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TRM ANTENNA FAILURE USING GENETIC ALGORITHM

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Abstract: *TRM array antenna is working in wireless communication networks. There are plentiful of drawback that can take place although the transmission of the data. The furthermost imperative drawback is of antenna is specifically its failure. In addition to this, if any receiving antennas get damaged, it is difficulty from a routing table to generate a routing set which is feasible without damaged antenna. Formerly the whole emission arrangement acquires inarticulate, customarily because of amplified SLL. In this paper, genetic algorithm has been used for the optimization of TRM antenna failure. During the operation of an array antenna system TRM failure can occur at any time. When a TRM failure occurs the TRM is supposed to be turn off as we know Genetic algorithm is more powerful for problems with one or more variables and local minima. So, genetic algorithm is very efficient for the implementation of array antenna structure. The whole system has taken place in MATLAB environment.*

Keywords: *TRM, TRM antenna failure, Genetic Algorithm, SLL.*

I. INTRODUCTION

In the wireless communication system, the antenna array is one of the utmost essential components which helps to increase the given capacity of the system and spectral efficiency of the system. The active antenna array is broadly used in numerous applications which can be more of like satellite communication, sonar, mobile communication etc. for the purpose of signal acquisition. These array antenna systems are installed on the outside over quite long period of time [2]. For that particular reason, a several number of factors such as degradation occurred in the performance of several solid-state devices, which also includes numerous number of semiconductor, integrated circuits and RF circuits, or some changes occurs in the features of the active devices which can worsen the performance of the complete system. Bending of the beam pattern cut down the performance of the whole system. Normally, the antenna array usually consists of huge number of various radiating elements due to which large number of elements is presented in an array, there is every time a probability of failure of the one or more elements present in the antenna array system. The catastrophes of elements in the array terminate the actual symmetry and which later on may be the reason of sharp variation in the field intensity across the given array and this also alter the pattern in the form of an increased side lobe level. In more or less situation like In a space platform the replacement of any defective element of the array is not imaginable.

The TRM antenna is the very unique component of a Wireless System Network. It is mostly used in the Wireless network to advance the throughout and efficiency of the network. The TRM antenna is widely used in satellites, SONAR for getting hold of signals.

II. TRM FAILURE COMPENSATION USING GA

Due to very large number of arrays presents, on occasion TRM antenna catastrophe takes place. When a transmitter/receiver module (TRM) error arises, the beam arrangement is inaccurate. In these cases, resynthesizing of the optimal beam pattern with all working TRMs, without failed TRM, is desirable to use for repair or replacement of the TRM. The deprivation of the volume of transmitter/receiver module (TRM) changes the beam pattern; that is, the side lobe level (SLL) will increase [3].

To recover from such hazards different researchers have put their efforts into this stream. One major fact regarding the antenna failure is that the communication system should not stop in between even though if the antennas are not working properly. It means that we need to find the alternating paths if the current path is not working and that should be dynamic.

During the operation of an array of the antenna system, the TRM catastrophe can happen at any time. When a TRM catastrophe arises, the TRM is thought to be turned off. When recalculation is complete with the left over TRMs, a resynthesized beam arrangement is created within a beam pattern mask. Then, the newly calculated amplitude and phase distributions are reset. In TRM Antenna Transmission using MIMO system reduces bit error rate has been challenge from decade. In addition to this, if any receiving antennas get damaged, it is difficulty from a routing table to generate a routing set which is feasible without damaged antenna. Our basic problem is to generate a routing table by using GA [4].

Lot of research has been done on the optimization of the antennas, but our focus will be on the use of Genetic Algorithm (GA). Firstly, 2 antennas failure takes place, checking of them takes place. Then compensation will be done by using GA. GA is one of the most advance techniques which is getting used world wide web for each and every purpose. GA has been used for the optimization of the TRM antenna failure. By using this, the side lobe level (SLL) decreases comparatively. During the operation of an array antenna system, TRM failure can occur at any time. When a TRM failure occurs, the TRM is supposed to be turned off. Then implementation of optimization method takes place. Genetic algorithm is a class of Evolutionary Algorithm via natural selection that works on the principle of survival of the fittest.

This optimization Algorithm is more powerful for the problems with several amount of variables and local minima given. GA is very well-organized in discovering the whole search space or any of the solution space, which is very large and difficult. The Genetic algorithm is executed using computer simulation, hiring a residents of individuals, which is the solution space. The individuals undergo the selection process by evaluating the fitness function, using several operators such as mutation and crossover. Simple Genetic Algorithm was first created by John Holland in the 1960s which provides a substitute technique for solving many problems, likewise finding some optimal parameters, which would else be difficult to find for traditional methods we use. The selection procedure is significant as it declares survival of the best fit individuals. The best fit individuals have the smallest cost function.

III. PROPOSED METHOLODOGY

A. METHODOLOGY

The optimization of TRM antenna failure using Genetic Algorithm will takes place in following manner:

STEP 1: Firstly, we generate a pattern for antenna.
STEP 2: When TRM antenna failure occur then we apply genetic algorithm for optimization of antenna failure.
STEP 3: After optimization, we will check if there is decrease in side lobe levels using GA.
STEP 4: If it is optimized and level of SLL decrease then the process will stop.
STEP 5: If it is not optimized, then we call GA again for optimization until there is any decrease found in side lobe levels.

STOP

B. FLOWCHART

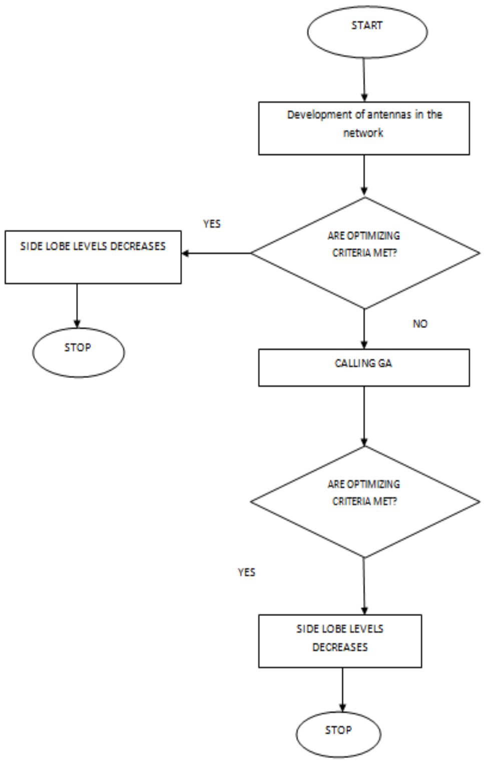

Figure 1: Flowchart of Proposed Work

IV. RESULTS

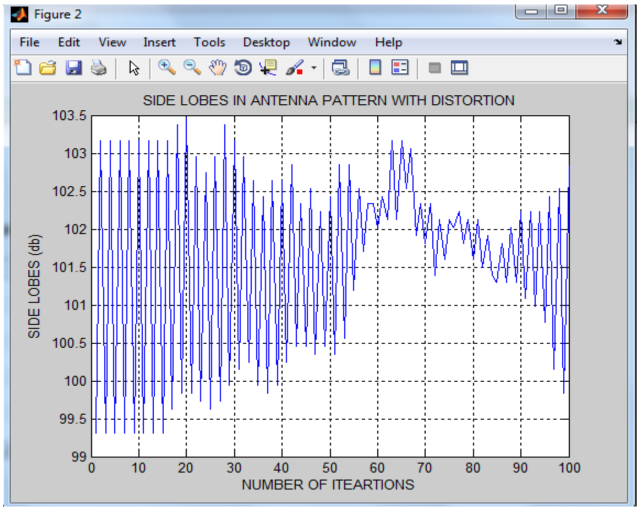

Figure 2: Side lobe in antenna pattern with distortion

The figure shown above describes the side lobe level of the signal whose units have been described on their axis. This is the uncompensated structure with distortion. The y axis is the side lobe level and the x axis represents number of iterations.

Figure 3: convergence time

Above Figure shows the value of Convergence time in antenna network during SLL lobe presence and it has found to be 30.6815 sec.

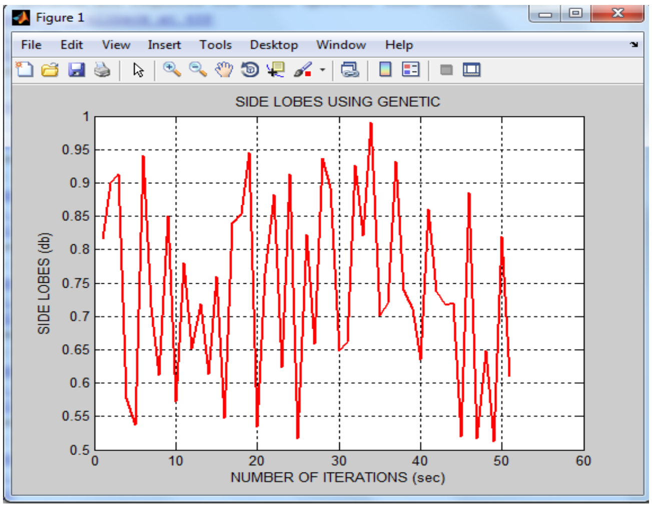

Figure 4: Side lobes using genetic algorithm

The figure shown above describes the side lobe level of the signal whose units have been described on their axis .This is the compensated structure using the GA algorithm. The y axis is the side lobe level and the x axis represents the deviation of angle.

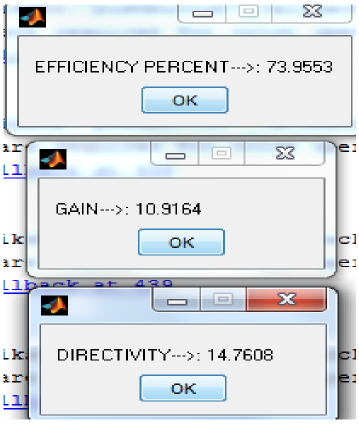

Figure 5: Energy Value, Gain Value And Directivity Value

Above Figure shows the value of energy consumed in antenna network during SLL lobe presence and it has found to be 73.95%, the value of GAIN in antenna network during SLL lobe presence and it has found to be 10.91 and the value of directivity in antenna network during SLL lobe presence and it has found to be 14.76%.

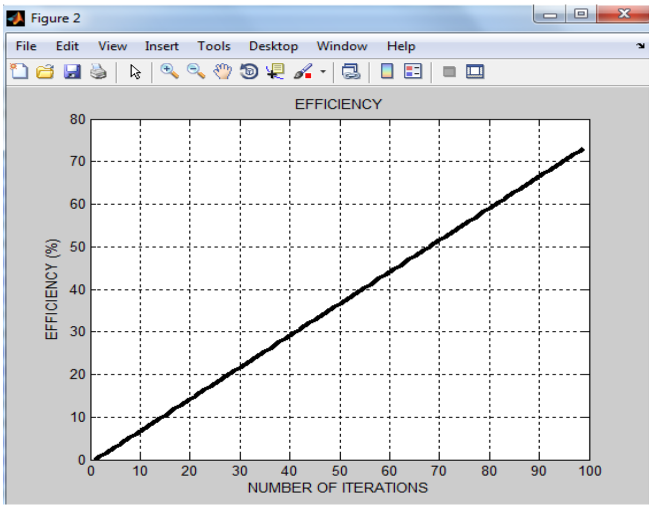

Figure 6: Efficiency graph

Above figure shows the efficiency in the antenna network. Above figure shows the high efficiency in antenna network when SLL compensation is done using GA.

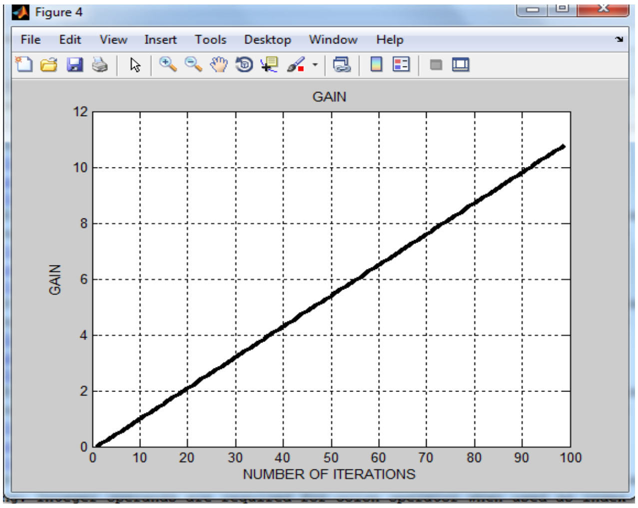

Figure 7: GAIN graph

Above figure shows the GAIN Graph in the antenna network. Above figure shows the high GAIN value in antenna network when SLL compensation is done using GA.

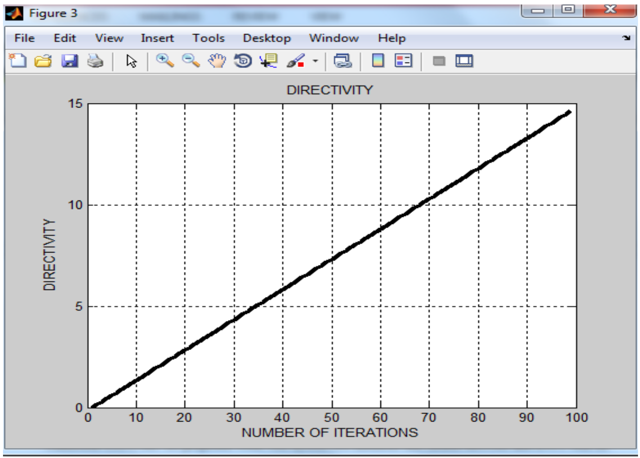

Figure 8: Directivity Graph

Above figure shows the Directivity in the antenna network. Above figure shows the high directivity in antenna network when SLL compensation is done using GA.

CONCLUSION

There are numerous benefits towards a linear array system. These also consist of great reliability, high beam agility, stress-free maintainability, as well as multi-beam multi-target applications. The shortcomings take account of inflexibility in adding new frequencies, much higher price at the present-day, convolution of multi-frequency operations, and lower gain at lower elevations for a linear array antenna. The technology hazards in addition to the cost drivers embrace, first and foremost, the T/R modules then the beam-forming network architecture and after this implementation. We propose that, as a proof of concept demonstration, a small linear array antenna be built and tested, in order to prove the maturity of the concept and in the direction of working out the impending issues at the T/R module as well as the beam-forming stages, for achieving a GA level performance. So GA will produce the best alternate path when one antenna fails to transmit the number of data packets.

There are several future generation algorithms which can be combined with GA to optimize the results like, neural networks or fuzzy logics. The future researchers can try their hands on this scenario.

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