ELECTROMAGNETIC INVERSE SCATTERING FROM BURIED CYLINDER USING SUPPORT VECTOR REGRESSION

by
Ayman Sherif Ismail Negm

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of
MASTER OF SCIENCE
in
ELECTRONICS AND COMMUNICATIONS ENGINEERING

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Thesis Title: "Electromagnetic Inverse Scattering from Buried Cylinder using Support Vector Regression"

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Summary:

In this thesis, Support Vector Regression technique is used to solve the inverse scattering problem of a circular cylinder buried in a dielectric half-space. A fast and accurate technique based on T-matrix and Signal-Flow Graph is employed to solve the forward scattering problem. The solution of the forward problem is then used to generate dataset for training the Support Vector Machine (SVM). Feature extraction based on Prony modeling of reflection coefficient data is performed to simplify the training process. Selection of SVM parameters is performed using a hybrid optimization algorithm whose objective is to minimize the cross validation error over the training data. After the training process is complete, the SVM can be used to estimate the buried cylinder parameters in real-time. Different cases are studied and the results show good performance of the employed approach.

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