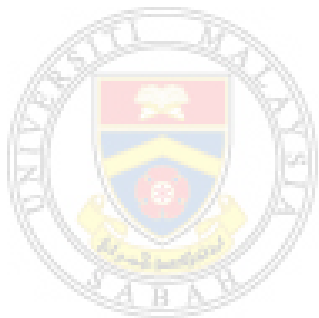


**MODELING TOURISM MOVEMENTS AND SENTIMENTS
USING SPATIAL ANALYSIS BASED ON
SOCIAL MEDIA BIG DATA**



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UNIVERSITI MALAYSIA SABAH

**FACULTY OF SOCIAL SCIENCES AND HUMANITIES
UNIVERSITI MALAYSIA SABAH
2023**

**MODELING TOURISM MOVEMENTS AND SENTIMENTS
USING SPATIAL ANALYSIS BASED ON
SOCIAL MEDIA BIG DATA**

ZHU CHEN



UMS

**THESIS SUBMITTED IN FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY**

**FACULTY OF OF SOCIAL SCIENCES AND HUMANITIES
UNIVERSITI MALAYSIA SABAH
2023**

UNIVERSITI MALAYSIA SABAH

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DECLARATION

I hereby declare that the material in this thesis is my own except for quotations, equations, summaries and references, which have been duly acknowledged.

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ACKNOWLEDGEMENT

For the duration of this study, I have been fortunate to receive support, encouragement and advice from a number of people to whom I wish to express sincere gratitude.

Foremost, I am grateful to my supervisor, Associate Professor Rayner Alfred who has provided unequivocal support, constant encouragement and regular scholarly input throughout the study program.

I also appreciate my second supervisor, Associate Professor Dr. Oliver Valentine Eboy for his valuable guidance and intellectual contribution to strengthening the geographic information system component of this research.

I am deeply thankful to Professor Li Renjie and Professor Zhang Junhai from Hebei Normal University, for their valuable intellectual input. They have given me great support during the data collection phase of my research.

I would like to thank my family for all their love and encouragement. For my parents, who raised me with love and supported me in all my pursuits. I am grateful to my wife, who has looked after the home duties while I was writing the final draft. I would also like to thank my son for bringing me joy during this doctoral study.

Last but not least, I would like to thank my fellow students who went with me for my Ph.D. Thanks for their care and support.

Zhu Chen
14 September 2023

ABSTRACT

Tourism can greatly meet people's spiritual needs. Due to the good interactivity and timeliness of social media, people are more willing to share their travel through social media platforms. This thesis constructs a model using Sina Weibo data to examine the attention and sentiment of Chinese tourists visiting Sabah, Malaysia. A correlation analysis was conducted between the number of inbound Chinese tourists and Sina Weibo data to verify the validity of Sina Weibo data. Research objectives include: 1. Design an algorithm to collect data from social media platforms and build a database to store and manage social media data. 2. Implement spatial analysis methods to discover hotspot areas of tourist attention and visualize their shape, size and distribution. 3. Implement natural language processing methods to analyze tourists' emotions from text data. The methods used in this thesis include web crawler technology, spatial analysis methods and sentiment analysis. The correlation analysis results show that Sina Weibo data is positively correlated with the number of Chinese tourists, indicating that Sina Weibo data can reflect changes in the number of Chinese tourists. The differences in the distribution of Sabah tourist destinations are more obvious, and the distribution balance is low. Chinese tourists mainly come from Guangdong, Zhejiang and Beijing. The average sentiment score from Beijing is higher, and Zhejiang is lower. On a large scale, Chinese tourists' attention is mainly concentrated on Kota Kinabalu and Semporna. The number of destinations with positive sentiments showed an upward trend in Sabah, negative sentiment trended downward. In 2016, tourist attention shifted from Semporna to Kota Kinabalu. The spatial distribution of tourist destinations shows an east-west direction, and the attention shows a northwest-southeast direction. On a small scale, the attention is mainly concentrated in the southwest area of Kota Kinabalu. The average sentiment of Chinese tourists was positive, showing an upward trend, while negative sentiment showed a downward trend. In 2017, tourist attention shifted from urban to the southeast of urban. Kota Kinabalu's tourist destinations and attention are distributed in the southwest-northeast direction. The average sentiment score in Qinghai is negative. Tourist attention and sentiment analysis based on social media big data will support decision-makers to plan a comprehensive framework for Sabah tourism, so that more areas in Sabah can enjoy the economic growth brought by tourism.

ABSTRAK

PERMODELAN PELANCONGAN MENGGUNAKAN ANALISIS RUANG BERDASARKAN DATA BESAR MEDIA SOSIAL DI SABAH

Pelancongan dapat memenuhi keperluan rohani orang ramai. Disebabkan interaktiviti yang baik dan ketepatan masa media sosial, orang ramai lebih bersedia untuk berkongsi perjalanan mereka melalui platform media sosial. Tesis ini membina model menggunakan data Sina Weibo untuk mengkaji perhatian dan sentimen pelancong China yang melawat Sabah, Malaysia. Analisis korelasi telah dijalankan antara bilangan pelancong China yang masuk dan data Sina Weibo untuk mengesahkan kesahihan data Sina Weibo. Objektif penyelidikan termasuk: 1. Mereka bentuk algoritma untuk mengumpul data daripada platform media sosial dan membina pangkalan data untuk menyimpan dan mengurus data media sosial. 2. Melaksanakan kaedah analisis spatial untuk menemui kawasan tumpuan pelancong dan menggambarkan bentuk, saiz dan taburannya. 3. Melaksanakan kaedah pemprosesan bahasa semula jadi untuk menganalisis emosi pelancong daripada data teks. Kaedah yang digunakan dalam tesis ini termasuklah teknologi web crawler, kaedah analisis spatial dan analisis sentimen. Keputusan analisis korelasi menunjukkan bahawa data Sina Weibo berkorelasi positif dengan bilangan pelancong China, menunjukkan bahawa data Sina Weibo boleh mencerminkan perubahan dalam bilangan pelancong China. Perbezaan dalam pengedaran destinasi pelancongan Sabah lebih jelas, dan imbalan pengedaran adalah rendah. Pelancong China kebanyakannya datang dari Guangdong, Zhejiang dan Beijing. Purata skor sentimen dari Beijing adalah lebih tinggi, dan Zhejiang lebih rendah. Pada skala besar, perhatian pelancong China tertumpu terutamanya di Kota Kinabalu dan Semporna. Bilangan destinasi dengan sentimen positif menunjukkan aliran menaik di Sabah, aliran sentimen negatif menurun. Pada 2016, perhatian pelancong beralih dari Semporna ke Kota Kinabalu. Taburan spatial destinasi pelancongan menunjukkan arah timur-barat, dan perhatian menunjukkan arah barat laut-tenggara. Pada skala kecil, perhatian tertumpu terutamanya di kawasan barat daya Kota Kinabalu. Sentimen purata pelancong China adalah positif, menunjukkan aliran menaik, manakala sentimen negatif menunjukkan aliran menurun. Pada tahun 2017, perhatian pelancong beralih dari bandar ke tenggara bandar. Destinasi pelancongan dan perhatian Kota Kinabalu diagihkan ke arah barat daya-timur laut. Purata skor sentimen dalam Qinghai adalah negatif. Perhatian dan analisis sentimen pelancong berdasarkan data besar media sosial akan menyokong pembuat keputusan untuk merancang rangka kerja komprehensif untuk pelancongan Sabah, supaya lebih banyak kawasan di Sabah dapat menikmati pertumbuhan ekonomi yang dibawa oleh pelancongan.

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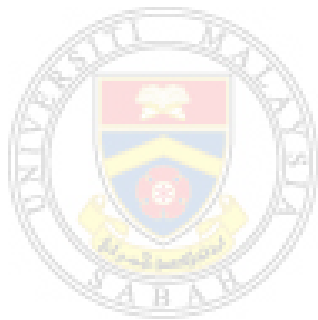
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CHAPTER 1

INTRODUCTION

1.1 Background

With the development of economy and the progress of globalization, people's income and living standards have been significantly improved. As the material needs are met, the spiritual needs of people become stronger. Tourism can greatly satisfy people's spiritual needs, so people's demand for tourism is increasing (Xu, & Zhang, 2021). While satisfying people's spiritual needs, tourism plays a vital role in improving population employment and promoting the development of the tertiary industry (Vu et al., 2023; Chen et al., 2021).

In recent years, as people's income has increased, more and more Chinese tourists have traveled abroad. According to the "China Outbound Tourism Development Annual Report 2018", the total outbound tourism market and consumption in China continued to grow, and the proportion of structural travel abroad increased significantly. The economic growth of passenger output was the main driving factor for outbound tourism. In terms of total volume, China's outbound tourism market reached 131 million in 2017, and outbound tourism cost 115.29 billion US dollars, up 6.9% and 5.0% year-on-year. The top 15 destinations for Chinese tourists in 2017 are Hong Kong, China, Macau, Thailand, Japan, Vietnam, South Korea, the United States, Taiwan, Malaysia, Singapore, Indonesia, Russia and Australia. The proportion of overseas travel continued to increase, accounting for 33.3% of the total number of outbound travels in 2017, an increase of about 2 percentage points compared with 31.24% in 2016. Chinese tourists are highly satisfied with both the satisfaction of the quality of tourism services and the overall satisfaction of the destination countries. The sample tourist satisfaction in 2017 is from high to low: Singapore, New Zealand, USA, Germany, Canada, France,

Italy, Australia, UK, Japan, Spain, Thailand, Malaysia, Korea, Brazil, Russia, Indonesia, Argentina, Mongolia, Vietnam, South Africa, Cambodia, India, Philippines.

Malaysia is a country in Southeast Asia with 13 states and three Federal Territories (Kuala Lumpur, Putrajaya and Labuan) with a total area of 330,000 square kilometers. The Malaysian border is divided into two parts by the South China Sea: the Peninsula of Malaysia (West Malaysia) on the Malay Peninsula and the Sarawak (East Malaysia) on the northern part of Kalimantan. Due to its geographical proximity to the equator, Malaysia's climate is tropical. Negeri Sabah, formerly known as North Borneo, has the reputation of "land under the wind" and is one of the 13 states in Malaysia. The capital of Kota Kinabalu is located on the northeast of Kalimantan Island. The Ministry covers an area of 74,500 square kilometers and has a population of 3,889,300 (Malaysian Bureau of Statistics, 2018).

Malaysia's tourism industry contributed directly to RM82.1 billion in Malaysia's gross national income in 2017, making it the third largest contributor to the 2017 Malaysian economy (Tourism Malaysia, 2018). However, the number of tourists in 2017 was 25.7 million, a decrease of 4% compared to 26.8 million in 2016. Despite the decline in tourist numbers, Malaysia's tourism industry remains one of the key pillars of the country's economic growth and is a dynamic industry.

The Malaysian government has developed many relevant policies and strategies to deal with the decline in the number of tourists. These include improving existing tourism products and developing new tourism products. It includes culture, art, heritage and crafts, nature tours and adventures, golf, cruise tours and other luxury travel projects, as well as business travel and leisure activities. These strategies and policies are aligned with the goals of National Transformation Program (NTP) and Malaysia Tourism Transformation Plan (MTTP) to promote Malaysia's tourism industry with innovation and creativity, reaching 36 million visitors by 2020 and revenues of RM168 billion.

The development of China's Internet has been late, but it has developed rapidly. The Internet has had a negligible impact in different regions and in different fields. According to the 41st Statistical Report on the Development of

China's Internet Network, as of December 2017, the number of Internet users in China reached 772 million, and the number of mobile Internet users reached 753 million. The proportion of Internet users using mobile Internet was 95.1% in 2016 increased to 97.5% (Statistical Report on the Development of China's Internet Network, 2018). The smart device centered on mobile phones has become the foundation of "Internet of Everything". The Internet of Vehicles and smart home appliances promote the "live and lodging" experience upgrade, and build personalized and intelligent application scenarios. The mobile Internet service scene is continuously enriched, the scale of mobile terminals is accelerating, and the amount of mobile data continues to expand, creating more value mining space for the mobile Internet industry.

Tourism attention studies can express visitors' attitudes and preferences towards tourist attractions, infrastructure and services, which is the same as tourists' satisfaction with tourist areas. Similarly, the results based on tourism attention research can also support tourism area management and policy formulation (Yu et al., 2023). The completed tourism experience is the focus of tourists' satisfaction research on tourist areas, but the research on tourism attention has weakened the condition of whether the tourism experience is completed or not. Specifically, the tourism attention research does not distinguish whether the tourists complete or experience the whole tourism process. Therefore, tourism attention research can explore the tourism projects being developed or the potential tourism market.

1.2 Scope of Research

This research was conducted among tourists who visited Sabah. Sabah is a state of Malaysia. Based on its geographical location, tourism resources and tourist composition, this section selects Sabah as the background for the analysis of outbound travel by Chinese tourists.

1.2.1 Geographic Profile

Sabah is located in the northern part of Borneo, between 115.4 and 118.8 degrees east longitude and 4.2 degrees to 6.5 degrees north latitude and is a state in Malaysia. Sabah borders Sarawak in Malaysia and borders Kalimantan in Indonesia in the southwest. Labuan Island is an island in the Federal Territory on the coast of Sabah. The Saudi Arabian Ministry and Vietnam, the northern and eastern parts of the Philippines have a maritime boundary, the west is the South China Sea, the northeast is the Sulu Sea, and the southeast is the Celebes Sea. Sabah has a total land area of nearly 74,500 square kilometers and a total of 1,743 kilometers of coastline (Department of Statistics Malaysia, 2019). As the coastline of Sabah faces three oceans, the region has a wide range of marine resources.

The coastline of Sabah is rich in forest resources, mainly mangroves and Nipah forests. About 331,325 hectares of state-owned land is covered by mangroves, accounting for 57% of the total number of mangroves in Malaysia (Forever Sabah, 2015). Coastal areas on the east and west coasts of Sabah are dominated by beaches (Mimura, 2008). The terrain in western Sabah is dominated by mountains, and the main mountain range is the Crocker Mountains. Several of these mountains range from 1,000 to 4,000 meters above sea level. Adjacent to the Crocker Mountain Range is the Trus Madi Range, 2264 meters above sea level (Argent et al., 2007). Mount Kinabalu is the highest mountain in the region, with an elevation of about 4095 meters (Sassa et al., 2014). These mountains and hills form a vast network of river valleys, mostly covered by dense rainforests. The lower mountains extend to the southern plains, the western coast, and the inner central region of Sabah. The central and eastern parts of Sabah are mostly low mountains and a few hill plains. Kinabatangan River is Malaysia's second longest river, located on the east coast of Sabah. Its length is 560 kilometers long with the Rajang River in Sarawak. The river begins in the western mountains, passes through the central region, and finally enters the Sulu Sea on the east coast (Tietze, 2007).

Sabah is located near the equator and has a tropical monsoon climate. Sabah has experienced two monsoon seasons a year. From November to March, the northeast monsoon brought a lot of rainfall. From May to September, the

southwest monsoon was prevalent and the rainfall was low. The average daily temperature is between 27 ° C and 34 ° C and the rainfall is between 1800 mm and 4000 mm.

Sabah is divided into 25 districts, of which Kota Kinabalu is the capital of Sabah. The city of Kota Kinabalu has a flat terrain and fertile land. It is the most populous city in all parts of Sabah, and the administrative work of Sabah and most of the commercial trade activities are concentrated here. In addition to Kota Kinabalu, the main cities in Sabah include Tawau, Sandakan, Nassau, and Semporna. As shown in Figure 1.1. In this figure, each area represents a county/city in Sabah. In addition to the 25 counties and cities of Sabah, it also includes the surrounding islands and the Labuan federal territory.

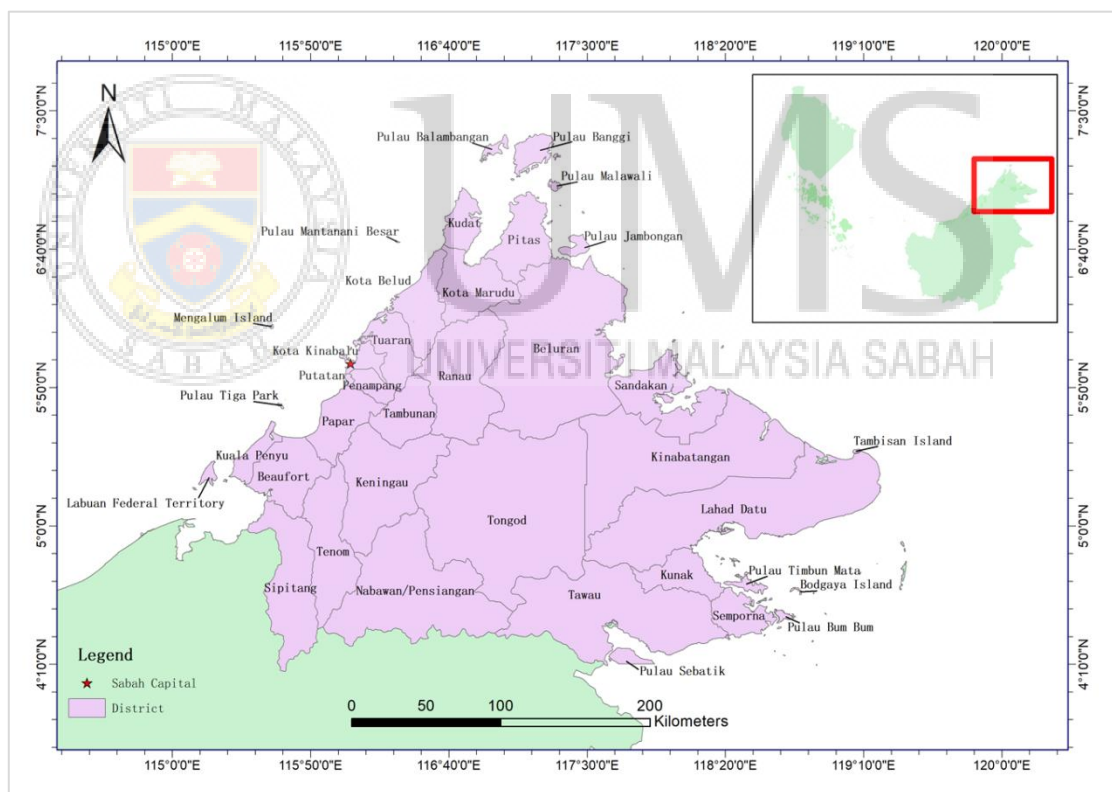


Figure 1.1 : The State of Sabah in Malaysia

According to the second census report of 2019, the population of Sabah is about 3.9 million, of which about 1.13 million are non-Malaysian citizens (Department of Statistics Malaysia, 2019). The population consists mainly of indigenous, Chinese and Indians. Due to the vast territory of Sabah, the sparse