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Program and Abstract Book

INTERNATIONAL CONFERENCE ON MATHEMATICS AND NATURAL SCIENCES

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PROGRAM AND ABSTRACT BOOK

fructose, lactose and maltose. The result of the research showed that both callus growth and accumulation of isoflavone was depended both on kind of carbon sources supplemented into medium and time of incubation. The medium containing sucrose, glucose and fructose were good on sipporting the average callus growth and accumulation of isoflavone was at a low level. On the other hand, medium containing maltose and lactose were lack on supporting callus growth but the accumalated isoflavone at a high level. medium containing maltose showed the higher accumulation of isoflavones (daidzein: 128.84 mg/g callus at 6 weeks after cultured: genistein: 104.61 mg/g callus at 7 weeks after cultured)

PC59   Methyl Red Removal from Aqueous Solution by Using Treated Sugarcane Bagasse

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Abstract

Dyes are used in a various industries, such as food, paper, carpet and others. Among these, textile industries rank first in the usage of dyes. The discharge of coloured wastewater from these industries had caused many significant problems, namely increasing the toxicity and COD (chemical oxygen demand) of the effluent. The adsorption process had been proven to be the most effective method in the dyes removal. But, commercially available activated carbon is very expensive. This had lead to the further studies for cheap substitution. In this study, sugarcane bagasse - an agro industry waste were used to remove the dyes from the aqueous solution in a batch reactor. The formaldehyde treated (PCSB) and sulphuric acid treated (PCSBC) sugarcane bagasse were used to adsorb methyl red at a various adsorbent dosage, initial dye concentration, contact time and pH values. Similar experiment were conducted using commercially used powder activated carbon (GAC), in order to evaluate the performance of PCSB and PCSBC. This study had shown that the PCSB and PCSBC could be employed and have a potential for low cost alternative in the wastewater treatment for dyes removal.

Mathematics

PD01   Vehicle Routing With Shortest Path System based Floyd Warshall Technique

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Abstract

Vehicle routing plays an important role in courier industry. Problems normally occur during delivery process specifically in determine the receiver. From the practical point of view, solving this problem and have a good routing procedure can save the industry millions of dollars per year through cost-effective movement and delivery of goods. In addition, effective routing can increase productivity, improve operations and make the job of dispatching easier. This project was to develop a system that capable to determine the vehicle route by implementing the traditional method, Floyd Warshall. This system focus on area in a city in Penang and consider 46 locations as the case study. The system was developed in windows XP environment and the interface development developed by using Macromedia Dreamweaver 2004. Its database used Microsoft SQL server. This system was capable to give travel distance, and determine the sequence of location for goods delivery with the shortest path. The system has been tested for a currier company in Malaysia.

Keywords: *Shortest Path, Vehicle Routing, Floyd Warshall, Micromedia Dreamweaver*

Vehicle Routing With Shortest Path System Based Floyd Warshall Technique

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Abstract

Vehicle routing plays an important role in courier industry. Problems normally occur during delivery process specifically in determine the receiver. From the practical point of view, solving this problem and have a good routing procedure can save the industry millions of dollars per year through cost-effective movement and delivery of goods. In addition, effective routing can increase productivity, improve operations and make the job of dispatching easier. This project was to develop a system that capable to determine the vehicle route by implementing the traditional method, Floyd Warshall. This system focus on area in a city in Penang and consider 46 locations as the case study. The system was developed in windows XP environment and the interface development developed by using Macromedia Dreamweaver 2004. Its database used Microsoft SQL server. This system was capable to give travel distance, and determine the sequence of location for goods delivery with the shortest path. The system has been tested for a currier company in Malaysia.

Keyword: *Shortest Path, Vehicle Routing, Floyd Warshall, Micromedia Dreamweaver*

1. Introduction

A vehicle routing problem involves determining for each vehicle, which customers will be visited and what route will be followed so that the total delivery cost is minimized. The good routing procedure can save the industry millions of dollars per year through cost effective movement and delivery of goods. In addition effective routing can increase productivity, improve operations and make the job of dispatcher easier.[2]

In this vehicle routing problem, a questions arise, within the distance considered, which each customer will be visited so that required service level, such a given number of customers visits are met. Obviously, the assignment of delivery item to customers' constrains the design of efficient route and cannot be considered separately of the routing component. [6] In this situation, an exact solution method was applied in problems of deterministic size.

In delivery system, this case study is currier's business that mainly focuses on delivery goods to customer. Delivery of the item with on time to customer and also they receive the right item, is the main agenda in this case study. The company uses several methods to currier the item such as air, sea and land. Scope of this study, focus on land delivery method. Current practice, truck driver received list of customer that should to deliver the item. The driver have responsibility to determine the sequence of customers that to visit and the route should be taken that gives the shorter travel time. Driver's experience and familiar with area of customer's location, makes their job become easier. Problem occurs for inexperience and unfamiliar driver in certain town, thus it result to lost the roads and chance for late delivery is high. This driver normally, only depends to given map that sometimes doesn't really help in location determination. Referring to this problem, an integrated vehicle routing with

shortest path system was developed. This system capable to assist drivers in determining the sequence of customers and path involve that gives the shortest path.

2. Currier system problem in Penang

In this research, the case study was Prestige Air Logistics (M) Sdn Bhd. This international company have branch in Hong Kong, China and join venture with others company in USA and Europe. The company offers currier services such as forwarding, freight, shipping agencies, warehousing and road transportation.

Penang Island is developing state. Its town centre is Georgetown. This state main economy is industrial tourism. Fast development in industrial area and town centre causes some rapid changes in their infrastructures, such as develop a new town, and open a new road and also changing in road structure, changing from two ways road into one way. The situation affected a truck driver to deliver goods for the given time frame.

The truck navigates the network travel through a sequence of locations; such a sequence is called route. The routes begin at their warehouse and lastly return back to the warehouse. The length of route is the sum of the distance taken along each edge of the route.

3. Routing and Shortest Path Algorithm.

The all-pairs shortest path problems were used as an example. In this problem, the sample undirected graph represent some locations of customers. This shows in figure 1.
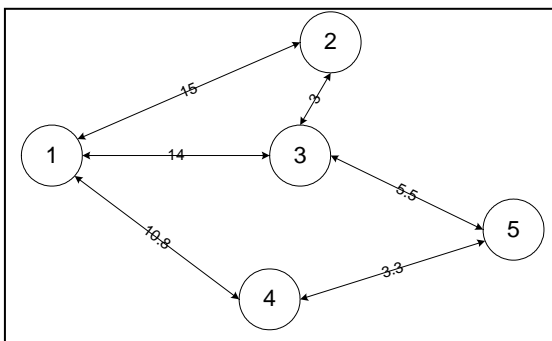

Figure 1 : Undirected graph for this case study

This graph, the undirected graph G consisting N nodes identified by numbers form 0 to N-1. Each (undirected) edge (i,j) has positive distance by the function $W(i,j)$. We assume that $W(i,i)=0$ for all i and $W(i,j)=\infty$ for any i and j that are not connected by an edge. The first problem is to determine the length of the shortest path between each pair of nodes; the second is to determine the sequence of locations according to the shortest path calculated.[1]

Three shortest path techniques were studies, namely : Djikstra algorithms, Floyd Warshall and Bellman Ford. Djikstra algorithm that finds the shortest path from the 'source' node to all other nodes of the defined network. The shortest path source and destination matrix is computed by repeating the application of Djikstra algorithm iteratively setting each node as source node and calculationg the shortest paths to every other node of the network. The distance is used as the only shortest criterion. That is because distances between the customers can be calculated quite reliably form road information whereas travel time have a highly stochastic nature. The reason for using distances is that according to the currier service is the cost is highly related with the total traveling distance.

In this research, we use Floyd-Warshall algorithm because it's have some characteristic that suitable for this problem. Compare to Djikstra algorithm, this algorithm do calculation with efficiency. This is because; no repeat calculation is done to get shortest path for all nodes. This algorithms also usually used to calculate the shortest path based on map, such as between town for a certain state.

We used Floyd -Warshall to get a shortest path for each node. This algorithm gives the shortest path for all pairs of nodes. The first and last node is warehouse situated at Bayan Lepas, Penang. Starting from the warehouse, the system will determine all the shortest path involves for the nodes. According floyd-Warshall algorithm, the system determine all shortest route for the nodes. Among the route, the shortest route becomes next starting node. Base on the new starting node, the process of determining the next shortest route is repeated as before, but just deduct one node. This process is done until it meet the first node which is the first starting node.

The Floyd-Warshall algorithm solves the all-pairs problem in $O(N^3)$ time on machine with $O(N^2)$ processors. The Floyd-Warshall algorithm operates on an array $d[i,j]$,

where initially $d[i, j] = W[i, j]$ for all i and j. Initially each nodes is "unscanned". At each step the algorithm selects an unscanned node k and scan it by replacing $d[i, j]$ with $\min(d[i, j], d[i, k] + d[k, j])$ for all values of i and j in parallel. When all values of k have been scanned, each $d[i, j]$ contains the minimum distance from node i to node j. The correctness of the algorithm can be proved using an invariant which can be informally read as " at all times, $d[i, j]$, is the length of the shortest path from i to j all of whose internal nodes have been scanned"[1]. The floyd warshall algorithm shows in figure 2.

```
Initialization
    k := 0
    for all I,j where 0 ≤ i ≤ N ^ 0 ≤j <N do
```
$$d[i, j] := W(i, j)$$
```
    end

Program
    While k < N do
     For all I,j where 0 ≤ i ≤ N ^ 0
     ≤j <N do
```
$$d[i, j] := \min(d[i, j], d[i, k] + d[k, j])$$
```
     end
     k:= k+1
     end
```

Figure 2 : abstract code for the Floyd-Warshall all pairs shortest path algorithm.

4. Results

The system works based on floyd-Warshall algorithm and routing procedure. The system was developed in Window XP environment and supported by Macromedia Dreamweaver 2004, this software was used as a system interface development. Microsoft SQL server is implemented as database. A password is required to use long in this system. This is to make sure that only the registered users were capable to use this system. There are several interfaces for this system, for this report, only discusses some important interface.
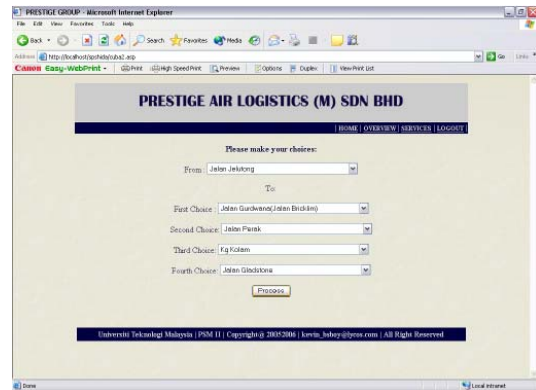

Figure 3 : Main system interface

Figure 3 shows interface of the system. In this interface, user determines the starting point of location's delivery item, and then there are 5 choices of location of customers need to be specified. This is compulsory input into system. The next step is the system gives results from calculation, as shown in figure 4.0 This interface, list of sequence of location was stated, the guideline of reading the result also shown in left side of the interface. Figure 5.0 shows detail, roads that give the shortest path to each destination. In this interface, the road should be used for that route, also indicated.
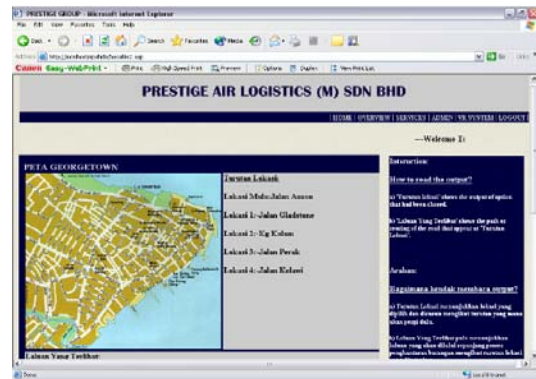

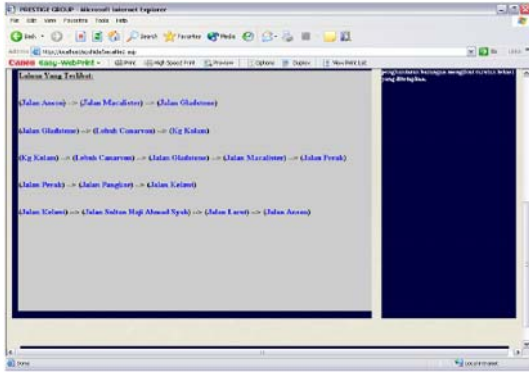Figure 4 : Routing of the location

Figure 5 : The shortest path

5. Testing and validation

Validation of the system, we compare result from the system with calculation by hand. Using the same input and parameter, a manual calculation was done. Result from the calculation was compared with result from system. This shows in figure 6, the inputs that used for validation. There are 5 location nodes with their distance, namely Jalan Perak, Jalan Macalister, Jalan Canarvon and Kg Kolam. Distance from location Jalan perak to Jalan Macalister is 1.43 KM, and from Jalan Macalister to Kalan Gladstone is 1.45 KL. The rest of distance as in figure below.
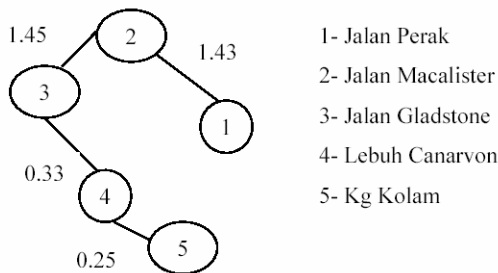

Figure 6 : nodes and distance

Result from calculation using Floyd Warshall algorithm shows distance for each node and the route as in figure 7 and figure 8

0	0.5	1.95	2.88	2.53
0.5	0	1.45	1.78	2.03
1.95	1.45	0	0.33	0.58
2.28	1.78	0.33	0	0.25
2.53	2.03	0.58	0.25	0

Figure 7 : distance matrix

1	2	2	2	2
1	2	3	3	3
2	2	3	4	4
3	3	3	4	5
4	4	4	4	5

Figure 8 : Routing matrix

According to these two figures, for example, total distance from the first node (Jalan Perak) to fifth node (Kg Kolam) is 2.53 KM . The route for each nodes is: 1 (Perak road)→ 2(Macaliscter road)→ 3(Gladstone road)→ 4 (Canarvon Avanue) → 5(Kg Kolam)

Comparing result with system developed is done by using the same input. Result form the system checked using text file generated by the system, namely distance file and route file, figure 9.0 shows the output. Both results from system and manual calculations shows that, they use the same route with the same total distance. This conclude that, result from the system is relevant with manual calculation.
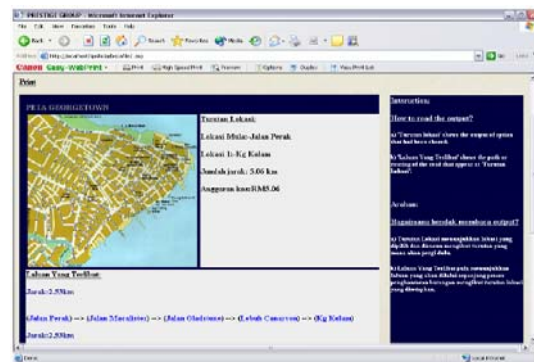

Figure 9 : Output from sistem

6. Conclusion

We developed a system that assists in determining the shortest path and routing for desired nodes. Floyd-Warshall was used as algorithms to determine the shortest path between nodes. Result from the system was compared with manual calculation, and proved that result from the system is same as manual calculation. Other validation method that will be uses for the system is pilot testing by the organization. For future step is, to receive feedback from the organization and do some changes based on their requirement.

Reference :

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[5] T. Nuortion, J. Kytojoki & O.Braysy. Improved Route Planning and Scheduling of Waste Collection and Transport. Expert System With Applications, 30(2006).

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Abstract

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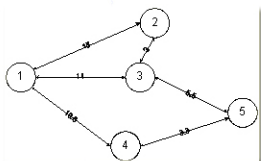
2. Routing and Shortest Path Algorithm

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Initialization
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  $d[i,j] :- W(i,j)$
  end

Program
While k < N do
  For all I, j where $0 =< i =< N \wedge 0 =< j < N$ do
$d[i,j] :- min(d[i,j], d[i,k]+d[k,j])$
end
  k:= k+1
  end

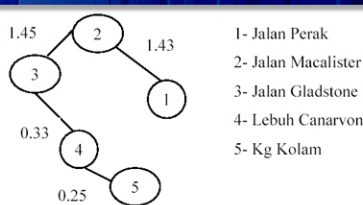Figure 2 : Abstract code for the Floyd-Warshall all pairs shortest path algorithm

3. Result

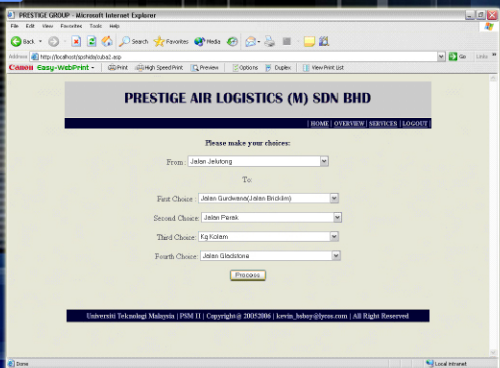Figure 3 : Main system interface

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4. Testing and Validation

Figure 5 : The shortest path

1- Jalan Perak
2- Jalan Macalister
3- Jalan Gladstone
4- Lebuh Canarvon
5- Kg Kolam

Figure 6 : Nodes and distance

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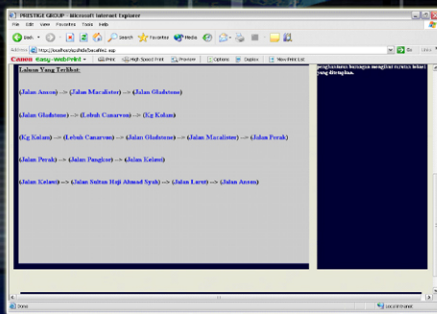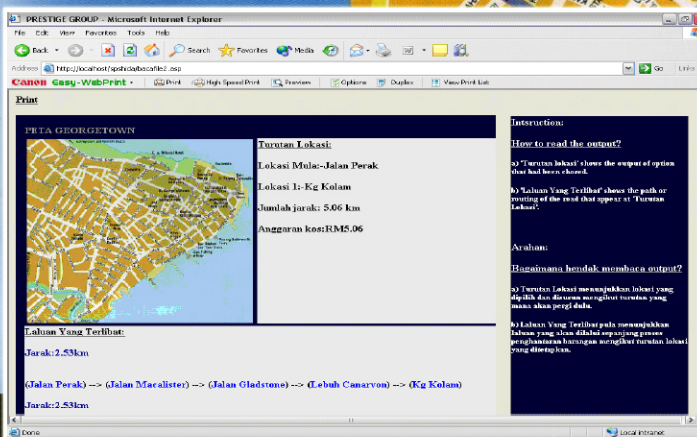Figure 7 : Distance matrix
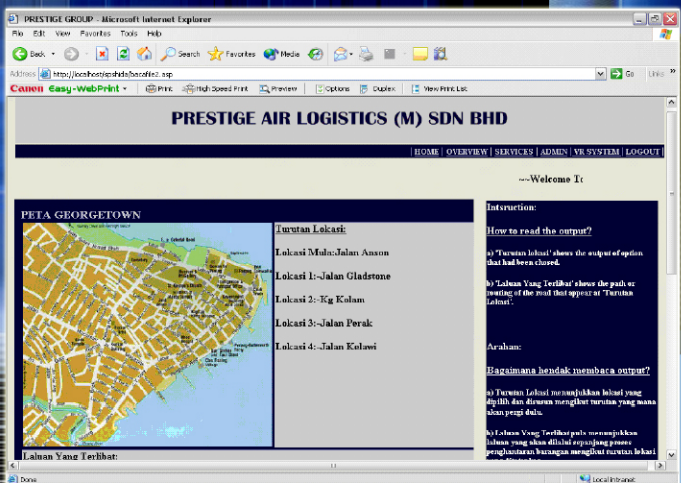
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