UNIVERSITI TEKNOLOGI MARA

ANALYZING TELECOMMUNICATION COVERAGE USING GIS TECHNIQUE

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledge as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Telecommunication coverage in Universiti Teknologi MARA (UiTM) and residential areas in Kota Samarahan, Sarawak need to be analyze because the study area received very poor signal coverage from the existing tower stations. The signal strength data from all the five (5) i.e. Kota Samarahan station, TM Kota Samarahan station, Bank Islam station, Universiti Malaysia Sarawak (Unimas) station and UiTM Kuching station are observed manually by driving through and using Test Mobile System (TEMS) instrument. The collected data are then transferred to Geographical Information System (GIS) software for further analysis. The aim of this research is to utilize GIS techniques to analyze telecommunication coverage of the study area. To achieve the general aim of the study, the objectives are as follows: i) to determine mobile phone signal strength of the study area, ii) to identify/map signal strength based on different tower station configurations and iii) to propose new tower configuration or setup such as the height of the tower station, antenna orientation and location of the tower station. The study area covers the whole area of Sarawak campus and residential areas of Kota Samarahan. The software used for this study are MapInfo Version 7, ArcGIS Version 9.3 and Global Mapper Version 10.02. Viewshed analysis, antenna orientation analysis and combination between viewshed analysis and antenna orientation analysis are used to evaluate the different tower stations configurations. Findings from this study have shown that the mobile phone signal strength of the study area can be separated into five (5) categories. There is the very strong signal strength reading records from 0 dBm to -36 dBm, strongest signal strength started from -37 dBm to -53 dBm, the moderate of signal strength reading marked from -54 dBm to -64 dBm, the weakness of signal strength shown in the map with the reading from -65 dBm to -76 dBm and the very weakness of the signal strength over the study area recorded from -77 dBm to -82 dBm. It was also found that the eastern part of the study area received very strong coverage as compared to the other areas because there are three (3) nearby stations (i.e. Kota Samarahan station, TM Kota Samarahan station and Bank Islam station). The south western part of the study area proved to have the weakest signal strength because the antenna orientation from the nearest station such as UiTM Kuching station and Unimas station are not covered the whole part of that area. This study proposed different tower station height and the construction of new tower stations near the western and south-western part of the study area to improve signal strength in problematic areas. As an overall conclusion, this research proved that the implementation of GIS techniques can be used to identify the mobile phone signal strength and can be used to propose the optimum tower configuration over the study area.

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CHAPTER ONE
INTRODUCTION

1.1 RESEARCH BACKGROUND

The modern mobile phone market provides a wide variety of customer taste and lifestyles. Some phones are tiny and discreet, some are chosen for their appearance (such as fashion accessories), while some others just offer basic functionality. Manufacturers are producing product ranges, including devices that specialize in providing particular services or are aimed at particular users. The competition in the market is very tough because of the usability of mobile phone. Beside the phone market caters for a wide variety of customer tastes, there is also a need for suitable site selection to set up towers that can provide good coverage.

Many mobile phone providers are trying to give the best services to all mobile phone users in Malaysia. Each of the company competes to give excellent services and get more subscribers to use their services. Many new telecommunication companies are entering the market, so competition is increasing every day. As competitions between various service providers grow, the customers are benefited to choose a good service in the market.

There are many parameters, which are needed to be highlighted by the company to provide better services and increase their profit. As summarized by Prakash & Chaudhari (2005), the site location of the telecommunication tower is the most important parameter. If the location is not taken into consideration then major problems such as improper connectivity to the customer and the income loss for the company occur. Besides that, the construction of towers in wrong place or location will effect the service's provider's popularity. This will reduce the number of customers using the service and as a result, the customers will receive poor quality services.

The quality of the mobile phone service depends on the signal strength which is available in the residential area. However, to set up the best network of antennas over the residential area is very difficult and relies beyond many factors such as terrain undulations, land cover, height of buildings, composition and morphology.