SPATIAL MODEL FOR ELECTRIC TRANSMISSION LINE ROUTING

by

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DECLARATION

The work described in this thesis was carried out by me under the supervision of Professor Krishan Deheragoda and Mr. H. M. Prabath Jayantha and a report on this has not been submitted in whole or in part to any university or any other institution for another degree/Diploma.

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LIST OF ABREVIATIONS

Abbreviation

3D	-	Three Dimensional
ADB	-	Asian Development
AHP	-	Analytic Hierarchy Process
AMIS	-	Analytical Minimum Impedance Surface
CEA	-	Central Environmental Authority
CEB	-	Ceylon Electricity Board
DD	-	Distribution Division
DP	-	Dynamic Programming
DSD	-	District Secretariat Division
EMF	-	Electric Magnetic Fields
ERP	-	Enterprise resource planning
ERRI	-	Electric Power Research Institute
ESRI	-	Environmental Systems Research Institute
ETLR_MSC	-	Electric Transmission Line Routing_Master in Science
FAHP	-	Fuzzy Analytic Hierarchy Process
GIS	-	Geographical Information System
GPS	-	Global Positioning System
GTC	-	Georgia Transmission Corporation
HV	-	High Voltage
KPI	-	Key Performance Indicators
LCP	-	Least Cost Path
LECO	-	Lanka Electricity Company (Private) Limited
MCDM	-	Multi Criteria Decision Methods
MS	-	Microsoft
MV	-	Medium Voltage
NBRO	-	National Building Research Organization
NDPL	-	New Delhi Power Limited
NEPA	-	National Environmental Policy Act
OH	-	Over Head

POI	-	Places Of Interest
PTL	-	Power Transmission Line
PTLR	-	Power Transmission Line Routing
RDA	-	Road Development Authority
ROW	-	Right of Way
SDE	-	Spatial Database Engine
SDSL	-	Survey Department of Sri Lanka
SLD	-	Sri Lanka Datum
sqkm	-	Square kilometer
SQL	-	Structured Query Language
UDA	-	Urban Development Authority
UK	-	United Kingdom
USA	-	United States of America
UTM	-	Universal Transverse Mercator
WGS	-	World Geodetic System
XML	-	Extensible Markup Language

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Spatial Model for Electric Transmission Line Routing

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ABSTRACT

This thesis demonstrates the value of integration Electric Transmission Line (ETL) routing with Geographic Information Systems (GIS) to find ways to make routing decisions automate, standardize, more quantifiable, consistent, and defensible.

With the increase of population and the economic development of the country the demand for energy and electricity are also expanding. However, as the population indicator of Sri-Lanka continues to sprawl into more rural areas especially to Northern and Eastern provinces in a scattered manner, there is a need to build up a new transmission line to meet their demand for electricity.

One of the most important problems in energy transmission is finding the best route in any area. Many people from different disciplines have been reported together to find the best routes by manual methods like using paper maps for the determination of which route is the least cost path (LCP) to the destination point. On the other hand, in order to find the best route it is a very important to consider criteria such as slope, landslide, road, railway crossing, distance to buildings, national parks, archaeological areas, residential areas, forests, river crossing etc.

In GIS tools, techniques, procedures, statistical evaluation methods and stakeholder collaboration used to produce the new siting methodology; Multi Criteria Decision Methods (MCDM) like as Analytic Hierarchy Process (AHP) have been used to make the most accurate decision. By this study, the mistakes identified by manual methods decrease in ETL routing and other routing problems.

This research study is implemented within a limited scope to find the best route between given two points. However, according to the introduced rules, conditions and parameters the new transmission line were accurately drawn between given source and destination locations.

The prepared model has converted to a computer programming language to create a tool for easy access. Once the tool is executed, required inputs parameters can be change depend on the geographic conditions of the project area for finding the best route.

Introduced weighted ranking system has used to create a suitability index for geographic factors, which are influencing for Electric Transmission Line Routing process. Finally, it is intended to highlight the need for the standardization and automatic integration of the system for the effective management of electric transmission line routing.