DETERMINATION OF
EARTH RESISTIVITY PROFILE
IN MUL TI LAYER SOIL

A thesis submitted to the
Department of Electrical Engineering, University of Moratuwa
in partial fulfillment of the requirements for the
Degree of Master of Philosophy

by
IMAL-I THANUJA DHARMADASA

Supervised by: Prof. J.R. Lucas
Co-Supervised by: Dr. -V.K.D.L. Vdawatta
Mr. W.D.A.S. Wijayapala

Department of Electrical Engineering
University of Moratuwa, Sri Lanka

2009

Abstract

Soil structure investigation is very important in many Engineering applications. The Electrical Engineers extensively use the soil structure information when designing grounding systems. The sub soil structure with its resistivity distribution has a direct impact on the performance of the grounding system, that is, the electrode resistance and the surface voltage distribution.

In Applied Geophysics a variety of soil structure investigation methods are used. Among these, the Electrical Resistivity Method has become very popular due to its simplicity. The resistivity method measures apparent resistivity of the ground to a direct current flow. The field data contain apparent resistivity values and geometry information. When the field data is interpreted, it detects the discontinuity of resistivity distribution in a location of interest. This interpretation can be done One dimensionally(lD), Two-dimensionally (2D) or Three-dimensionally (3D) depending on the application's necessity. The interpretation of resistivity field data using inversion techniques may be ambiguous. Conventional ID DC resistivity inversion techniques include graphical methods requiring interpolation and judgment and computer based iterative calculation methods.

The work presented in this thesis, investigates a new resistivity data inversion tool, Neural networks(NNs). Neural Networks are capable of solving several types of problems, including parameter estimation, parameter prediction, pattern recognition, classification and optimization. Also recently the use of Neural Networks in the Geophysics parameter estimation problems has Shown strong results. With this recent trend in the applicability of the NN's for the non linear geophysical inversion problems NN's is proposed as the inversion tool for parameter estimation or **Sub** surface interpretation. The main intention of this study is to investigate the applicability of NNs as a fast and accurate inversion tool for field resistivity data. The study considers the approach and capabilities of the NNs in inversion of field

resistivity data to interpret ID, 2D or 3D sub soil Structure with resistivity discontinuities.

List of Figures

List of Tables