الآيـــــــــــــــة

بسم الله الرحمن الرحيم

قال تعالى:

{وَلَقَدْ كَرَّمْنَا بَنِي آدَمَ وَحَمَلْنَاهُمْ فِي الْبَرِّ وَالْبَحْرِ وَرَزَقْنَاهُمْ مِّنَ الطَّيِّبَاتِ وَفَضَّلْنَاهُمْ عَلَى كَثِيرٍ مِّمَّنْ خَلَقْنَا تَفْضِيلاً (70)}

●صدق الله العظيم

سورة الاسراء

Dedication

To ...

Soul of My Father

Who Always Supported Me

My Mother

Who took Care of Me Kindly

My Brothers and Sisters

Who were Always Helpful

My Wife

Who always loved Me

My Son

Who always shining above

The clouds and storms of this life

My Friends

Who are Always beside Me

ACKNOWLEDGMENT

In the name of Allah, Most Gracious, and Most Merciful

Praise be to Almighty Allah (Subhanahu Wa Ta'ala) who gave me the courage and patience to carry out this work. Peace and blessing of Allah be upon his last prophet Mohammed (Sallulaho-Alaihe Wassalam) and all his companions (Sahaba), (Radi-Allaho-Anhum) who devoted their lives towards the prosperity and spread of Islam.

There are many people who I want to thank for the encouragement and support: ***Dr. Eisa Bashier Mohamed*** *as my teacher and advisor; he has been entirely supportive of me. My project would not be what it is without him.*

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Abstract

Transmission lines, among other electrical power system components, suffer from unexpected failures due to various random causes. These failures interrupt the reliability of the operation of the power system. When unpredicted faults occur protective systems are required to prevent the propagation of these faults and safeguard the system against the abnormal operation resulting from them. The functions of these protective systems are to detect and classify faults as well as to determine the location of the faulty line when a fault is detected in the voltage and/or current line magnitudes. Once the fault is detected and classified the protective relay sends a trip signal to a circuit breaker(s) in order to disconnect (isolate) the faulted line.

The features of neural networks, such as their ability to learn, generalize and parallel processing, among others, have made their applications on many systems ideal. The use of neural networks as pattern classifiers is among their most common and powerful applications.

This thesis presents a back-propagation artificial neural network architecture approach to detection, classification and isolation (location) of faults in transmission line systems. The objective is to implement a complete scheme for distance protection of a transmission line system. In order to perform this goal, the distance protection task is subdivided into different neural networks for fault detection, fault identification (classification) as well as fault location in different zones.

الملخـــــــص

تعاني خطوط نـقل الـقدرة الكهربائية كبا قي مكونات نظام الـقدرة من الاعطال نتيجة لاسباب متنوعة ومختلفة.

تؤثر هذه الأعطال علي كفاءة عمل منظومة الـ قدرة الكهربائـية. عـند ظـهور الاعـطال الغـير متو قعة فان نظم الحماية مطلوبة لمنع انتشار هذه الاعـطال وحما ية النـظام من العملـيات الغير طبيعية الناتجة عنها.

إن وظيفة نظم الحماية إكتشاف وتصنيف هذه الأعـطال بالا ضافة ا لى تحد يد مو قع الـخط المعطل عند اكتشاف العطل من قيمة مطال موجة الجـهد او التـيار في الـخط. بـعد اكتـشاف العـطل وتـصنيفه فإن مر حل الحما ية (Protective Relay) يرسل اشارة قطع (Trip Signal) لـ قاطع الدائرة (Circuit Breaker) لعزل الخط المعطل.

إنَ خصائص الشبكات العصبية الاصطناعية (Artificial Neural Networks) كـ قدرتها علي التعلم والتعـميم والمعالـجة المتوازية من بـين الاخـريات جعـلت تطبيـقها علي العديد من الانظمة مثاليا. كما يعـتبر ا ستخدام الـشبكات العـصبية الا صطناعية كنـمط للتصنيف من التطبيـقات الشـهيرة والفعالة.

إنَ هذا البحث يستعرض استخدام خوارزمية الانتشار العكسي (Back Propagation Architecture) كنهج لإكتشاف الاعطال وتصنيفها وتحديد مو قعها في خطوط نـقل الـقدرة الكهربائـية. الـهدف من هذا البـحث تنفـيذ مخـطط متكا مل للو قا ية المـسافية (Distance Protection) لخطوط نـقل الـقدرة الكهربائية. ولتحـقيق هذا الهدف قسم مخطط الو قاية المسافية ا لى عدة دوائر عـصبية ا صناعية لاكتـشاف الاعـطال وتـصنيفها وتحد يد مو قع العطل من عدة موا قع.

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ANN	-	Artificial Neural Networks
NN	-	Neural Net
BP	-	Back Propagation
KVL	-	Kirchhoff's Voltage Low
KCL	-	Kirchhoff's Current Low
PU	-	Per Unit
SLG	-	Single-Line-to-Ground fault
LL	-	Line-to-Line fault

2LG	-	Line-to-Line-to-Ground
VT	-	Voltage Transformer
CT	-	Current Transformer
OC	-	Over Current
MCB	-	Miniature Circuit Breaker
RMS	-	Root Mean Square
IEEE	-	Institute of Electrical and Electronics Engineers