University of Moratuwa

WAVELET PACKET BASED ANTENNA RADIATION PATTERN ANALYSER

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The work presented in this dissertation has not been submitted for the fulfillment of any other degree.

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ABSTRACT

Analysis of antenna radiation patterns, especially in respect of antennas with complex shapes and sizes, require the adoption of numerical methods of obtaining solutions to electro-magnetic equations. Method of Moments (MoM) being one of such proven methods, still poses the problem of manipulation of large matrices.

Objective of this exercise is to investigate the possibility of using wavelet transform techniques in obtaining fast solutions for the matrix equations resulting from MoM method. Specific attention has been given to Discreet Wavelet Transform (DWT) and Discreet Wavelet Packet (DWP) transform methods in order to sparsify the large impedance matrices generated by MoM method.

Wavelet transform being a recently developed technique, the mathematical background and related theoretical aspects have been illustrated prior to analysing several examples of thin wire centre fed antennas.

Examples have been selected to demonstrate effective adaptation of Discrete Wavelet Transform and Discrete Wavelet Packet Transform techniques in obtaining solutions for the matrix equations in the analysis of thin wire antennas. Comparisons have been made with the conventional method of solving these matrix equations illustrating the improvement in the computation times as a result of sparsification of matrices using Wavelet transform methods with the extensive assistance of MatLab Wavelet Tool Box.

Having indicated the advantages of wavelet transform techniques over the conventional methods of solving large matrix equations, several suggestions have been made towards optimising the results obtained to be taken up as further research work.

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LIST OF ABBREVIATIONS USED

AIM	Adaptive Integral Method
CWT	Continuous Wavelet Transform
DWP	Discrete Wavelet Packets
DWT	Discrete Wavelet Transform
FMM	Fast Multipole Method
FT	Fourier Transform
IDWT	Inverse Discrete Wavelet Transform
IML	Impedance Matrix Localization Method
MoM	Method of Moments
MVM	Matrix Vector Multiplication
STFT	Short Time Fourier Transform
WT	Wavelet Transform

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