

# **Animal migration optimization algorithm applied to antenna synthesis**

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*Dissertation submitted to the  
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in partial fulfilment of the requirements*

*of the degree of*

***Master of Technology***

*in*

***Electrical Engineering***

*by*

***Ambati Sangeetha***

(Roll Number: 214EE1212)

*under the supervision of*

***Prof. K. R. Subhashini***



May, 2016

Department of Electrical Engineering  
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May 28, 2016

## **Certificate of Examination**

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Title of Thesis: Animal Migration Optimization algorithm applied to antenna synthesis.

We the below signed, after checking the thesis mentioned above and the official record book (s) of the student, hereby state our approval of the dissertation submitted in partial fulfilment of the requirements of the degree of Master of Technology in Electrical Engineering at National Institute of Technology Rourkela. We are satisfied with the volume, quality, correctness, and originality of the work.

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**Prof. K. R.Subhashini**

May 28, 2016

**Supervisor's Certificate**

This is to certify that the work presented in this dissertation entitled " *Animal migration optimization algorithm applied to antenna synthesis* " by "Ambati Sangeetha", Roll Number 214EE1212, is a record of original research carried out by him/her under my supervision and guidance in partial fulfilment of the requirements of the degree of *Master of Technology in Electrical Engineering*. Neither this Thesis nor any part of it has been submitted for any degree or diploma to any institute or university in India or abroad.

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*K. R.Subhashini*

## *Dedication*

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*This work is dedicated to my lovely parents and  
inspiring guide*

## Declaration of Originality

I, Ambati Sangeetha, Roll Number 214EE1212 hereby declare that this dissertation entitled "*Animal migration optimization algorithm applied to antenna synthesis*" represents my original work carried out as a postgraduate student of NIT Rourkela and, to the best of my knowledge, it contains no material previously published or written by another person, nor any material presented for the award of any other degree or diploma of NIT Rourkela or any other institution. Any contribution made to this research by others, with whom I have worked at NIT Rourkela or elsewhere, is explicitly acknowledged in the thesis. Works of other authors cited in this thesis have been duly acknowledged under the section "Bibliography". I have also submitted my original research records to the scrutiny committee for evaluation of my thesis.

I am fully aware that in case of any non-compliance detected in future, the Senate of NIT Rourkela may withdraw the degree awarded to me on the basis of the present thesis.

May 28, 2016  
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# Abstract

In this thesis an Optimization Algorithm that is animal migration algorithm have taken and applied to antenna synthesis. This algorithm is a swarm intelligence technique which is an artificial intelligence technique, based on the self-organized system's behaviour. Optimization is nothing but getting a best solution from all possible solutions. If a situation is arises where there are lot of parameters are playing an important role in a problem then optimization is required to get the best solution.

This Animal Migration Optimization algorithm evaluated from animal's behaviour. There are two processes involved in this algorithm. In the first process, how animals will move from the present position to a new position which is based on a neighbourhood scheme which followed by ring topology. In the second process checks whether animal should stay in the group or not which is based on probability which is calculated based on the quality of fitness. This algorithm applied to antenna synthesis. To verify this AMO algorithm which is applied to antenna synthesis, convergence curve and AF plots for symmetric, Asymmetric and Circular geometry of antenna arrays are employed. For symmetric array geometry optimization of element spacing is done for different number of elements like 10, 28 and 32. For symmetric array geometry Optimization of excitations is done for 16 and 24 number of elements. Null detection is done for 28 and 32 number of elements and compared with other algorithms. For circular array geometry with 10 number of elements distance optimized, excitations and both optimized at a time. The proposed method has been compared with other optimization algorithms and finally sensitive analysis is employed.

Different distributions applied to AMO algorithm and finally worked out distribution explained. Convergence curve is shown for all distribution.

Later this thesis pattern multiplication Concept explained when isotropic elements are replaced by anisotropic elements (for example micro strip antennas) where frequency of Operation comes into picture in such cases pattern multiplication Concept arrives. Introduction to Patch antenna and Design Considerations explained and further introduced a concept called Polarization where each element rotated with some angle. Finally simulation is done and results explained. MATLAB software is used for the programming.