Online Shopping Based Home Delivery System Using A*

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Abstract

Since the Internet has become popular, the consumer oriented e-commerce market has grown rapidly. Online shopping may stimulate a shift from the need for personal travel to demand for the distribution of goods. Transportation plays an important role in online shopping for everyone and every place. The propose system will provide a product delivery system for online shopping market. In this system, the new branches can be opened in Mandalay region and goods will be delivered to customers who live in Mandalay region. This system will use Dijkstra's algorithm to find distances between cities of Mandalay region. When the customer orders the goods then the system will find the nearest branch from the customer's address and find the shortest paths from nearest branch to the customer address by using A search algorithm. This system will also arrange the transportation paths for each branch. This system is implemented by using Java programming.*

Keywords: Dijkstra's algorithm, e-commerce market, A* search algorithm

1. Introduction

Home delivery refers to all goods delivered to customers' home rather than customers having to collect the goods in-person from a shop and transport them home themselves. Therefore, in a home delivery operation, the physical distribution of the goods from the point of purchase to the customer is organized and carried out by specialist companies rather than by the customer. Home delivery can take place for several different reasons including (i) a physical shop can provide its customers with an additional service (this could be either because the customer does not wish to take the goods with them at the point of purchase, or because the goods are currently out-of-stock and home delivery will prevent the need for the customer to make another visit to the shop, or because the customer places the order with the shop remotely and does not want to visit the store to collect the goods) (ii) because the size and/or weight of the product make it impossible for customers to transport the goods themselves, or (iii) because the seller of the goods does not operate physical shops and therefore there is no possibility for the customers to collect the goods themselves: instead they have to deliver to the customer. In this paper, the system implement online shopping based home delivery system that use Dijkstra's algorithm and A* search algorithm to identify the shortest path for the delivery of goods.

2. Related Work

Prepare your paper in full-size format, custom size (19 cm x 24.5 cm). Margins: top = 2.5 cm, bottom = 2 cm, left = 2.5 cm and right = 2 cm. The column width is 7 cm in equal. The space between the two columns is 0.5 cm. Paragraph indentation is 0.5 cm. Left and right justify your columns E-shopping identified as the process of buying goods and services directly over the internet which is considered as a form of e-commerce transactions. Xia, Huang and Zhu (2010), [5] identified the process of order fulfilling as the process of planning, organizing and dispatching consumers' orders and prepare them to be delivered to the consumer's door-step or any other delivery location. Home delivery service is one of the most important services

which play a crucial role in the success of e-shopping. Physical distribution of items bought online must be operated by the seller's delivery fleet or by third-party logistics (3PL) Company [1]. Therefore, retailers/3PL must meet their consumers' expectations by having a reliable and efficient delivery system that fills their needs in order to gain their trust and satisfaction [3]. Home delivery service also called "last mile" which plays an important role in the preservation of the environment by generating less CO2 in comparison with conventional shopping and reducing energy consumption by reducing consumers trips into shops for shopping or collecting their items. In addition, it reduces the impact of traffic by delivering consumers' orders using one vehicle within specific time windows [2]. However, the development of the delivery service needs a developed addressing system to enable the consumers to provide their shipping address details to the delivery couriers to be able to find this address. This system is called "postcode or ZIP code system" which consists of series of letters and digits to give each house a unique identifier for the purpose of mail sorting [4]. The system is based on by using positioning technologies such as web GIS and GPS as an application for desktop and Smartphone platforms.

3. System Flow

The main purpose of the system is to provide a product delivery system for online shopping market that can apply in Mandalay region. The two sides are considered in this system: Administrator site and Customer site. Before starting the two sides, the system do preprocessing step as shown in Figure 1. In this figure, the system converts Mandalay region map into "Map" file, and then calculates estimate distance between cities by using Dijkstra's Algorithm and stores these distances into "Estimated distance" file. System flow diagrams for customer and administrator can be seen in Figure 2 and 3 respectively.

At the customer site, the system shows items information and allows the customer to choose items. After choosing the items, the system requests the customer to provide login and checks the customer who is a member or not. If the customer is not a member, the system does not accept customer order. So the system prepares for member registration.

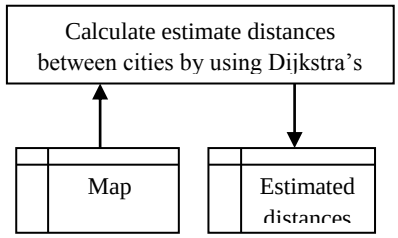

Figure 1. Preprocessing step of the system

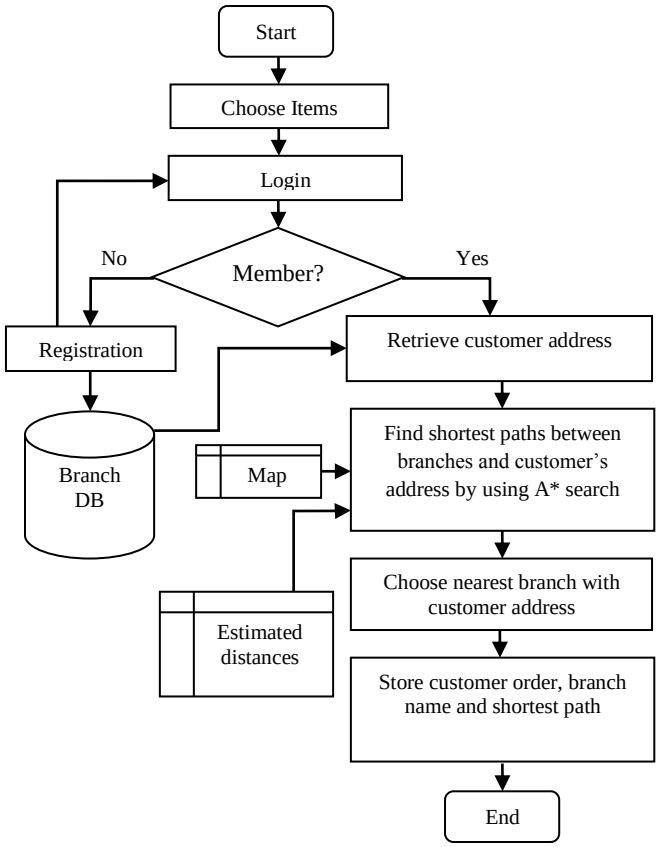

Figure 2. System flow diagram for customer

If the customer is not a member, the system does not accept customer order. So the system prepares for member registration. If the customer is member, the system retrieves customer's address from the database and finds shortest paths between branches and customer's address by using A* search. And then, the system finds the lowest distance from the customer's address among shortest paths. After defining the nearest branch, the system stores order items, branch name and shortest path into the database.

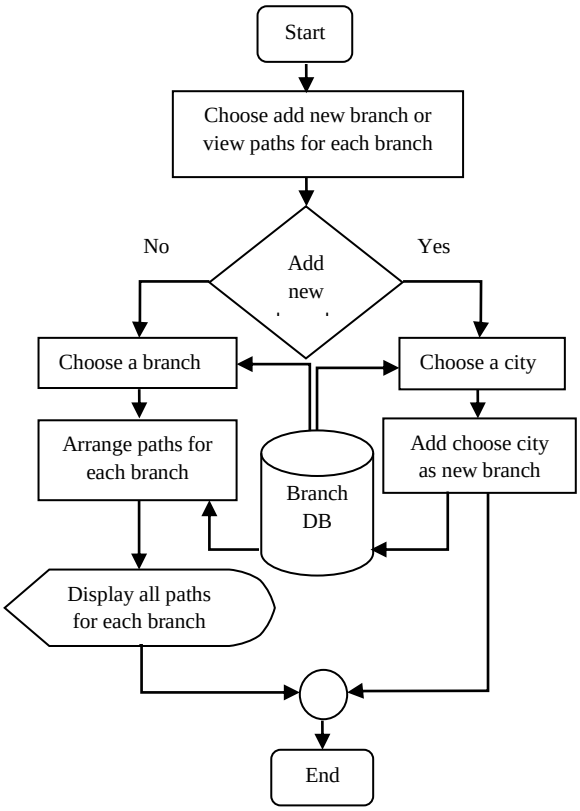

Figure 3. System flow diagram for administrator

At the administrator site, the system arranges for the administrator to add a new branch and to view delivery paths for each branch. If the administrator chooses adding new branch, the system retrieves all cities of Mandalay region and allows the administrator to choose a city that is he wants to set as a new branch and stores this city into "Branch" database. Otherwise, the system provides viewing paths for each branch. In this process, the system loads current branches of the system from the "Branch" database and allows the administrator to choose a branch. After choosing the branch, the system retrieves all order paths from the database and groups the same order paths because the order group is applicable for delivery system.

4. Finding Shortest Path Using A* Search

This section finds the estimated distances of the shortest path by using A* search algorithm . Table 2 shows sub map file of the system and Table 3 shows estimated distances for this sub map. In this example, we assume node AL (Mandalay) as the system branch and node E ("Kume") as customer's address. So, in this section, we show how to find shortest path from node AL to node E by using Table 1. This table shows estimated distances from E to other nodes of sub map.

The system's branch node AL(Mandalay) has two paths. The two paths is from node AL (Mandalay) to AJ (Madaya) and from node AL (Mandalay) to AH (Myitnge). So, we find shortest path for two paths. Firstly, we find shortest path from AL (Mandalay) to AJ (Madaya).Thus, we must sum the cost of actual distance from Table 2 from AL(Mandalay) to AJ (Madaya) is 35.4 and the cost of estimated distance from Table 1 from AJ (Madaya) to E (Kume) is108.02.So,the cost of distance from AL(Mandalay) to AJ (Madaya) is 143.42. And then, we find shortest path from AL(Mandalay) to AH (Myitnge).

Thus, we must sum the cost of actual distance from AL(Mandalay) AH (Myitnge)is 11.87 and the cost of estimated distance from AH (Myitnge) to E (Kume) is 60.75. So, the cost of distance from AL (Mandalay) to AH (Myitnge)

is 72.62.In this two path, the cost of AL (Mandalay) to AH (Myitnge) is less than the cost of AL(Mandalay) to AJ (Madaya).So, we choose the path from AL(Mandalay) to AH (Myitnge). The system can do the same process until destination city E (Kume) reach.

State	h(estimate distance)
A (Kyaukse)	30.57
E (Kume)	0.00
J (Sintgaing)	49.88
R (Tada-U)	67.99
Z (Pyawbwe)	115.86
AB (Palate)	56.32
AH (Myitnge)	60.75
AJ (Madaya)	108.02
AK (Meiktila)	74.02
AL (Mandalay)	72.62
AX (Yamethin)	136.78
BF (Wundwin)	41.84
BJ (Thazi)	93.33

Table 1. Estimated distances from E by using Dijkstra's Algorithm

{[AL->AJ, 35.4+108.02], [AL->AH, 11.87+60.75]}
{[AL->AJ, 143.42], [AL->AH, 72.62]}
{[AL->AH->AB,(11.87+4.43)+56.32]}
{[AL->AH->AB, 16.30 +56.32]}
{[AL->AH->AB, 72.62]}
{[AL->AH->AB->J, (11.87+4.43+6.44) +49.88], [AL->AH->AB->R (11.87+4.43+12.87)+67.99]}
{[AL->AH->AB->J, 72.62], [AL->AH->AB- > R, 97.16]}
{[AL->AH->AB->J ->A, (11.87+4.43+6.44+19.31)+30.57]}
{[AL->AH->AB->J ->A, 72.62]}
{[AL->AH->AB->J ->A->E, (11.87+4.43+6.44+19.31+30.57) +0]}
{[AL->AH->AB->J ->A->E, 72.62]}
Shortest path from AL(Mandalay) to E(Kume) = AL(Mandalay)->AH(Myitnge)->AB(Palate)-> J(Sintgaing) ->A(Kyaukse)->E(Kume) = 72.62 km

5. Arrange Paths

Arranging paths is also the importance part of the delivery system. For each branch, this system will arrange all paths by finding the same ways. The following is the example of arrange paths. In this example, the system has three orders for Mandalay (AL) branch. In these orders, the path of the order1 contains in the path of order3. So the system assumes that these two orders are the same direction and defines as Group1. Order3 has different direction from order1 and order2. So the system defines this path as Group2.

order1→ AL, AH, AB, J
order2→ AL, AH, AB, R
order3→ AL, AH, AB, J, A, E

Results:

Group1
order1→ AL, AH, AB, J
order3→ AL, AH, AB, J, A, E

Group2
order2→ AL, AH, AB, R

6. Experimental Results

This system is implemented by using Mandalay region map and 68 cities are contained in this map. To measure the accuracy of this

system, we set all cities as branches alternatively and create customers for each city to order goods. When the customer orders the goods, the system finds nearest branch and records delivery path. In this situation, we check whether system results are really true or not with actual map manually. The system can decide nearest branch and can find shortest path for all cities.

7. Conclusion

Online shopping is an Internet application that has spread rapidly in the developed countries. Online shopping is identified as the process of buying goods and services directly over the internet which considered as a form of e-commerce transactions. Since the internet is the only medium for online shopping, it become one of the most attractive facilities for internet users where consumers place an online orders and the retailer is responsible for fulfilling their orders. Home delivery service is an essential service for online purchased goods. Therefore, reliable delivery system is becoming necessary. The proposed delivery system is necessary for both online shopping users to identify their delivery addresses and finds the nearest branch with the location of the delivery address and plans delivery routes. Therefore, this system identifies the process of order fulfilling as the process of planning, organizing and dispatching consumers' orders and prepares them to be delivered to the consumer's door-step or any other delivery locations in Mandalay region.

8. Future Works

The system is only implemented for Mandalay region. So, the new branch of the system can only open new branch and accept customer order in Mandalay region. Therefore, the future works of the system is to extend this home delivery system that contains all states and regions of Myanmar.

Table 2. Map file

	A	E	J	R	Z	AB	AH	AJ	AK	AL	AX	BF	BJ
A	0	30.57	19.31	37.42	0	0	0	0	0	0	0	0	0
E	30.57	0	0	0	0	0	0	0	0	0	0	41.84	0
J	19.31	0	0	0	0	6.44	0	0	0	0	0	0	0
R	37.42	0	0	0	0	12.87	0	0	0	0	0	0	0
Z	0	0	0	0	0	0	0	0	41.84	0	20.92	0	0
AB	0	0	6.44	12.87	0	0	4.43	0	0	0	0	0	0
AH	0	0	0	0	0	4.43	0	0	0	11.87	0	0	0
AJ	0	0	0	0	0	0	0	0	0	35.4	0	0	0
AK	0	0	0	0	41.84	0	0	0	0	0	0	32.18	19.31
AL	0	0	0	0	0	0	11.87	35.4	0	0	0	0	0
AX	0	0	0	0	20.92	0	0	0	0	0	0	0	0
BF	0	41.84	0	0	0	0	0	0	32.18	0	0	0	0

BJ	0	0	0	0	0	0	0	0	19.31	0	0	0	0

Table 3. Estimated distances results from Map file

	A	**E**	**J**	**R**	**Z**	**AB**	**AH**	**AJ**	**AK**	**AL**	**AX**	**BF**	**BJ**
A	0.00	30.57	19.31	37.42	146.43	25.75	30.18	77.45	104.59	42.05	167.35	72.41	123.90
E	30.57	0.00	49.88	67.99	115.86	56.32	60.75	108.02	74.02	72.62	136.78	41.84	93.33
J	19.31	49.88	0.00	19.31	165.74	6.44	10.87	58.14	123.90	22.74	186.66	91.72	143.21
R	37.42	67.99	19.31	0.00	183.85	12.87	17.30	64.57	142.01	29.17	204.77	109.83	161.32
Z	146.43	115.86	165.74	183.85	0.00	172.18	176.61	223.88	41.84	188.48	20.92	74.02	61.15
AB	25.75	56.32	6.44	12.87	172.18	0.00	4.43	51.70	130.34	16.30	193.10	98.16	149.65
AH	30.18	60.75	10.87	17.30	176.61	4.43	0.00	47.27	134.77	11.87	197.53	102.59	154.08
AJ	77.45	108.02	58.14	64.57	223.88	51.70	47.27	0.00	182.04	35.40	244.80	149.86	201.35
AK	104.59	74.02	123.90	142.01	41.84	130.34	134.77	182.04	0.00	146.64	62.76	32.18	19.31
AL	42.05	72.62	22.74	29.17	188.48	16.30	11.87	35.40	146.64	0.00	209.40	114.46	165.95
AX	167.35	136.78	186.66	204.77	20.92	193.10	197.53	244.80	62.76	209.40	0.00	94.94	82.07
BF	72.41	41.84	91.72	109.83	74.02	98.16	102.59	149.86	32.18	114.46	94.94	0.00	51.49
BJ	123.90	93.33	143.21	161.32	61.15	149.65	154.08	201.35	19.31	165.95	82.07	51.49	0.00

References

[1] Browne, M., Allen, J., Anderson, S. and Jackson, M. (2001), “Overview of Home Deliveries in the UK (A study for DTI)”, Freight Transport Association, University of Westminster Disponívelem, vol. 17, pp. 1-6.

[2] Cairns, S. (2005) "Delivering supermarket shopping: more or less traffic?”, Transport Reviews, Vol. 25, No. 1, pp. 51-84.

[3] De Koster, R. (2003) "Distribution strategies for online retailers", Engineering Management, IEEE Transactions, Vol. 50, No. 4, pp. 448- 457.

[4] Dzuba, G., Filatov, A. and Volgunin, A. (1997) "Handwritten zip code recognition", Document Analysis and Recognition, 1997., Proceedings of the Fourth International Conference onIEEE, , pp. 766.

[5] Xia, X., Huang, Y. and Zhu, H. (2010) "Consumer logistics tradeoffs in EGS environment", Logistics Systems and Intelligent Management, 2010 International Conference on IEEE, Vol. 3, pp. 1549

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