Quest for Research Excellence On Computing, Mathematics and Statistics

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Faculty of Computer and Mathematical Sciences

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Chapters in Book

The 2nd International Conference on Computing, Mathematics and Statistics (iCMS2015)

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4-5 November 2015
Langkawi Lagoon Resort
Langkawi Island, Kedah
Malaysia

Publication by
Faculty of Computer & Mathematical Sciences
UiTM Kedah

ISBN 978-967-0314-26-6

Content

CHAPTER 5
Dijkstra's Algorithm In Product Searching System (Prosearch)

Nur Hasni Nasrudin, Siti Hajar Nasaruddin, Syarifah Syafiqah Wafa Syed Abdul Halim and Rosida Ahmad Junid

Abstract. There are huge numbers of supermarkets these days. Some customers find it difficult for them to get the items that are needed for. Customers need to search every-where in the supermarket to find the product without knowing the exact location and availability. Preliminary study had been conducted in one popular supermarket in Perak. There were 30 respondents participated in the survey and had to respond to four (4) main questions; a) Searching duration, b) Emotional Impact, c) Supermarket staffs' assistance, d) Proposing a System Application as a solution. The results from the survey have led to the development of ProSearch application system. ProSearch is a system that is developed by applying a graph search algorithm called Dijkstra Algorithm so as to find and identify the shortest path to reach the product. Dijkstra algorithm is able to solve the single-source shortest path problems. It has been used in game development and Geographic Information Systems (GIS) application. ProSearch enable user to identify the location of the product in a supermarket. To avoid from making mistakes ProSearch offer facilities to dis-play the product picture and availability status to the user. ProSearch has been tested in three different browsers; Internet Explorer, Chrome and Firefox. It was found that Chrome browser is the most compatible browser and it has the fastest loading time. ProSearch then has been tested in one popular supermarket. However, surprisingly the management refused to implement ProSearch due to some reasons that will be discussed later in this paper.

Keywords: Product searching problems, Dijkstra Algorithm, Shortest path, ProSearch.

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1 Introduction

As a customer, searching a product without knowing the exact location is crucial. Especially for those who are in rush and has limited time to shop. Therefore, realized that finding product in supermarket become one of the difficulties to customer, has encouraged researchers to come out with some solutions. The researchers did a literature review to find the best and possible algorithm to be implemented in this particular solution and found Dijkstra's Algorithm is the most possible solution for this project.

2 Background Study

Researcher has done a preliminary study about customer's emotion, expectation and perception when they are in the supermarket. A set of questionnaire has been randomly distributed to one of the chosen supermarkets. There were 30 customers participated in the survey. The first question asked to the customers was whether they get frustrated when the products that they want are not found after searching for a long time. Figure 1 represents the result of the question.

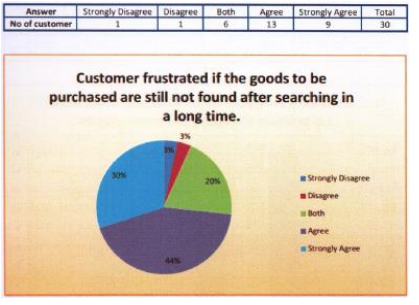


Fig. 1: Pie chart of customers' feedback when the product that they want is not found.

Next, the researcher also wanted to know whether it will take a long time to find a product in the supermarket. Figure 2 shows majority of the customers chose 'BOTH" as an answer. According to 14 respondents, some products are easy to find and some are difficult to find due to several factors. Nevertheless, 7 respondents agree that products are difficult to find and 7 respondents did not agree with this statement. The latter is probably some loyal customers to the supermarket and very familiar with the location of the product.

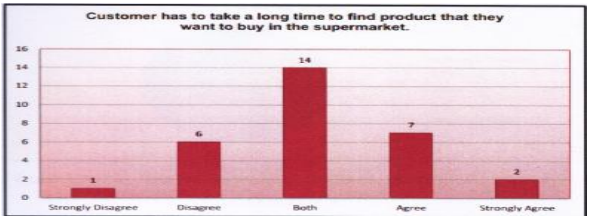


Fig.2: Bar chart of customers' feedback from questionnaire for question about taking long time to find the product that they wa

Anotther curiosity is whether customers get proper assistance from the supermarket's staffs, during products search. Based on the survey, the result is quite motivating. About 20 respondents agree that they do get good experience during products searching while on the other hand 2 respondents have bad experiences; the staffs did not give any assistance in looking for the product they want. In reality, there is a possibility of more customers having bad experience and are disappointed when they are at the supermarket. The results are clearly displayed in figure 3.

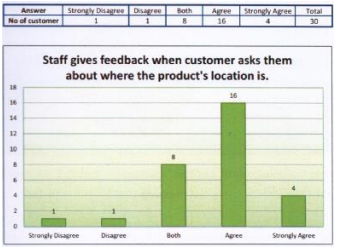


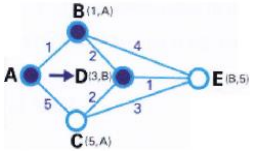
Fig. 3: Bar chart for staffs' assistance during product search

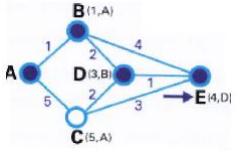
3 Proposed Solution

3.1 Dijkstra's Algorithm

The proposed solution is called Product Searching System (ProSearch), which integrate Dijkstra's algorithm. This system is to find the location of the product and also suggest the shortest path to reach the location. Dijkstra's Algorithm is a graph search algorithm that solves the single source shortest path problem for a graph with non-negative edge past costs, in order to producing a shortest path tree [1]. Dijkstra's algorithm computes length of the shortest path from the source to each of the remaining vertices in the graph.

The following example indicates the steps needed to find the best route between A and E. Generally, there are six possible routes: AABE, ACE, ABDE, ACDE, ABDCE, and ACDBE.





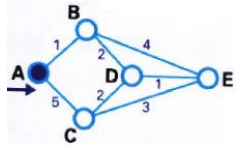


Fig. 4: The source node is A. **Fig. 5**: Defined T-Nodes and identify final shortest path

Firstly, the source node (A) has been chosen as T-node and label as permanent. Secondly, the system will check the nearest nodes. For this case, B is set as the next T-Node since it is the least weight. This step will be repeated to find the next T-Node. The next T-Node is D. Therefore, the best route from A to E is ABDE.

3.2 System Design And Development

ProSearch is developed according to the process flow or flowchart that has been designed according to the requirement and the objective of the project. In order to implement Dijkstra's algorithm in the ProSearch, we need an XML (Extensible Markup Language XML) and AJAX (Asynchronous JavaScript and XML) to make the process of path weight comparison become faster and reduce the loading time. XML is a W3C standard and easy to read, understand and process by computer [2]. It will help to reduce the time between the system and MySql. It is a new technique in creating better, faster and more attractive web application [3]. Some examples of applications that use AJAX are Google Maps, Gmail, YouTube and Facebook tabs. The interface of the system has been designed to help customers search for their product easily. The arrangement of the rack has been drawn and displayed as an image. Every rack has been assigned to the node and the distance between one rack to another. These nodes will be used by Dijkstra's algorithm suggesting the shortest path to the customer. The screen of the system has been arranged according to the flowchart as in figure 7.

1. Homepage of Prosearch. Key in search keyword

2. Details of the product

3. Enlarge product to ensure the specific product that customers' want.

4. The shortest path suggest by Prosearch using Dijkstra algorithm. The path is clearly shown in the map.

Fig. 7: The simple interface of ProSearch to facilitate customers in finding a product.

3.3 Prosearch Testing

3.3.1 Testing On Loading Time And Browser Compatibility

Loading time is vital to be handled. In order to ensure the performance of ProSearch, the system has been tested in terms of time loading. First, the time loading will display an image from the database according to customers'

request. Therefore, the researcher decided to test the compatibility and the performance of the system towards three main browser; Internet Explorer, Firefox and Chrome. The result of the testing is represented in the bar chart in figure 8.

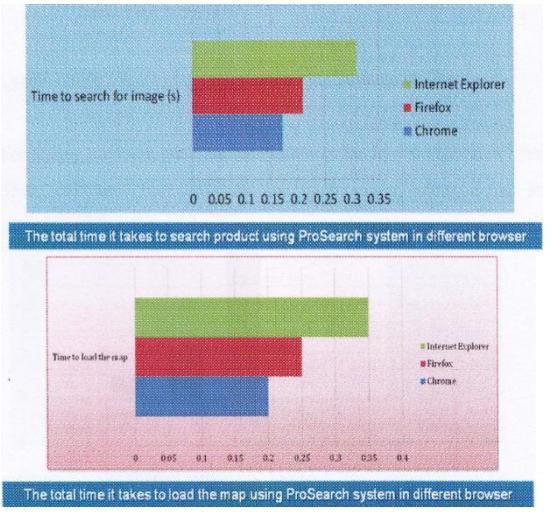


Fig. 8: The loading time to search and display product image and map location in different web browser.

This clearly shows, Chrome is the lowest loading rate which is less than 0.15 seconds. However, Firefox and Internet Explorer need more than 0.20 seconds to produce the image. Furthermore, this process not only involves database search and connection but it also involves total time needed to display the map. Result shown Chrome is the lowest loading rate that only needs 0.20 seconds, Internet Explorer took the longest time which is 0.35 seconds and Firefox took 0.05 seconds longer than Chrome. The testing concludes that, Chrome is the most compatible browser for ProSearch.

3.3.2 Userbility Testing In Supermarket

The researcher chose one supermarket to test the systems. A single terminal has been set up near the customers' service counter. Brochure and template were delivered to the customers to inform them our intentions and objectives. We targeted to have at least 30 respondents to use the system and give their feedbacks. After all, the effort from our team members and support from the

supermarket's staffs finally reached our target setting. We gave the customers some green and red cards to represent agree and disagree when using the system. The results are as follow in figure 9.

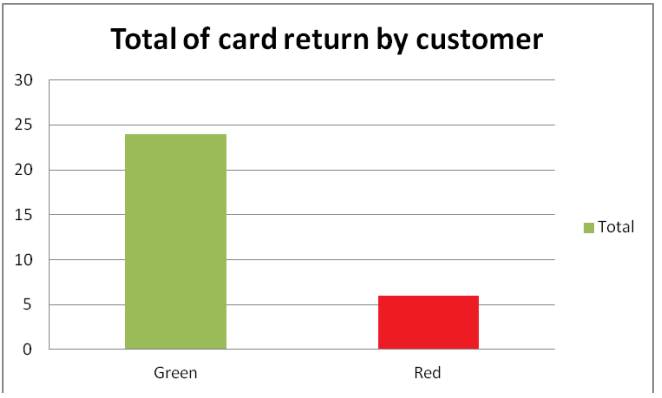


Fig. 9: Number of cards returned by customers, green represent agrees and red represent disagree.

Positive responses from the customers have motivated our team to have further discussion with the supermarket's representative. However, based on the discussion, we were surprised that the system cannot be implemented due to some reasons. The reasons are summarized in Table 1.

Table 2. Reasons from the supermarket's representative toward ProSearch implementation.

No.	Reason
1.	The position of the product rack and the location of the product will be changed periodically.
2.	The cost of the implementation of the hardware is high.
3.	The implementation of the system discourages customers from exploring the entire supermarket. This will reduce sales and against company's strategies.

4 Conclusion

The study proved that customers do face problems in finding the products that they want in the supermarket. ProSearch proposed a solution to reduce the risk of disappointment in looking for products and goods in supermarket. The system has been tested and found Chrome is the best web browser to be used. ProSearch technique needs to be improved especially in a dynamic map layout

to suit the supermarket's objectives. Up to date, the system has not been implemented in any supermarket yet.

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ISBN 978-967-0314-25-6