

Motorcycle Route Planning in Phuket Province for Tourist

Pakdee Jaisue and Paitoon Siri-O-Ran

Faculty of Engineering and Technology, Panyapiwat Institute of Management, Nonthaburi, Thailand
E-mail: pakdeejai@gmail.com, paitoonsir@pim.ac.th

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Abstract—The tourism in Phuket province has organized routes to a variety of tourist attractions. The vehicles to be used depend on the tourist decision such as taxi car/van/bus service, private car, and motorcycle. Which, the tourist traveling by motorcycle is very popular. The variety of tourist attractions in Phuket province and the duration of tourists stay is limited. And, most tourists plan by a limit visiting tourist attractions. Therefore, the motorcycle route planning will help tourists to reach more tourist destinations by using VRP spreadsheet solver of Microsoft Excel workbook. An open-source unified platform for solving, representing, and visualizing the results of vehicle routing problems (VRPs). By the way, the results shown how many plans and how many places of tourist point to visit and under the condition of time, speed, and vehicle restrictions used as motorcycles.

Index Terms—VRP, VRP spreadsheet solver, Route Management

I. INTRODUCTION

Phuket is the 3rd largest province of Thailand that has the most tourists visiting after Bangkok and Chonburi. The statistics visitor of the Ministry of tourism and sport [1] shows the number of visitors and more than 60 million people visiting Bangkok 18 million people visiting Chonburi and there are has about 14 million people in 2018.

Arranging travel routes is a priority for tourism planning for value and convenience. That is to be punctual and spend time effectively on the journey, travel safely, having accurate information about the location and the needs of various tourist groups. Phuket has an area of around 576 square kilometers

[2]. Tourist destinations such as beaches and the Andaman sea are a highlight of Phuket province. In 2018, there are about 10 million foreigners and 4 million Thai citizens visiting Phuket province as shown in Fig. 1.

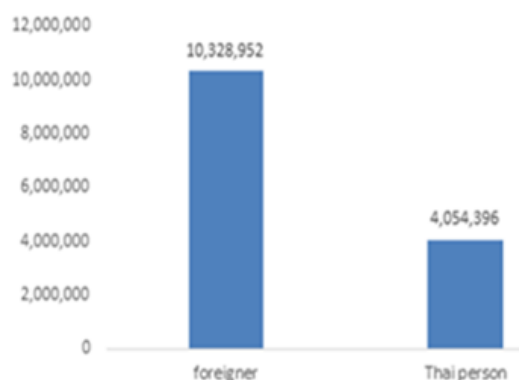


Fig. 1. Tourist proportion in Phuket

Tourism in Phuket province has organized travel routes and facilitated services to many tourist attractions. There is many alternative traveling such as package tours and self-traveling. In this research, Arranging the tourist destination routes by using motorcycle to be a vehicle and the tourists decide on the tourist attractions. There is also a service to recommend popular tourist attractions that tourists are interested in.

This research aims to assist a travel plan for tourists of Phuket.

1) To survey attractive destinations in Phuket, that are popular among tourists.

2) To investigate possible routes passes attractive destinations in Phuket, that suit timing conditions.

3) To suggest a travel plan that takes shortest time to travel and nearest distances of attraction in Phuket by program VRP spreadsheet solver.

II. BACKGROUND

A. Transportation in Phuket province.

The public transportations take many times to wait and limited place to passing. Traveling by public transport such as bus and local bus still has a small amount and takes a lot of time to wait for each. Usually, tourists will use a private transport service. And shuttle service such as taxi and motorcycle, which will be delivered to various locations depending on the needs of tourists.

Transportation services for tourists are available to the driver service and to drive by themselves. Service with a driver usually called a taxi. The types of taxis use different types of cars, as in Fig.2 and Fig.3, such as motorcycles, cars, and minibus or van. Most of the tourists are self-driving will be using motorbikes than a car because of flexibility and faster than cars with trouble traffic in the city.



Fig.2. Vehicle for rent and transport service



Fig. 3. Taxi service and transport in Phuket

B Theory

Tourism route management is service that adds value to products or services of hotels and tour business. There is a competitive advantage in business. Phuket is a small island with many diverse attractions. Each location has both a distance close to each other, and some places are

very far apart. Which depend on the customer required to visit each location.

The demand for travel to each location of each tourist is different, especially independent travelers, who like to travel themselves without relying on tour companies. Allocation of travel routes, travel planning is important. Because the distance to each location takes a different time. If tourists have limited time and do not plan the routing wells. There will result in visiting fewer places from the desired. Described the simple theory of vehicle routing problems.

In this research, we will consider the scope of transportation route problem. According to customer needs. There has time limit for Time Windows and specify the weight and distance limitations which tourists use to go to various attractions by the beginning and end. There is only one point. The house or hotel where the customer live. Customers will receive services for traveling only one vehicle. The route used must be the shortest route and pass through all the planed locations. There is a certain amount of demand for tourist attractions. The number is uncertain. Used vehicle have restrictions on loading, weight, number of passengers and the appropriate route. The problem distance and each point not far from each other. The route must be the shortest route and pass all points or attractions of the planned location. This issue is called. Capacitated and Distance-Constrained VRP: DCVRP and Vehicle Routing Problem with Time Windows. Abbreviated is VRPTW.

Clarke and Wright [3]. The economical way of transporting products or goods has developed a route-based route that has the needs of many places. Vehicles with limited capacity to transport of a single warehouse. From Fig. 6, the products are transported from the beginning at point O. Transportation from warehouse going to many places such as going to point i and point j by transporting to each point separately. It is necessary to transport products to point i and then return to point j again that will be increased the cost of transport, which can be calculated from the equation one (1) The cost of transporting each item is one point and back to the warehouse.

$$C_{0i} + C_{ij} + C_{j0} \quad (1)$$

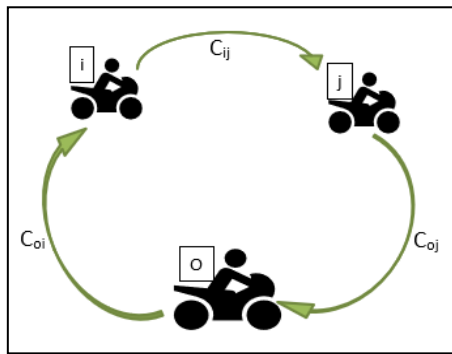


Fig. 4. Shipping to each delivery point and return to a single warehouse.

Products are transported to point i and point j, but transport to point i and go straight to point j and then returns to the warehouse at point O as shown at Fig. 4. The cost of transportation will calculate for one route and could help reduce transportation costs by calculating from equation two and three ((2) and (3)).

Shipping costs for each delivery point and return to the warehouse only:

$$C_{oi} + C_{ij} + C_{jo} \tag{2}$$

Save transportation costs:

$$S_{ij} = C_{oi} + C_{io} + C_{jo} + C_{oj} - C_{oi} - C_{ij} - C_{jo}$$

$$S_{ij} = C_{oi} + C_{oj} - C_{ij} \tag{3}$$

$$S_{ij} = [C_{oi} + C_{io} + C_{jo} + C_{oj}] - [C_{oi} + C_{ij} + C_{jo}]$$

How to route vehicles using economical methods.

Step 1 Calculate Savings from equation (3) $S_{ij} = C_{oi} + C_{oj} - C_{ij}$ for all point (i, j).

Step 2 Sorting order S_{ij} . From more to less.

Step 3 Transportations arranging routes based on S_{ij} starting from the highest value. And to consider the S_{ij} value to include the path i, j into the given path. If not, transportation conditions are violated. Capacity of vehicles and if one of these three conditions is true.

1) If i and j are not in the same path, then i and j are the new paths.

2) Only if i or j is included in the existing path. And the point connected with. The warehouse includes routes (i, j) into that route.

3) If both i and j do not use the same path. And not a point to both warehouses. Include two routes together.

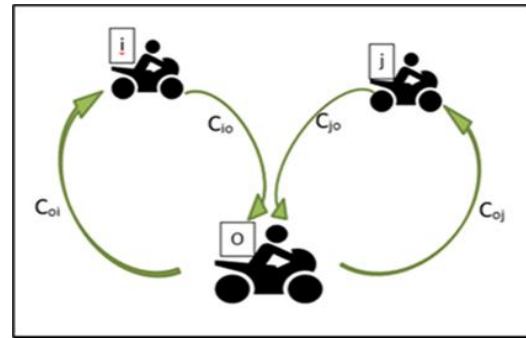


Fig. 5. Each shipment is delivered at one point and returned to the warehouse.

C. Literature review

Takerngsak [4]. Research about Tourism logistics management for Wang Nam Khiew district in Nakhon Ratchasima province has objects to 1. study the behaviors of tourists visiting Wang Nam Khiew. 2. satisfying of tourism logistics managements and then 3. To investigate for developing logistics management for tourism in this perspective of those directly evolved. The methods of this research are using survey research for correct the information and descriptive statistical analysis. The result can divide into 4 part as follows 1. general information of tourist 2. Tourism behavior 3.the satisfaction of tourists 4. guidelines for development of tourist route management. The Recreational activities that are made along with tourism are views of the scenery. And almost all want to come back to travel in Wang Nam Khiew District.

Watchar in [5]. Research about traveling behavior of Oceania tourists during the low season in Phuket. The behavior of middle east countries tourists for 1. To know the needs of customers in the Middle East countries. 2. To increase satisfaction in prices, time and place for middle eastern customers and 3. To reduce the cost and travel time of each tourist attraction of the tourism program. Determination of sample group the researcher used purposive sampling method by collecting data from middle eastern tourists who use the company's tourism services. The data obtained from the questionnaire were analyzed to find the basic information, behavior and needs of the middle east tourists. Statistical tools used in the analysis are descriptive statistics by presenting a percentage distribution. Then, analyze the results of each tourist destination to change the tourist attraction in the tourism route

of the program for a period of 10 days, considering the saving time of each route for each day to reduce costs. And compare the cost and value of each package in the route to increase revenue and reduce the time spent by changing the program. After changing the travel route of each tourism program, can reduce the total cost of each program, reduce time, increase revenue and increase quality which results in increased customer satisfaction.

Kamonrat and the group [6]. Research about an examination for factors and routing impacting tourism logistic in Ubonratchathani. Tourism logistics is a new discipline gaining popular from multi-disciplinarians, in the research investigate various factor that impact satisfaction of tourists by using mixed research method, which evaluates data based on quantitative and qualitative analysis and using information related preferred locations analyzed from the first part, the theory in this research is study travel routing based on Traveling Salesman Problem (TSP) and then provide suggestions for optimal traveling route under time limit. The results in this research is suggest route of travel time at the time is the least hour which is the same answer as the shortest distance in this case found that the minimum travel time is 6.65 hours

Sanphob and Varin [7]. Research about the appropriate travel route planning to improve efficiency of the concrete monitoring unit. Planning and development of travel routes to inspect concrete production units the objective is to check the number of cycles according to the needs and plans that have been presented to the management. By using logistics principles to help solve these problems to help reduce travel costs as well as increasing the efficiency of inspecting concrete production units. This research uses the A-B-C segmentation technique, Saving Algorithm and Nearest Neighborhood as follows:

- 1) Nearest Neighborhood Technique. Consider organizing travel routes using the nearest distance. By calculating the routing table in Microsoft Excel
- 2) Travel line arrangement with the saving method. Consider traveling routes using the nearest distance and the highest save value. You can choose the most suitable vehicle route.
- 3) How to divide the unit type A-B-C. Consider the route arrangement using the nearest distance and save the most.

The first step is to use the analysis to find the real problem by the fishbone method. Then, using the data obtained using all 3 techniques, the result shows that the suitable method for management assessed from the cost and travel expenses is the route arrangement by dividing the A-B-C group or the Saving Algorithm.

III. RESEARCH METHODOLOGY

This research would like to solve the problem of route planning tourist destination of tourists an dan additional service to guiding and planning routed, who use the motorcycle rentals service to travel. The theory of routing the shortest and passing all the designated attraction sand then return to starting point. Underneath with capacity and time limit is VRP or vehicle routing problem sand the technology that helps to manage is Microsoft Office Excel. An open-source unified platform for solving, representing, and visualizing.

A. Collected data

1) Tourist attraction

Phuket is the third most popular tourist destination in Thailand. Phuket's tourist attractions are popular such as beaches around the island, waterfall, mountains, island, entertainment places and night markets. The popular tourist destination in Phuket

2) Research tools

The tool used in this research is a questionnaire for tourists who come to use the motorcycle rentals service and then using program route for attraction. The research tool of survey was created to collect tourist information about tourists and the satisfaction of using the services of hotels and motorcycle rentals shop.

The VRP spreadsheet solver program has the window page like the same as Microsoft Excel because this program is developed from Microsoft Excel and using VBA and coding to developing and then added routing function to tab bar add-in function at Microsoft Excel.

B Route management

In this topic, we will discuss software of routing by using the VRP spreadsheet solver program, which describes the procedure for using the program as shown at Fig. 6 Process of program VRP spreadsheet solver.

First step of process is starting program. The VRP program will show first worksheet name called "VRP Solver Console" and then provide the data that program require. In a case study, the research specifies the vehicle is a motorcycle and the requirements of the data used in the program for the operation of the VRP spreadsheet program are as follows.

- 1) Vehicle: Set the speed at 50 km/hr. Specify information at average vehicle speed
- 2) The amount of depot which is determined to have only 1 places to be the starting point

- 3) Departure start time depend on tourists determine such as 9:00 - 18:00 p.m. or 09:00 - 19:00 p.m. (Thailand time zone)
- 4) Set service time or time limit like 1 day, 2 days and 3 days.

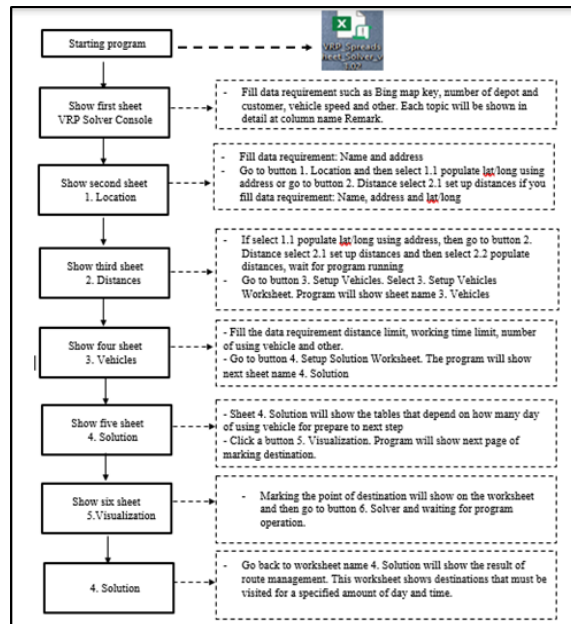


Fig. 6. Process of program VRP spreadsheet solver.

Second step will be coming before enter data requirement already at worksheet name “1. Location” and then follow step of this program for populate coordinates and set up distances, step three worksheet name “2.distance” will appear for program running to next step four, worksheet name “3.Vehicles” will require the data kind of limit distance, how many hours per day and number of days. All the data requirement fills in last worksheet of vehicle and then go to click button solution for running program in to step five, worksheet name “4. Solution” will show the tables of detail for tourist destinations all plans and then click the button visualization for show visual of map point to many destinations at worksheet name “5. Visualization”.

IV. RESEARCH METHODOLOGY

The information details of the research results from the data collected from questionnaires and show the database of tourist attractions and motorcycle route plans from tourists requirement.

A. Surveying and collecting data

Information about tourist destinations collected by self-survey in Phuket and survey on internet for basic information such as coordinates, name of place, available time, condition to used, location, and characteristics of tourist attractions. The initial survey method from the questionnaire, surveying

the actual area, on internet and tourist spots from tour operators.

Motorcycle ware set up to use in this research for taking tourists into a tourist destination. The basic information of vehicle speed ware setup to 50 kilometer per hour and capacity for two people on a motorcycle.

B Tourism database

After collecting detail information of tourist attractions, coordinates, maps and behavioral queries of tourists interest The basic data was collected by creating table in Microsoft Excel document, especially tourist information and map coordinates as shown at Table I database travel coordinates of Phuket province. Using to calculate the distance and planning tourist sites with limited duration.

TABLE I
DATABASE TRAVEL COORDINATES OF
PHUKET PROVINCE

No.	Destination	Lat	Long	Category
1	Sino-Portuguese Building	7.904	98.307	Old town museum
2	Thaihua Museum	7.886	98.387	Museum
3	Rang Hill	7.893	98.380	Viewpoint
4	Promthep cape	7.759	98.304	Viewpoint
5	Chaitharam Temple	7.847	98.336	Temple
6	WatPhraThong	8.034	98.338	Temple
7	Thao ThepKasattri	7.982	98.364	Take picture
8	Kamala Beach	7.956	98.283	Beach
9	Patong beach	7.899	98.296	Beach
10	Phuket Karon beach	7.846	98.294	Beach
11	Kata Noi Beach	7.808	98.299	Beach
12	Big Buddha	7.828	98.313	Temple
13	Phuket FantaSea	7.956	98.288	Entertain
14	Water park	8.118	98.306	Waterpark
15	Laem krating	7.776	98.289	Viewpoint
16	Baan Teelanka	7.939	98.380	Take picture
17	Trickeye Museum	7.884	98.392	Museum
18	Simon Cabaret	7.879	98.292	Entertain
19	Windmill	7.770	98.307	Viewpoint
20	Aquaria	7.889	98.367	Aquarium
21	Jungle Bungy Jump	7.908	98.338	Adventure
22	Flying Hanuman	7.925	98.323	Adventure
23	Chinpracha House	7.886	98.384	Take picture
24	Sarasin Bridge	8.201	98.298	Take picture
25	Three beaches viewpoint	7.798	98.302	Viewpoint
26	Mai khao beach	8.126	98.301	Beach/take picture
27	Hanuman World	7.877	98.351	Adventure
28	Bangla Road	7.894	98.297	Entertain/Night party
29	Dolphins Bay	7.843	98.357	Aquarium
30	Kathu Waterfall	7.935	98.323	Waterfall
31	Go kart	7.913	98.328	Adventure
32	Shooting Rang	7.796	98.311	Sport

TABLE I
DATABASE TRAVEL COORDINATES OF
PHUKET PROVINCE (CONT.)

No.	Destination	Lat	Long	Category
33	Monkey spot	7.886	98.421	Zoo
34	Sino-Portuguese Building	7.904	98.307	Old town museum
35	Thaihua Museum	7.886	98.387	Museum
36	Rang Hill	7.893	98.380	Viewpoint

*Destination = Show name of tourist destination in phuket.
 *Lat = Latitude is a geographic coordinate that specifies the north-south position of a point on the Earth's surface.
 *Long = Longitude to specify the precise location of features on the surface of the earth.

The database file will record the data from the questionnaire, customer information, tourist list, area coordinates and basic information that will be used to route the tourist attraction by the VRP spreadsheet solver program. As show visualization at Fig. 8 until Fig. 18. The information on all 8 route plans, which include information on tourist spots, starting time from the depot, time end for return to the depot, time spent for each area and time of service.

The information of plan travel used data as shown in Table I database travel coordinates of Phuket province. Take the data into the program VRP spreadsheet solver. From the 8 plans tables as shown at Table II until IX. The data file name VRP plan data indicates all the desired destinations not including the first place starting point. There is a specified time of departure until the time of arrival at the accommodation. An example from plan name called the VRP1 starting time is 9:00 am, ending time at 18:00 pm (Thailand time zone), the amount of time to relax in each area will depending on the customers how much time they want to enjoy each area and the table name called "the duration of the service" is based on the number of days tourist desire and example from the VRP2 data plan. The data is recorded in the same format. It will be different only for the specific details of each customer, the customer requirement one day rental and 7 places the tourist attraction that must be visit.

TABLE II
THE INFORMATION OF PLAN TRAVEL NO. VRP1

VRP1					
No.	Name	Time Start(A M)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	18:00	0:30	2
2	Sino-Portuguese Building, TH	9:00	18:00	2:00	
3	Kathu Waterfall, TH	9:00	18:00	1:00	
4	Promthep cape, TH	9:00	18:00	2:00	
5	Big Buddha Phuket, TH	9:00	18:00	2:00	
6	Tiger Kingdom, TH	9:00	18:00	2:00	
7	Surin beach Phuket, TH	9:00	18:00	3:00	
8	Siam Niramit Phuket	9:00	18:00	1:00	
9	Three beaches viewpoint Phuket,	9:00	18:00	2:00	

TABLE III
THE INFORMATION OF PLAN TRAVEL NO. VRP2

VRP2					
No.	Name	Time Start(A M)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	18:00	0:10	1
2	Patong beach, TH	9:00	18:00	3:00	
3	Mai khao beach, TH	9:00	18:00	2:00	
4	Promthep cape, TH	9:00	18:00	2:00	
5	Chaitararam Temple, TH	9:00	18:00	1:00	
6	Elephant Sanctuary, TH	9:00	18:00	2:00	
7	Big Buddha, TH	9:00	18:00	1:00	
8	Monkey spot	9:00	18:00	1:00	

TABLE IV
THE INFORMATION OF PLAN TRAVEL NO. VRP3

VRP3					
No.	Name	Time Start(A M)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	18:00	0:00	2
2	Three beaches viewpoint, TH	9:00	18:00	1:00	
3	Sino-Portuguese Building, TH	9:00	18:00	3:00	
4	Baan Teelanka - The UpsideDown	9:00	18:00	2:00	
5	Kathu waterfall, TH	9:00	18:00	2:00	
6	Surin beach, TH	9:00	18:00	2:00	
7	Thaihua Museum, TH	9:00	18:00	2:00	
8	FantaSea, TH	9:00	18:00	3:00	
9	Monkey spot	9:00	18:00	2:00	

TABLE V
THE INFORMATION OF PLAN TRAVEL NO. VRP4

VRP7					
No.	Name	Time Start(AM)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	19:00	0:00	3
2	Big Buddha, TH	9:00	19:00	1:00	
3	Mai khao beach, TH	9:00	19:00	2:00	
4	Three beaches viewpoint, TH	9:00	19:00	1:00	
5	Aquaria, TH	9:00	19:00	2:00	
6	Promthep cape, TH	9:00	19:00	2:00	
7	Rang Hill view point, TH	9:00	19:00	1:00	
8	Kata Beach, TH	9:00	19:00	1:00	
9	Karon beach, TH	9:00	19:00	1:00	
10	Surin beach, TH	9:00	19:00	2:00	
11	Patong beach, TH	9:00	19:00	2:00	
12	Kamala Beach, TH	9:00	19:00	1:00	
13	Tiger Kingdom, TH	9:00	19:00	1:00	
14	Monkey spot	9:00	19:00	1:00	

TABLE VI
THE INFORMATION OF PLAN TRAVEL NO. VRP5

VRP4					
No.	Name	Time Start(AM)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	19:00	0:00	4
2	Mai khao beach, TH	9:00	19:00	1:00	
3	Phuket town, TH	9:00	19:00	1:00	
4	Sino-Portuguese Building, TH	9:00	19:00	2:00	
5	Saphan Hin, TH	9:00	19:00	1:00	
6	Three beaches viewpoint, TH	9:00	19:00	1:00	
7	Promthep cape, TH	9:00	19:00	2:00	
8	Rang Hill view point, TH	9:00	19:00	1:00	
9	Big Buddha, TH	9:00	19:00	1:00	
10	Tiger Kingdom, TH	9:00	19:00	1:00	
11	Go kart Phuket, TH	9:00	19:00	1:00	
12	Shooting Range, TH	9:00	19:00	1:00	
13	Hanuman World, TH	9:00	19:00	2:00	
14	Aquania, TH	9:00	19:00	2:00	
15	Laem krating, TH	9:00	19:00	1:00	
16	Scpo,WatPhraThong (Phrabhud)	9:00	19:00	1:00	
17	Monkey spot	9:00	19:00	1:00	
18	Jungle Bungy Jump	9:00	19:00	2:00	
19	Flying Hanuman	9:00	19:00	1:00	
20	Phuket Tiger Kingdom, TH	9:00	19:00	1:00	

TABLE VII
THE INFORMATION OF PLAN TRAVEL NO. VRP6

VRP5					
No.	Name	Time Start(AM)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	19:00	0:00	3
2	Windmill Viewpoint	9:00	19:00	1:00	
3	Aquania, TH	9:00	19:00	2:00	
4	Promthep cape, TH	9:00	19:00	2:00	
5	Mai khao beach, TH	9:00	19:00	1:00	
6	Three beaches viewpoint, TH	9:00	19:00	2:00	
7	Dolphins Bay, TH	9:00	19:00	2:00	
8	Big Buddha, TH	9:00	19:00	1:00	
9	Hanuman World, TH	9:00	19:00	2:00	
10	Tiger Kingdom, TH	9:00	19:00	1:00	
11	Baan Teelanka - The UpsideDown	9:00	19:00	1:00	
12	Kata Beach, TH	9:00	19:00	2:00	
13	Karon beach, TH	9:00	19:00	2:00	
14	Surin beach, TH	9:00	19:00	2:00	
15	Elephant Sanctuary, TH	9:00	19:00	2:00	
16	Chaitharam Temple, TH	9:00	19:00	1:00	

TABLE VIII
THE INFORMATION OF PLAN TRAVEL NO. VRP7

VRP6					
No.	Name	Time Start(AM)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	19:00	0:00	2
2	Chaitharam Temple, TH	0:00	19:00	1:00	
3	Big Buddha, TH	0:00	19:00	1:00	
4	Phuket town, TH	0:00	19:00	1:00	
5	Sino-Portuguese Building, TH	0:00	19:00	1:00	
6	Thaihua Museum, TH	0:00	19:00	1:00	
7	Mining Museum, TH	0:00	19:00	1:00	
8	Promthep cape, TH	0:00	19:00	2:00	
9	Three beaches viewpoint, TH	0:00	19:00	2:00	
10	Kathu waterfall, TH	0:00	19:00	1:00	
11	Patong beach, TH	0:00	19:00	2:00	
12	Rang Hill view point, TH	0:00	19:00	1:00	
13	Scpo,WatPhraThong (Phrabhud)	0:00	19:00	1:00	

TABLE IX
THE INFORMATION OF PLAN TRAVEL NO. VRP8

VRP8					
No.	Name	Time Start(AM)	Time End (PM)	Time spent (hr)	Time of service (Day)
1	White sky boutique, TH	9:00	19:00	0:00	3
2	Elephant Sanctuary, TH	9:00	19:00	2:00	
3	Three beaches viewpoint, TH	9:00	19:00	1:00	
4	Promthep cape, TH	9:00	19:00	2:00	
5	Tiger Kingdom, TH	9:00	19:00	1:00	
6	Go kart Phuket, TH	9:00	19:00	1:00	
7	Mai khao beach, TH	9:00	19:00	1:00	
8	Scpo,WatPhraThong (Phrabhud)	9:00	19:00	1:00	
9	Monkey spot	9:00	19:00	1:00	
10	Rang Hill view point, TH	9:00	19:00	1:00	
11	Baan Teelanka - The UpsideDown	9:00	19:00	1:00	
12	Kathu waterfall, TH	9:00	19:00	2:00	
13	Dolphins Bay, TH	9:00	19:00	2:00	
14	Big Buddha, TH	9:00	19:00	1:00	
15	Kata Beach, TH	9:00	19:00	1:00	
16	Karon beach, TH	9:00	19:00	1:00	
17	Surin beach, TH	9:00	19:00	2:00	
18	Patong beach, TH	9:00	19:00	2:00	
19	Kamala Beach, TH	9:00	19:00	1:00	

C Arranging tourist attractions.

From the objectives of planning a travel route with conditions of limited time and vehicles used for traveling in this section, it will show the travel plans that are based on the needs of customers. With conditions for using the motorcycle for a limited period such as the number of days needed to use the motorbike, the amount of time needed to use in each area, the total number of tourist spots that need to visit throughout the service period

In this research, the researcher has created 8 tourism route plans from customers who stay in hotels and use motorcycle rentals. Advising for customers to choose the tourist attractions that they want to visit. The time limit of stay each area decide by tourists and configuring time from the starting point until returning into accommodation in to program planning, and then program VRP spreadsheet solver will process visualization map plan as shown in Fig. 8 until Fig. 15.

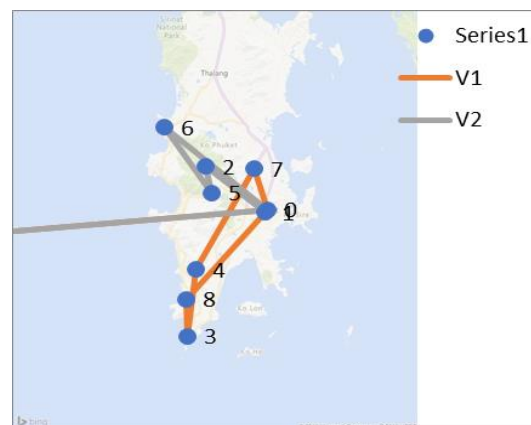


Fig. 8. VRP1 plans visualization routing by Bing map.



Fig. 9. VRP2 plans visualization routing by Bing map.

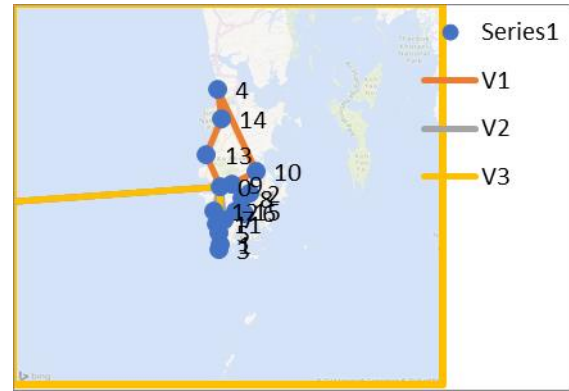


Fig. 12. VRP5 plans visualization routing by Bing map.

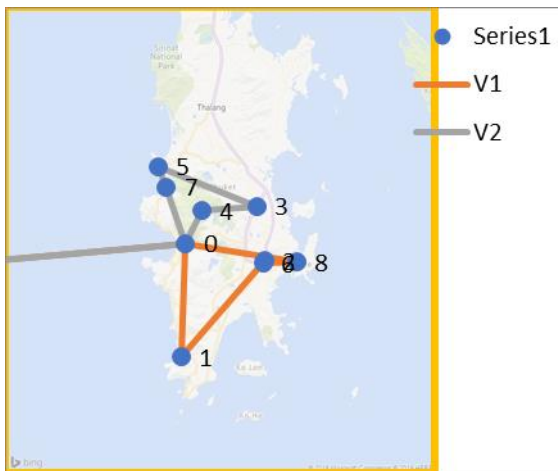


Fig. 10. VRP3 plans visualization routing by Bing map.



Fig. 13. VRP6 plans visualization routing by Bing map.

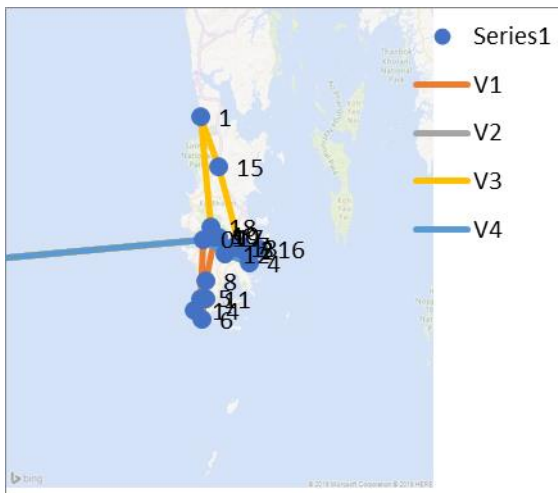


Fig. 11. VRP4 plans visualization routing by Bing map.



Fig. 14. VRP7 plans visualization routing by Bing map.

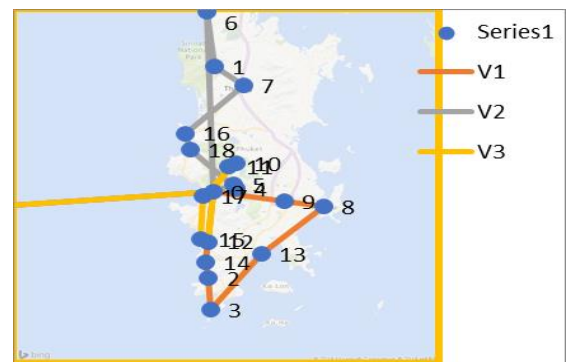


Fig. 15. VRP8 plans visualization routing by Bing map.

Fig. 8-11 shown the priority of the route from the starting point to many destinations. In which the locations are shown in figures as shown in the pictures for each plan. Line color and V symbol followed by numbers meaning as the number of days specified for use in tourism.

V. DISCUSSION

Phuket is a popular tourist destinations for Thai people and foreigners. The popularity of tourists depends on private interesting of the sea and mountains that suitable for recreation and seek new experiences in life. Phuket is an interested place. Phuket province is a large island with many beautiful points. The prominent tourist attraction in Phuket is the sea surrounded by mountains, including small and large islands around Phuket islands.

Tourism within Phuket is organized as a commercial activity and provides tourism facilitation services. For an example, a brochure recommends package tour within 1 day, 2 days or more, according to tourist desire. Complete services such as, booking travel tickets, travel plans, food, drink, accommodations, hotel services and the motorcycle rentals are very popular among tourists who would like to be relaxing and planning their own travel for living with the local people and made new experience life.

Tourism motorcycle route plans using basic information about popular tourist destinations and can be searched online and collecting from recommendation and agent tours. The data from Table I database travel coordinates of Phuket province, the collected data, surveys from local people and questionnaires from tourists interested to visit Phuket. then the researcher suggests motorcycle rentals and the route planning for tourists. Most places have been choosing from tourists and suggesting to tourists is island trips, seaside beaches, viewpoint, and temple.

Tourist information from the database shown at Table I database travel coordinates of Phuket province and in section 4 tourism database. The researcher collected tourist information to make a tourist attraction document for tourists' alternatives decision. After that, they must be recommended tourist attractions and propose a tourist attraction motorcycle route plans within a limited time.

Besides, behavioral data from the questionnaire can be analyzed to prepare ready-made travel routes that are like package tours. So that tourists can pick up this instant routing plan in the future.

IV. CONCLUSION

From the objectives of surveying tourist attractions and Motorcycle planning travel routes using appropriate time and distance, with conditions regarding the vehicle and limit time restrictions, can be summarized as follows.

Researcher surveying attractive destinations in Phuket, that are popular among tourists by questionnaire from tourist and agents' tours service. The data of tourist attraction and behavior of tourists from the questionnaire have been collected separate worksheets into Table I database travel

coordinates of Phuket province. The information on the Table I has been used to planning route and destination management by program VRP spreadsheet solver, the information on the behavior of tourist customers will be used for considering and suggesting to tourists.

The program VRP investigate possible routes passes attractive destinations in Phuket, that suit time limit and vehicle conditions. Tourist attractions are allocated based on the distance of nearby tourist sites and the limit time. Section 4 shows the details of the plan's motorcycle route and show the result of the route planning details with time and vehicle constraints. The VRP spreadsheet solver program can provide similar routes and allocate time to restrict tourists to the desired location.

Suggestion a motorcycle travel plan that takes the shortest time to travel and nearest distances with the underneath condition of a time limit and vehicle by program VRP spreadsheet solver. The researcher decides to take the select method for selecting tourist attractions based on the popularity of tourists, who use the services. And then, the researcher takes all the data required to fill into the VRP program. Finally, the motorcycle route planning from the VRP program will show routes detail and for example, as shown in section 4 will show motorcycle route 8 plans that some plan spends time than specified. Due to the number of tourist destinations to visit and may take more time to travel. The researcher recommends increasing service time conditions to increase sales opportunities and appropriately meet tourists' desires.

REFERENCES

- [1] Ministry of tourism and sport. Tourist Statistics of 2018. (2019, July). Tourist Statics. [Online]. Available at: https://www.mots.go.th/more_news_new.php?cid=411
- [2] Wikipedia. Phuket Province. (2013, March). Phuket province. Wikipedia. [Online]. Available at: https://en.wikipedia.org/wiki/Phuket_Province
- [3] G. Clarke and J. W. Wright, "Scheduling of vehicles from a central depot to a number of delivery points," *Operation Research*, vol. 12, no. 4, pp. 568-581, 1964.
- [4] T. Chaichan, "Tourism logistics management for Wang Nam Khiew district in Nakhon Ratchasima province," *Suranaree J. Soc. Sci.*, vol. 6, pp. 17-33, Dec. 2012.
- [5] W. Keadsap. "The Traveling behavior of Oceania tourists during the low season in Phuket." *Rajaprak University. Humanities and Social Sciences*, vol. 4 no. 2, pp. 127-138, Sep. 2011.
- [6] K. Boonsang, K. Boran, A. Homsin, J. Onwong, and K. Ransikarbum, "An Examination for factors and routing impacting tourism logistic in Ubonratchathani Province," in *Proc. IE Network Conference. Ubonratchathani University 2018*, pp. 1244-1248.
- [7] S. Krudthieng and V. Vongmanee, "The appropriate travel route planning to improve efficiency of the concrete monitoring unit." Presented at the 16th Thai Value Chain Management and Logistics Conference. University of Thai Chamber of Commerce. Thailand, Aug, 25-27, 2016.



Pakdee Jaisue received the industrial engineering from Panyapiwat Institute of Management, Thailand, in August 2017 and currently studying a master's degree in Faculty of Engineering and Technology. Used to work as an internship in engineering at the corrugated box factory, in 2017-2018. The current job is hotel staff at Phuket province.



Paitoon Siri-O-Ran received the doctor of engineering in industrial engineering from Kasetsart University, Thailand, in 1994. Used to be a professor in industrial engineering, in 2004-2011 at Southeast Asia University, Thailand, and the current job is head of industrial engineering faculty at Panyapiwat Institute of Management, Nonthaburi, Thailand.