, PSO and chaotic optimizing algorithm for various parameters. This parameters are side lobe levels, directivity, beam width and convergence time.

Table 1: Parameters For Multiple Optimization Techniques

S. No	PARAMETER	VALUE
1	Frequency of operation	3.3GHz
2	Spacing between elements(d)	4.5cm
3	Phase between two elements	0 radian
4	Number of elements	5
5	Output parameters	SLL, Directivity, Beam width

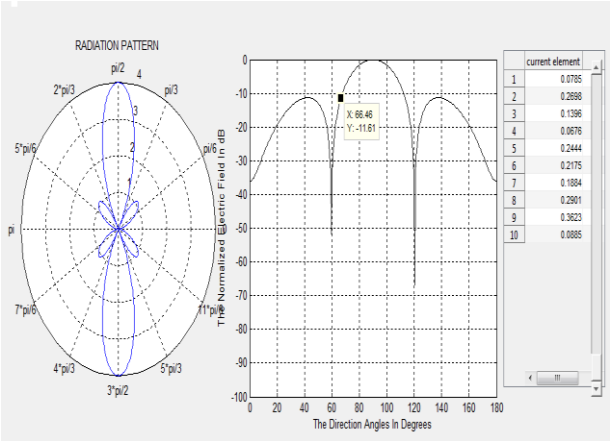
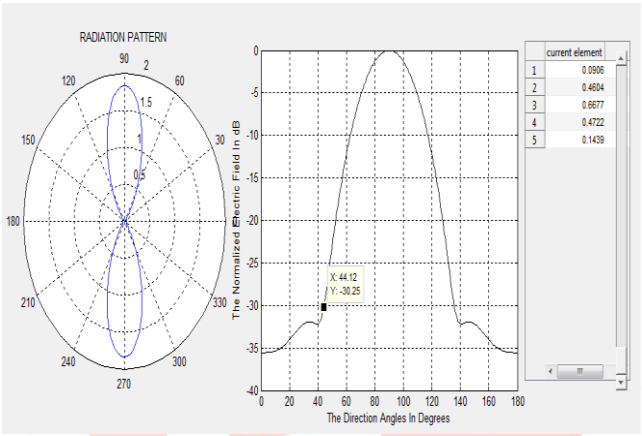


Figure3: Unoptimized Radiation Pattern with N=5 elements



Fgure4: Optimized Radiation pattern with reduce side lobe level -31.93 dB for N= 5 element (PSO)

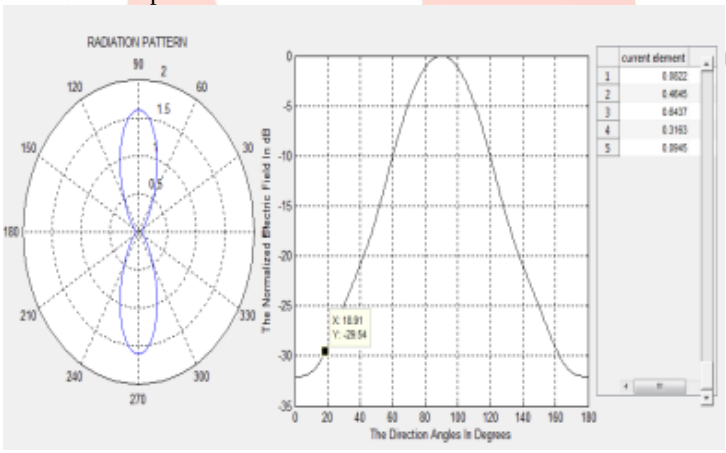


Figure 5: Optimized Radiation pattern with reduce side lobe levels -34.63 dB for N= 5 elements (CHOITIC)

Table 2: Comparison Between Without Optimization, Pso And Choitic Method For N=5 Elements

S.I	PARAMETER	WOP	PSO	CHOITIC
1	Side Lobe Level (in dB)	-12.044	-31.93	-34.63
2	Directivity (in dB)	12.66	11.41	10.68
3	Beam width (in degree)	12.44	30.25	29.54
4	Convergence time (in Sec)	Nil	6.96	6.16

IV. CONCLUSION

In this paper, it has been demonstrated that the side lobe levels are successfully reduced by using chaotic optimizing algorithm in linear antenna array for WI-Max technology. Chaotic algorithm increases the radiation intensity in the direction of propagation while reducing the radiated power. The chaotic algorithm gives fast response because its convergence time is lower than PSO. The directivity and beam width is lower in chaotic algorithm as compare to PSO. Simulation results shows that chaotic optimizing

algorithm is better in reduction of side lobe levels as compare to PSO when number of 5 element are consider in WI-MAX technology.

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