Trip Planning System

By

Syed Aminuddin bin Syed Salleh

Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Technology (Hons)
(Business Information Systems)

JULY 2009

Universiti Teknologi PETRONAS
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Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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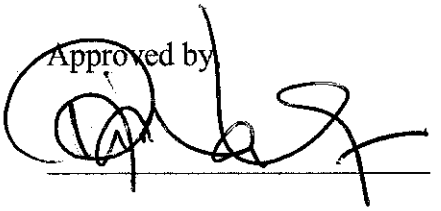
Approved by



(Ms Diana Wong Mei Leng)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
July, 2009

CERTIFICATE OF ORIGINALITY

This is to cerfity that I am responsible for the work submitted in this project that the original work is my own except as specifies in the references and acknowledges and that the original work contained herein have not been undertaken or done unspecified sources or persons.

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ABSTRACT

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Rapid improvement of development depends on transport, for movement from where there are produced to where it's needed, and the movement of people from their home to where they must go to achieve what they need for survival in this world. A good public transport system is important to a main city, at the same time the cause affecting the development of the city play an important part determining the way in which is most transport system growing.

In order to assist the citizen and the tourist in Kuala Lumpur, Trip Planning System is the best system to manage and help people to choose the best mode of public transportation. Trip Planning System can provide assistance in trip planning (before and during the journey) using one or a number of modes of travel, taking into account travelers preferences and constraints, and effectively integrating the best output for the users. The Trip Planning System could adversely affect traffic demand, as people who become aware of new opportunities might be encouraged to make more journeys. It could also affect traveler's choice as they can properly plan their journey with all the information in the system.

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INTRODUCTION

1.1 PROBLEM STATEMENT

Malaysia is a land full of continual change and surprise. The development of its capital, Kuala Lumpur has been tough, rapid and impressive. Few cities in the world can boast the alluring sight of the city at night approached from the airport highway which takes you through an illuminated ravine and then reveals the now internationally recognized landmarks of Kuala Lumpur with PETRONAS Twin Tower and Menara Kuala Lumpur and the Malaysia's new government office at Putrajaya.

Kuala Lumpur citizens and especially tourist from outside Malaysia may not know the various tourist attraction spots and the available modes of transport to those and other destinations which are connected with the public transport. Some modes of transportation may be cheaper compared to others. Travelers are often unaware of alternative routes or services and many are unable to acquire adequate information from one source. If this situation happened, the users will waste too much time and money traveling using the wrong transportation. In addition, there is a lack of providing real time information where it is required (bus stops or train station) and of effective interaction of static and real time information.

1.1.1 Traffic Congestions

The high travel demand has been met in large part by private transportation in particular, private cars. As a consequence, there has been congestion and a serious deterioration of travel speed on major roads in many parts of Kuala Lumpur, especially in the city centre, due to major traffic routes operating at or above capacity during peak hours. Low vehicle occupancy has further aggravated the problem. This is the main reason why the issue of high travel demand to and from the city centre

during peak hours rises. Although traffic management measures have done much to ease traffic flows, they cannot continue to do so indefinitely if traffic demand on the roads continues to grow.

1.1.2 Pollution

Malaysia is experiencing a number of environmental problems stemming from its drive towards development. Primary among these are deforestation, air pollution from industrial and vehicular emissions, and industrial municipal sewage in its river. Air pollution is due to both stationary industry emissions and vehicle exhaust in industrial and urban areas. To some degree the burning of solid waste is also a cause of air pollution. The major source of air pollution in Kuala Lumpur is car exhaust fumes from a rapidly growing fleet of private cars, in spite of government efforts to maintain strict emissions standards. The deterioration of air quality can be a serious hazard to human health leading to respiratory diseases as well as a reduction in visibility.

Industrial development in Peninsular Malaysia has made significant beneficial contributions to the country's overall economic development. It has generated employment and promoted socio-economic infrastructural development; however, it has profound effects on the environmental water resources because all industries require the use of both renewable and non-renewable resources from the environment. It is obvious that the conversion of these resources into finished or semi-finished industrial products results in residues that are often discharged as wastes into water. These wastes are in solid, liquid or gaseous forms and, when discharged indiscriminately, could adversely affect the quality of the water.

State	Major water pollution sources/industries							
	Palm oil	Raw rubber	Rubber product	Food/ beverage	Textile/ leather	Paper	Chem.	Total
Selangor	29	13	132	94	22	15	109	414
Johor	67	41	36	136	59	11	34	384
Pulau Penang	5	9	35	164	58	14	43	328
Perak	36	26	28	133	13	5	12	253
Kedah	3	29	22	98	9	2	8	171
Terenganu	11	3	6	84	16	–	–	120
Pahang	58	20	3	33	–	1	1	112
Wilaya/P	–	4	26	21	10	13	31	105
Sabah	27	4	3	49	5	11	5	104
Negeri/S	12	22	13	15	2	22	9	95
Melaka	3	12	17	21	7	3	11	74
Kelantan	8	11	1	28	4	1	3	56
Sarawak	6	4	1	38	–	3	4	56
Perlis	–	–	1	14	1	–	–	16
Total	255	198	324	928	206	101	270	2292
Percent	11.6	8.6	14.1	40.5	9.0	4.4	11.8	–

Source: DOE (1991, p. 127).

Table 1.1.2.1 Major water pollution sources/industries

According to Table 1, approximately 2292 industries were identified as significant water pollutant sources in Peninsular Malaysia by the Department of Environment (DOE). The major potentially polluting industries were 928 (40%) food and beverage factories, 324 (14.1%) rubber producing premises and 270 (11.4%) chemical producers. Based on the distribution of water pollution sources by state in Peninsular Malaysia, the majorities were found in Selangor (414), Johor (384), Pulau Penang (328) and Perak (253).

These are also the most industrialized states in Peninsular Malaysia. Even though improvements have been done to the public transportation system and road infrastructure, the utilization's rate is low, primarily as a consequence of route duplication, unreliable service frequency, overcrowding during peak hours and the poor condition of buses. For example, the existing main bus terminal is at Puduraya in the city centre. The majority of inter city buses and coaches terminate there, thus adding to traffic congestion and consequently, longer journey times for passengers.

Development guidelines do not specify adequate buffer zones between residential areas and potential pollution sources. In some cases, highways and major roads cut through closely populated residential areas. High noise levels apart from causing discomfort can lead to health problems. Existing planning guidelines are not ample enough to gauge the impact of development projects on environmentally sensitive areas. This is because the lack of development guidelines for environmentally sensitive areas.

That's why people rather to use private transportation rather than using public transports which led to traffic chaos. Public transport utilization rate in Klang Valley has declined from 34 percent in 1985 to 16 percent in 2004 (2005 Budget Speech). Displayed below is the public transport statistics gathered by Malaysian Ministry of Transportation for the year of 2007.

JADUAL 2.9 : BILANGAN PENUMPANG BAGI PERKHIDMATAN SISTEM ALIRAN RINGAN, 1998 - 2007
Table 2.9 : Number of Passengers For Light Rail Transit (LRT) Services, 1998 - 2007

JENIS PERKHIDMATAN Type of Services	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
PUTRALINE	1,528,884	17,252,259	44,542,496	52,478,951	54,423,246	50,254,365	57,729,971	60,290,467	56,747,136	56,965,258
STARLINE	18,100,102	22,829,543	28,426,201	32,412,191	33,471,344	41,159,817	433,535,471	45,636,997	49,727,909	52,434,883
KL MONORAIL	* Perkhidmatan belum dijalankan					3,220,297	12,201,518	16,206,441	19,322,170	22,197,169
KLIA EKPRESS	* Perkhidmatan belum dijalankan				1,048,201	1,697,674	1,912,340	1,504,404	1,838,723	1,780,384
KLIA TRANSIT					187,848	970,598	1,734,614	1,829,224	2,369,763	2,449,842

SUMBER : RAPID KL SDN.BHD
Source : Rapid KL Sdn.Bhd
SUMBER : KL STARRAIL SDN.BHD
Source : KL StarRail Sdn.Bhd
SUMBER : EXPRESS RAIL LINK SDN.BHD
Source : Ekspres Rail Link Sdn.Bhd

Table 1.1.2.2 Statistics of Light Rail Transit's Users

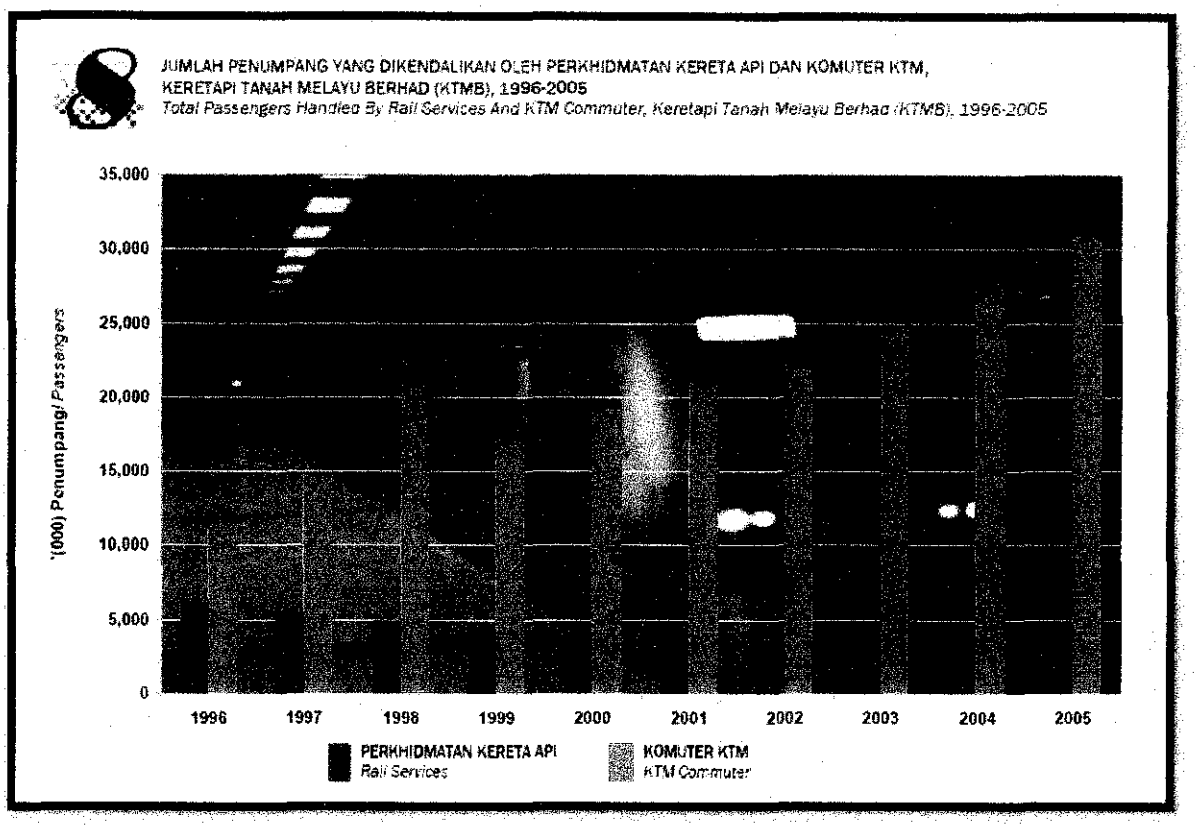


Table 1.1.2.3 Total Passengers Handles by Rail Services and KTM Commuter

1.2 OBJECTIVE

Trip Planning System is a web-based application that helps user to plan their traveling route in advance. It provides route alternatives and user is free to choose any that the user most, base on the number of transfer, time of departure/arrival and cost. This system accommodates travel using different means of transports, including buses and trains services. The application prompts a user to input departure and arrival places, and will find a door-to-door route between the two. It also provides online information about the public transportation such as traveling promotion and places of interest around Kuala Lumpur.

1.3 SCOPE OF STUDY

In graph theory, the shortest path problem is the problem of finding a path between two vertices (or nodes) such that the sum of the weights of its constituent edges is minimized. An example is finding the quickest way to get from one location to another on a road map; in this case, the vertices represent locations and the edges represent segments of road and are weighted by the time needed to travel that segment.

For this project, the author will be using single source shortest path problem using Dijkstra's algorithm. Dijkstra's algorithm is probably the best known and thus most implemented shortest path algorithm. It is simple, easy to understand and implement, yet impressively efficient. Dijkstra's algorithm, when applied to a graph, quickly finds the shortest path from a chosen source to a given destination. As the research go on, the author have identifies some of the user's preferences in traveling, which can help them to go around. Travel from, travel to location, leaving after / arriving by what time, using what, date, station to stop / places of interest and cost of travel, mainly around city center in Kuala Lumpur.

CHAPTER 2

LITERATURE REVIEW

2.1 PUBLIC TRANSPORTATION SYSTEMS IN KUALA LUMPUR

Given its low population density, remote residential areas, and the government's emphasis on promoting Proton, the national car, it's no surprise that Kuala Lumpur is one of the most car-dependent cities in the world. The end result, which is increased road congestion and street-level pollution. Traveling from one place to another in this busy metropolis, just like in most other Asian capitals can be difficult. Bus transportation is ordinary. And taxi drivers are notorious for haggling over fares.

But, thankfully, a light railway system now crossing the city, allowing even harried business travelers to keep their trip on track - away from snarled traffic and car fumes. With a booming economy comes increased car ownership and traffic congestion. The Government has taken steps to lessen this escalating problem with the implementation of the Light Rail Transit System or LRT. The LRT system will form the central feature of an integrated transportation network, combining with feeder buses and commuter rail services to offer an efficient alternative to the current limitations of road travel.

The Malaysian capital has three lines metro system. Kuala Lumpur's light rail transit (LRT) system connects some key districts where banks, offices, hotels and shopping malls are concentrated. Although it's called LRT (Light Rail Transit) it is a fully independent metro network. There are three lines operated by different companies. STAR (Sistem Transit Aliran Ringan Sdn Bhd) manages track that comprises of a north-south line and another going eastward and PUTRA (Projek Usahasama Transit Ringan Automatik Sdn Bhd) runs the line that connects the city's northeastern

section to the west, which run by RapidKL. The two intersect in the central financial district at Masjid Jamek. The other two companies is KL Monorail and Keretapi Tanah Melayu (KTM) which covering the other parts in the city.

The total Kuala Lumpur LRT network is a multi-billion Ringgit project that uses modern, electrically powered trains operating on double tracks to offer a reliable and comfortable alternative by bus, taxi and car within Kuala Lumpur's urban area. The KL LRT is a closed system whereby a ticket is required to get access to the platform and also to leave the station. The fare collection system uses plastic tickets with magnetically stored information. Both single and stored value tickets are available at the ticket booths at the stations. Tickets will be purchased from ticketing booths in the station concourses. Once in possession of a valid ticket, passengers will be able to pass through an automatic barrier. Once on the platform, it is just a matter of waiting for the next train.

Route and fare maps are displayed at all stations. The stations have ticket vending machines and public telephones are located near bus and taxi stands. For the handicapped, there are special lifts, ramps and sitting space on the railcars, which are designed very much like metros elsewhere in the world. One-way fares range from RM0.70 to RM2.90. Return and stored value tickets are available. Traveling across the city could take about 45 to 55 minutes, but within its commercial center, the average is closer to 10 minutes. Trains leave approximately every three minutes during peak hours and about eight to ten minutes apart during non-peak.

2.2 PUBLIC TRANSPORTATION SYSTEMS IN OTHER COUNTRIES

2.2.1 Washington Metro Area Transit Authority (WMATA)

WMATA operates the second largest rail transit system and the fifth largest bus network in the United States, transporting more than a third of federal government workers and millions of tourists every year. WMATA services a population of 3.5

million in Washington, DC, Maryland and Virginia, and covers a 1,500 square mile area. Its 10,000 employees work across the geography and have an array of functions that range from civil engineering to bus driving.

"To implement its vision, WMATA used the Transformation Life Cycle (TLC) approach to address all the vital elements of the equation: people, processes, and technology, as well as ownership and stewardship of the change initiative. WMATA initially set out to implement an enterprise resource planning (ERP) system to integrate and streamline the disparate legacy systems, reducing redundancy and dependence on human data entry. "Shortly after engaging Booz Allen in this project, we realized this was more than just a technology implementation and that we could substantially revamp our business processes and increase capabilities to make our results more successful," says Burfield. The company recognized that the transformation was not just about technology; changes in people and processes were keys to success as well. As a result, WMATA employed a holistic view of transformation to address all dimensions of change through a life cycle approach. Senior level executives led the transformation activities from multiple functional areas". (Sources taken from www.boozallen.com)

Payment on the WMATA rail system is based on a distance-based peak/off-peak system, and can be made by magnetic fare card or SmarTrip card. Fare vending machines in each station are available to accept cash or credit cards for purchase of magnetic fare cards or for adding value to SmarTrip cards. Magnetic fare cards, SmarTrip cards or passes may be purchased at one of several sales centers, by mail or through the Internet.

The bus system uses a flat-fare system, and payment can be made only by exact change or a visually displayed pass. Reduced fares are accepted for transfer trips from rail to bus and from one bus to other bus. Transfers from bus to rail are not available. Currently each WMATA bus is equipped with an electronic registering fare box that accepts the cash fares paid by the passengers, and keeps a statistical count of the number of fares paid and the total value of the money collected. The fare box also has a keypad to allow the bus operator to enter a tally of the number of passengers boarding the bus and either paying a reduced fare or displaying a flash

pass. Each day, the money is collected from the fare boxes and is secured in a garage receiver vault for transport to the Revenue Collection Facility. The data is also collected from the fare boxes at the bus garage each day, and then uploaded first to the garage computer and then to the mainframe computer for further analysis. The use of SmarTrip cards with the new fare boxes will simplify this system by automatically calculating transfers and deducting fares when the card is passed over the target. Data will continue to be downloaded from the bus fare box daily, but cash handling will be reduced.

2.2.2 London Underground (Tube)

The London Underground or Tube is a rapid transit system serving a large part of London and neighboring areas of Essex, Hertfordshire and Buckinghamshire in the United Kingdom. The Underground has 270 stations and about 400 km (250 miles) of track, making it the longest metro system in the world by route length. It also has one of the highest numbers of stations.

"Last year, London Underground carried more than a billion passengers for the third year running. 1.1 billion passengers traveled on the Tube in 2008/9, the highest in its 146-year history, and over the year, all key Tube performance levels have improved. Passenger satisfaction ratings also hit a new high with average scores reaching 79 out of 100. All this has been achieved at the same time as the London Underground Investment Programme is being implemented. The programme has intensified with an increase in planned engineering works and weekend closures, in order to progress the upgrades and replace track and other infrastructure, while carrying out regular essential maintenance."

To calculate the fares, The Underground uses TfL's Travelcard. The London city is divided into 6 zones; Zone 1 is the most central, with a boundary just beyond the Circle line, and Zone 6 is the outermost and includes London Heathrow Airport. Stations on the Metropolitan line outside London are in Zones 7-9. Lately, TfL has introduced the Oyster card, a smartcard with an embedded contactless RFID chip, which travellers can acquire, charge with credit, and use to pay for travel. Like

Travelcards they can be used on the Underground, buses, trams and the Docklands Light Railway. The Oyster card is cheaper to manage rather than cash ticketing or the older-style magnetic-strip-based Travelcards, and the Underground is encouraging passengers to use Oyster cards instead of Travelcards and cash (on buses) by implementing considerable price differences. Oyster-based Travelcards can be used on National Rail throughout London.

For tourists or other non-residents, the all day travelcard is one of the better ticketing options available and it's available at any underground station. These cost around £5.50 and allow unlimited travel on the network from 9:30am onwards for the rest of the day. This provides good value for money and a huge saving considering one single journey on the network can cost close to £5. On the other hand, for some travellers, it will be more advantageous to buy a Pay as You Go Oystercard; the issue of children complicates the fare structure for short-term visitors further, leading to a slew of websites attempting to help visitors through the ticketing system. Travel cards for multiple days are also available.

2.3 GEOGRAPHICAL INFORMATION SYSTEM (GIS) MAP

A geographic information system (GIS) is a technological tool for comprehending geography and making intelligent decisions. It combines all hardware, software, and data for capturing, managing, analyzing, and also displaying for all forms of geographically referenced information. GIS organizes geographic data so that a person reading a map can select data necessary for a specific project or task. A thematic map has a table of contents that allows the reader to add layers of information to a basemap of real-world locations. Maps of the underlying geographic information can be constructed and used as "windows into the database" to support queries, analysis, and editing of the information.

For this project, the author will focus on Kuala Lumpur City Center map. A few research has been done on the map and as a result, Trip Planning System can also been use around the country and can benefit the people at large. More important, the nodes on the map itself will keep on updated as the administrator received new information on certain places or nodes on the map. Nodes information consists of the name of that particular place, fares from that specific node to the other node, what time the train or bus will arrive or depart from the node to the other node and the distance from that node to the other node. All the information will be stored in the database for future use.

The nodes selection on the map are made base on the public transport station (bus, train or taxi) located in Kuala Lumpur from the public transport operator. Nodes that located close to each other will be pooled as one node. The distance between two places will be determined by calculation of the Dijkstra Algorithm from the first node to the destination node. To simplify the system and make it more users friendly and interactive, the author will use Java Applet (Carla Laffra, March 1996) on top of the map in order for the user to pinpoint their desired origin and destination.

Digital map is any cartographic image in a digital format, which can be shown on a screen of computer, or can be printed. Representation in vector and/or raster format based on bearers suitable for computer processing is called a digital map. That kind of map has software and all the attributes necessary for showing on a computer screen, or drawing with plotter including the complete signalization, names and map description.

Interactive cartographic structure used for searching and showing information, which consists of one or more maps represented in raster or vector format and database with descriptive information about some objects is called an electronic map. This kind of map also contains software for searching and showing maps and descriptive data on computer screen or working station. Beside maps and text, electronic map contains the sound and moving or not moving pictures.

Geographical information systems have been made for various purposes, and they use different types of digital maps. Most frequently, GIS has been used with the purpose of spatial positioning of moving objects (ships, cars, aero planes, etc.), also for diverse investment analyses (road making, choosing the optimal location, etc.). Digital cartography, including GIS, gives several possibilities to geography. Some of them are:

- More modern space analyses, synthesis and modeling with GIS
- Faster and more simple (technically) drawing thematic maps
- Better quality of drawn thematic maps
- Geographic education (on every level)
- Drawing digital maps as a part of process for realizing space relationships

```
class DocText extends TextArea {
    final String drawnodes = new String("DRAWING NODES:\n"+
          "Draw a node by clicking the mouse.\n\n");
    final String rmvnodes = new String("REMOVE NODES:\n"+
          "To remove a node press <ctrl> and click on the node.\n"+
          "You can not remove the startnode.\n"+
          "Select another startnode, then you can remove the node.\n\n");
```

Figure 2.3.1: Snippet code for drawing nodes in the map

```
final String startnode = new String("STARTNODE:\n"+
      "The startnode is blue, other nodes are grey.\n"+
      "The first node you draw on the screen will be the startnode.\n"+
      "To select another startnode press <ctrl>, click on the startnode,\n"+
      "and drag the mouse to another node.\n"+
      "To delete the startnode, first select another startnode, and then"+
      "\nremove the node the usual way.\n\n");
final String drawarrows = new String("DRAWING ARROWS:\n"+
      "To draw an arrow click mouse in a node,"+
      "and drag it to another node.\n\n");
```

Figure 2.3.2: Snippet code to give information about the nodes on the map

```
public void showexample() {
// draws a graph on the screen
    int w, h;
    clear();
    init();
    numnodes=10;
    emptyspots=0;
    for(int i=0; i<MAXNODES; i++) {
      node[i]=new Point(0, 0);
      for (int j=0; j<MAXNODES;j++)
          weight[i][j]=0;
    }
    w=this.size().width/8;
    h=this.size().height/8;
    node[0]=new Point(w, h);      node[1]=new Point(3*w, h);
    node[2]=new Point(5*w, h);    node[3]=new Point(w, 4*h);
    node[4]=new Point(3*w, 4*h); node[5]=new Point(5*w, 4*h);
    node[6]=new Point(w, 7*h);    node[7]=new Point(3*w, 7*h);
    node[8]=new Point(5*w, 7*h); node[9]=new Point(7*w, 4*h);
```

Figure 2.3.3: Snippet code for the Dijkstra algorithm

2.4 GLOBAL POSITIONING SYSTEM (GPS)

The Global Positioning System is a satellite-based navigation system made up of a network of satellites placed into orbit. GPS works in any weather conditions, anywhere in the world, 24 hours a day, 7 days a week and also it's free to use.

The Global Positioning System has a clever, effective solution to calculate the distance for every journey that the user's put and also advising the shortest path to the destination. Every satellite contains an atomic clock, but the receiver itself uses a regular quartz clock, which it continuously resets. On overview, the receiver looks at incoming signals from four or more satellites and gauges it's own inaccuracy. In other words, there is only one value for the "current time" that the receiver can use. The exact time value will make all of the signals that the receiver is receiving to align at a single point in space. That time value is the time value held by the atomic clocks in all of the satellites. So the receiver sets its clock to that time value, and it then has the same time value that all the atomic clocks in all of the satellites have.

When you calculate the distance to four located satellites, you can draw four spheres that all intersect at one point. Three spheres will intersect even if your numbers are not accurate, but *four* spheres will not intersect at one point if you've measured incorrectly. Since the receiver makes all its distance measurements using its own built-in clock, the distances will all be proportionally wrong.

The receiver can easily analyze the necessary adjustment that will cause the four spheres to intersect at one point. Based on this, it resets its clock to be in sync with the satellite's atomic clock. The receiver does this constantly whenever it's on.

In order for the distance information to be of any use, the receiver also has to know where the satellites actually are. This isn't particularly difficult because the satellites travel in very high and predictable orbits. The GPS receiver simply stores a directory that tells it where every satellite should be at any given time.

2.5 DIJKSTRA ALGORITHM

For this project, the author will use Dijkstra's algorithm as the main algorithm to find the shortest path. Dijkstra Algorithm is one of the more common shortest path algorithms and can be applied to network routing. This Algorithm is an iterative process that works through a graph or a set of vertices & paths to calculate the shortest path from any one-source node to every other node in the set.

The algorithm begins at a specific vertex and extends outward within the graph, until all vertices have been reached. Dijkstra's algorithm stores the total cost from a source vertex to the current vertex. More simply, Dijkstra's algorithm stores a summation of minimum cost edges.

Dijkstra's algorithm creates labels associated with vertices. These labels represent the distance (cost) from the source vertex to that particular vertex. Within the graph, there exist two kinds of labels: temporary and permanent. The temporary labels are given to vertices that have not been reached. The value given to these temporary labels can vary. Permanent labels are given to vertices that have been reached and their distance (cost) to the source vertex is known. The value given to these labels is the distance (cost) of that vertex to the source vertex. For any given vertex, there must be a permanent label or a temporary label, but not both.

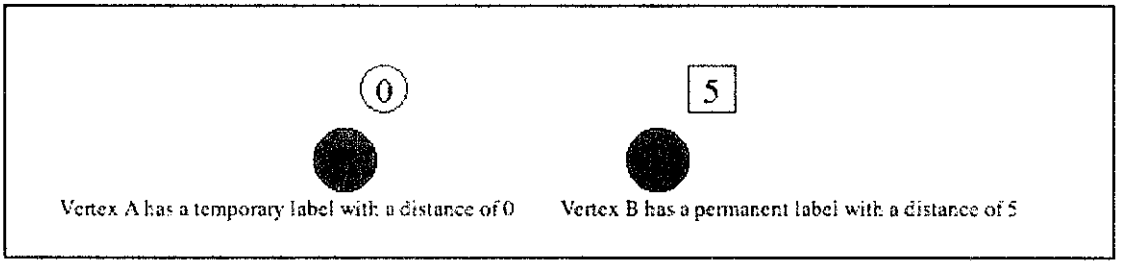


Figure 2.5.1: Dijkstra example 1

The algorithm begins by initializing any vertex in the graph (vertex A, for example) a permanent label with the value of 0, and all other vertices a temporary label with the value of 0.

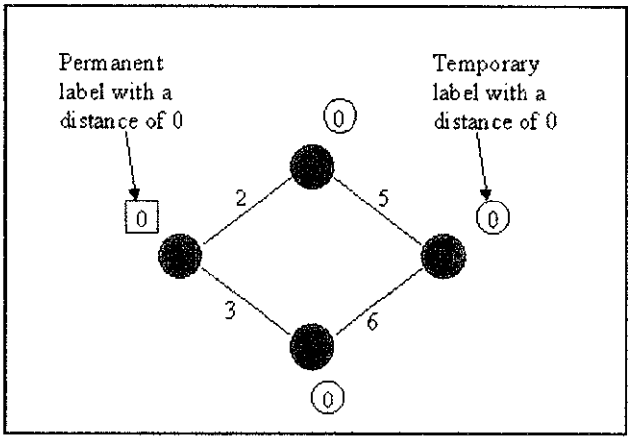


Figure 2.5.2: Dijkstra example 2

The algorithm then proceeds to select the least cost edge connecting a vertex with a permanent label (currently vertex A) to a vertex with a temporary label (vertex B, for example). Vertex B's label is then updated from a temporary to a permanent label. Vertex B's value is then determined by the addition of the cost of the edge with vertex A's value.

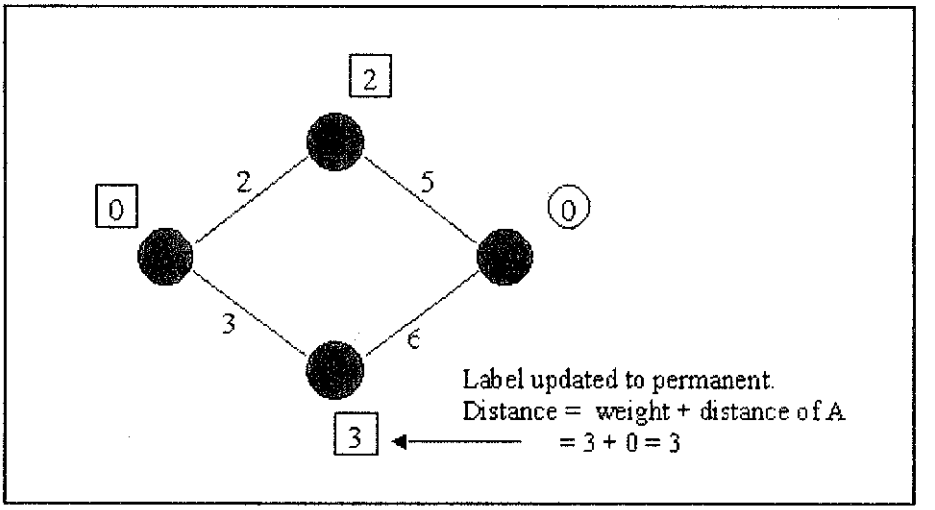


Figure 2.5.3: Dijkstra example 3

This process is repeated until the labels of all vertices in the graph are permanent.

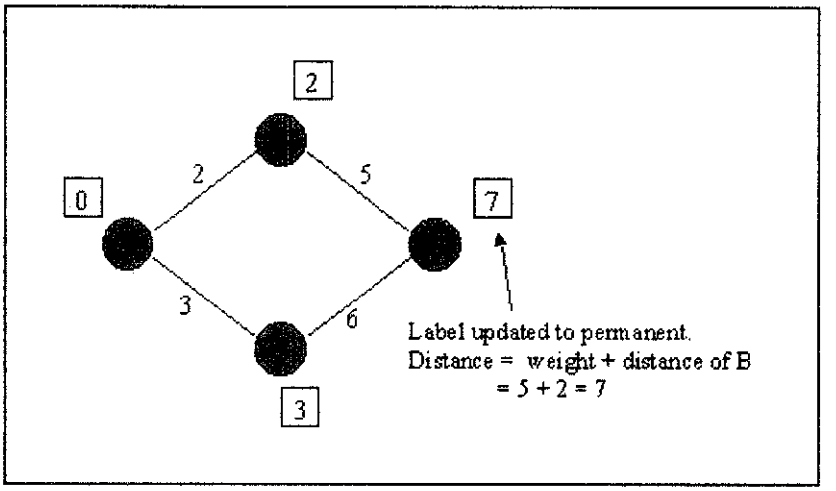


Figure 2.5.4: Dijkstra example 4

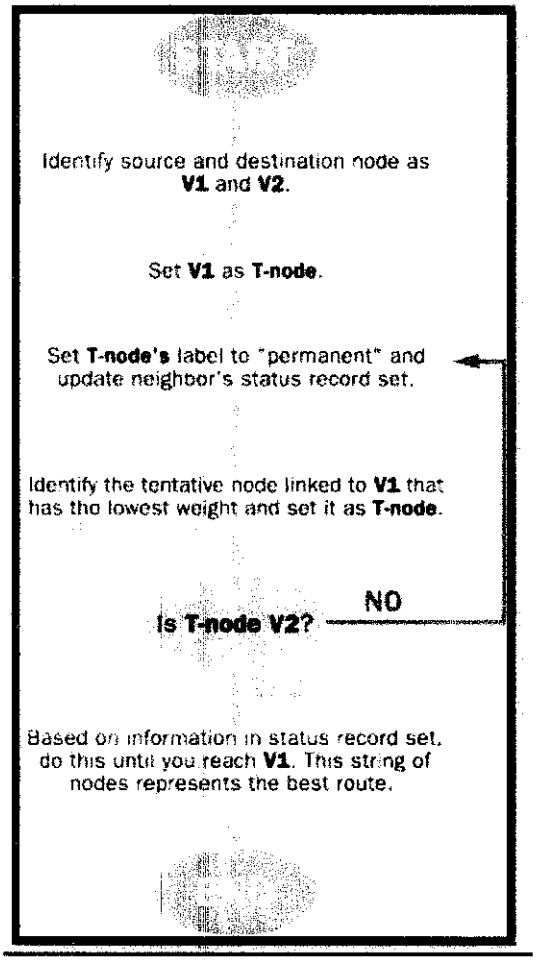


Figure 2.5.5: Dijkstra Algorithm Implementation Flow Chart

2.6 COMPARISON BETWEEN EXISTENCE SYSTEMS

After doing research and studying a few existence systems that are accessible through the Internet, Table 2.1 in the Appendix section shows the comparison between them. Service indicates the service they provide to customer where all the websites provide service to the customer where all the websites provide service to facilitate public transport service (buses and trains) except the KTM Interactivity Train Timetable/Fare/Seat Availability. As for the User Control, it indicates what the user should put into the system in order to get the results. If the information that the user put into the system is correct, the more precise and accurate the result generated.

Accessibility indicates how the system can be access by the users. Some of the system can only be access through the Internet and mobile devices. For Trip Planning System, it can only be accessed using Internet but future enhancement can be made to suit the customer's needs.

From the study, Trip Planning System will take Washington Metropolitan Transit Authority and London Underground Journey Planner as a guide to develop Trip Planning System because this websites provides user friendliness design.

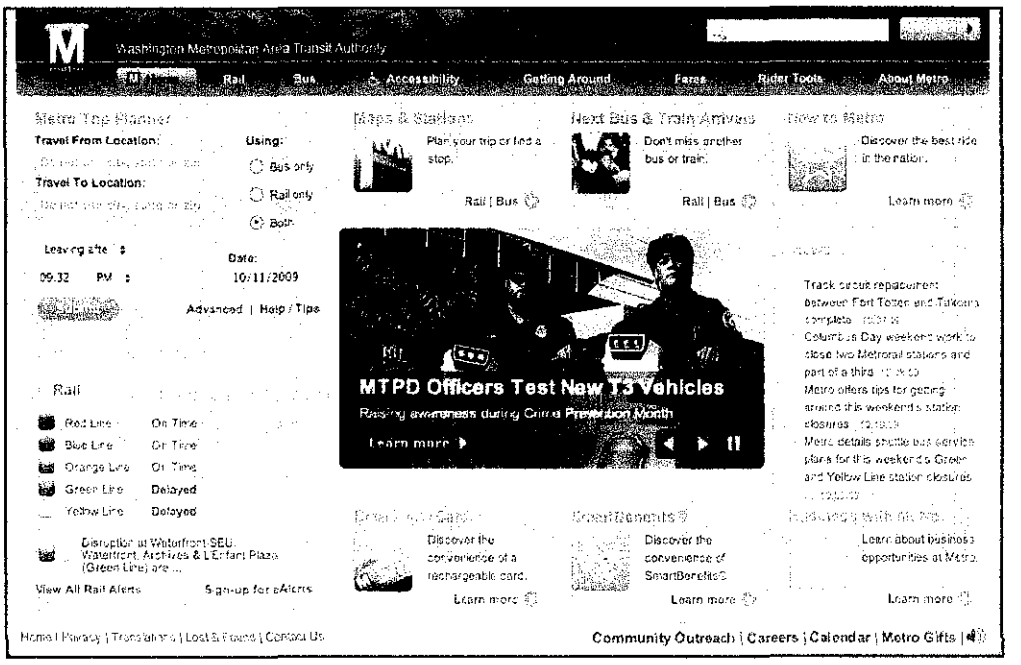


Figure 2.6.1: WMATA interface

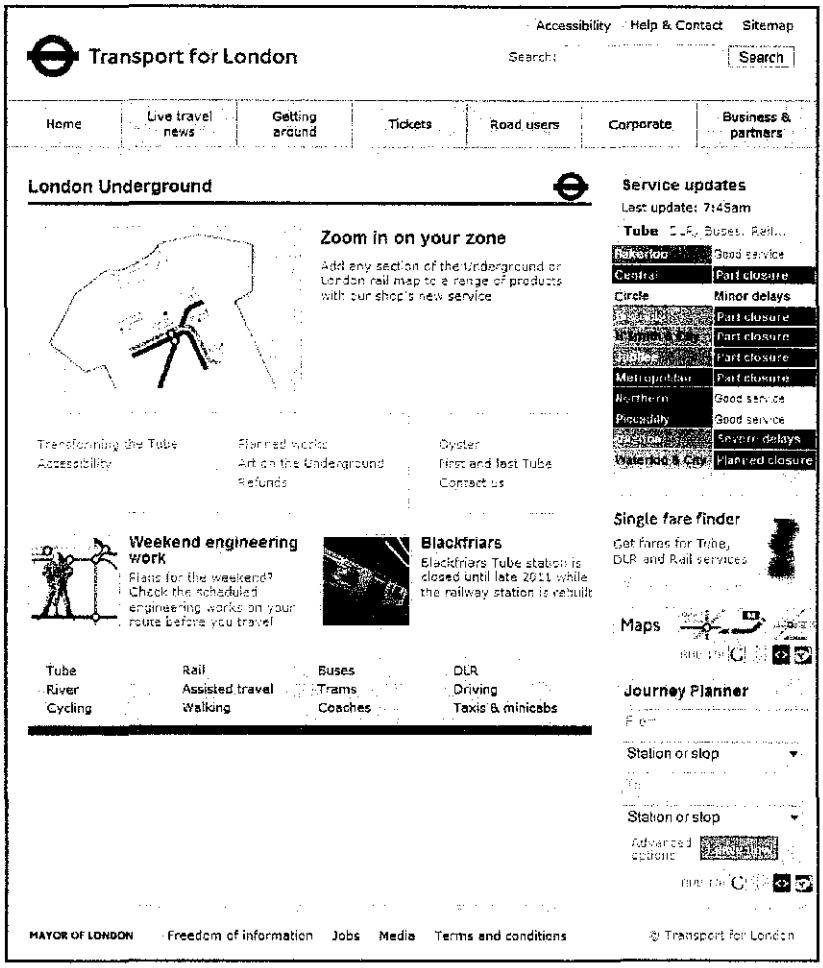


Figure 2.6.2: London Tube interface

CHAPTER 3

SYSTEM DEVELOPMENT METHODOLOGY

3.1 METHODOLOGY

A methodology is a formalized approach to implementing the System Development Life Cycle (SDLC). There are many different systems development methodologies, and each one is unique based on the order and focus it on each SDLC phase. Some methodologies are formal standards used by government agencies, while others have been developed by consulting firms to sell to their clients.

For this project, the author is using Rapid Application Development (RAD), which is prototyping. RAD-based methodologies attempt to address both weaknesses of structured design methodologies by adjusting the SDLC phases to get some part of the system developed quickly and into the hands of the users. In this way, the author can have a better understanding with the system.

The RAD models a linear sequential software development process that emphasizes an extremely short development cycle. The RAD model is a "high speed" adaptation of the linear sequential model in which rapid development is achieved by using a component-based construction approach.

Strengths of Rapid Application Development

1. Testing and turnover
    - Since the RAD process emphasizes of reuse, many of the program components have already been tested. This minimizes the testing and development time.

2. It gives users a tangible description
    - The users can judge whether critical system requirements are being met by the system. Report output can be compared with existing reports.

3. Greater flexibility
    - The author can easily redesign the system anytime during the project as is depends on the user's requirement.

Weakness of Rapid Application Development

1. Required a lot of users time

    - It may be alleviated by the customer agreeing to a limited amount of rework in the RAD process, as it required for the users to involve in the whole project. It may be difficult for many important users to commit the time required for success of the RAD process.

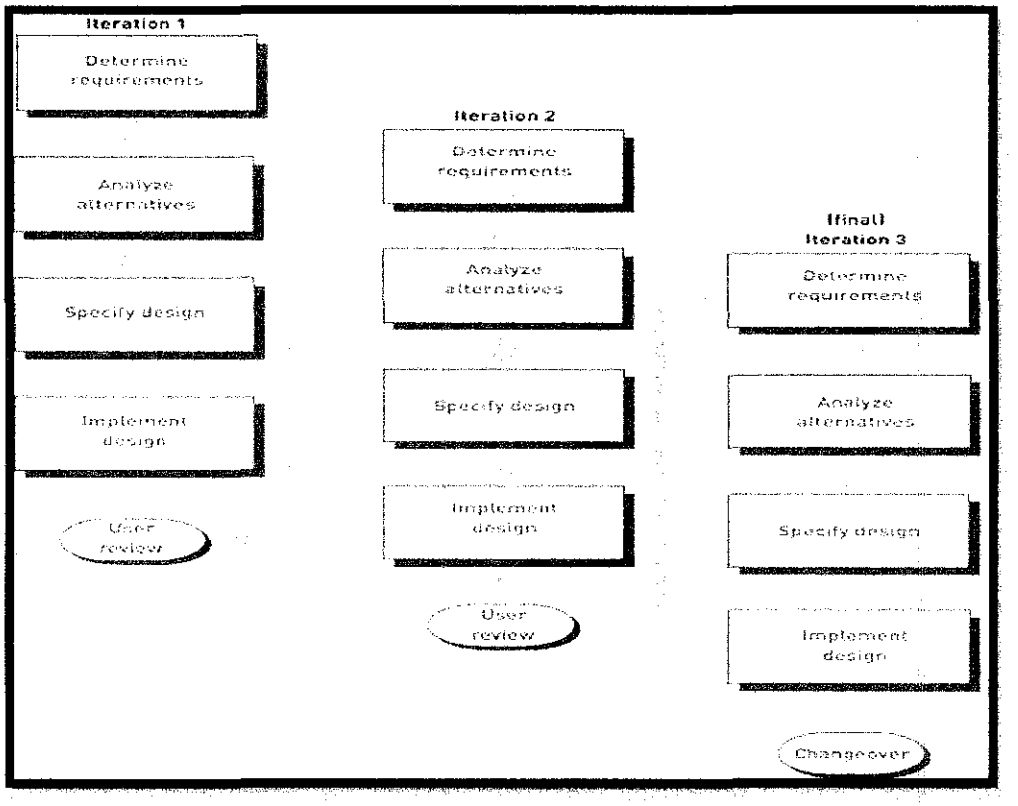


Figure 3.1: Phased Development Methodology

According to the figure 3.1, there are four steps that have been repeated for three iterations. Actually, it doing the same thing but at different level requirements after a few changes has been met to suit the user's need.

A phased development based methodology breaks the overall system into a series of versions that are developed sequentially. The analysis phased identifies the overall system concept and the users. The analysis phase then leads into specifying the design and implementation, but only with the set of requirements identified for the first iteration. For the first iteration, the author conducts a survey to determine the user's need for the system. For example, the user interface and the information that are need to be in the system.

Once iteration 1 is implemented, work begins on iteration 2. Additional analysis is performed based on the previously identified requirements and combined with new ideas and issues that arose from the users' experience with iteration 1. Iteration 2 then is designed and implemented, and work immediately begins on the next iteration. This process continues until the system is complete or no longer in use.

The reason why the author chooses to use phased development based methodology is it have the advantage of quickly getting a useful system into the hands of the users. While the system does not perform all the function the users need at first, it does begin to provide business value sooner that if the system were delivered after completion.

3.2 FEASIBILITY ANALYSIS

Once the need for the system and its business requirements have been defined, it is time to create a more business case to better understand the opportunities and

limitations associated with the proposed project. Feasibility analysis guides in determining whether to proceed with a project. Feasibility analysis also identifies the important risks associated with the project that must be addressed if the project is approved.

Technical Feasibility: Can we build it?
• Familiarity with Application: Less familiarity but still continues to learn day by day. Stick to use Adobe Flash CS3 in order to deliver the best interface for the users. • Familiarity with Technology: Familiar. For example, familiarity with the current system which deliver the same result as the author's project such as Washington and London Journey Planner System. • Project size: Medium as the author has to enhance the current system and design more interactive user interface. • Compatibility: The system that is being developed is compatible to all users' computers as it used basic Java Application to run the system.
Economic Feasibility: Should we build it?
• Until this stage, there will be no cost occurred for this project.
Organizational Feasibility: If we build it, what will they come?
• Risk: From the author's view, this project has low risk as it didn't required money and the system can be build in time. • Objective: Manage and help people to choose the best mode of public transportation in Kuala Lumpur. • Users: The users are expected to appreciate the system as the system provide assistance in trip planning (before and during the journey) using one or a number of modes of travel, taking into account travelers preferences and constraints, and effectively integrating the best output for the users.

Table 3.2.1: Feasibility Analysis Table

3.3 PROJECT WORKFLOW

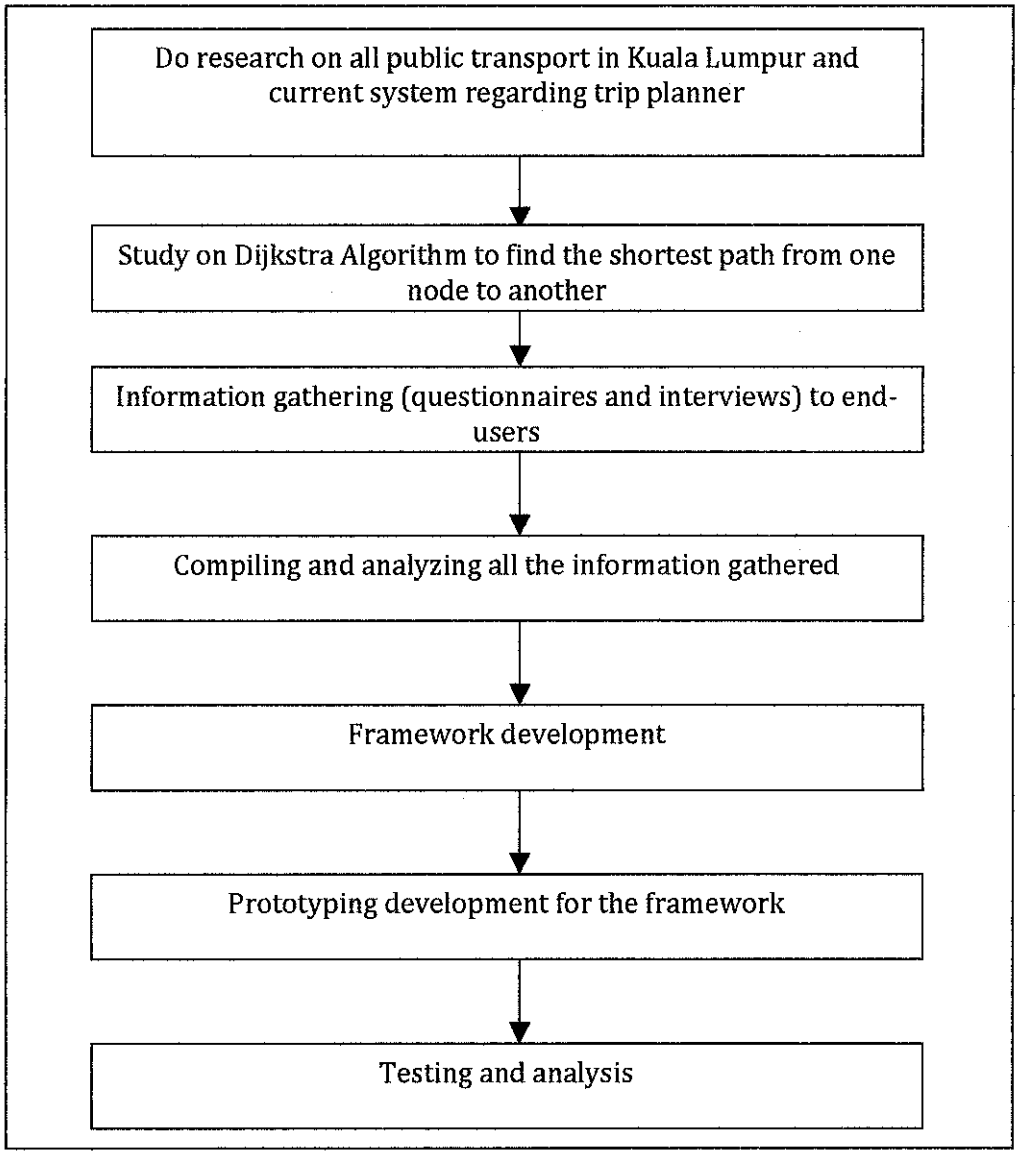


Figure 3.3.1: Project Workflow Diagram

Diagram above shows the workflow of the trip planner system. Research and studies on Dijkstra Algorithm are a high priority in this project, which is why it is being done first because the algorithm later on will be vital to the system to calculate the shortest path to one place from another. Then work continues on studying existing Trip Planner System. Information gathering is done through interview and research. Information analyzing comes next and by analyzing the information, a framework on the disease detection intelligence is developed. A system prototype will be develop

based on the framework, and it will be tested and analyze depend on the user's preferences.

3.4 TOOLS AND TECHNOLOGY

3.4.1 Programming Language

To develop this system, the author used HTML, JavaScript and PHP as the main language. Using this language and software, the author can easily develop the graphical user interface with the digital map. It is also very compatible with the type of database that has been chosen.

3.4.2 Database

For the database, the author decided to use Microsoft SQL Server 2005, and as the front-end, I will use SQL Server Management Studio Express.

3.4.3 Platform

The system is developed to be use on Macintosh OS X and Windows platform operating system.

3.5 SYSTEM ARCHITECTURE

There are three tiers in the proposed architecture for the system: Data tier, Application server, and Analytical tier. The Presentation tier is used to handle the display of the management the graphical user interface (GUI) relationship with the modules in the Application tier. The Application tier consists of three modules, the prediction, algorithm and record. Lastly the Data tier provides access to underlying SQL data storage of the whole system.

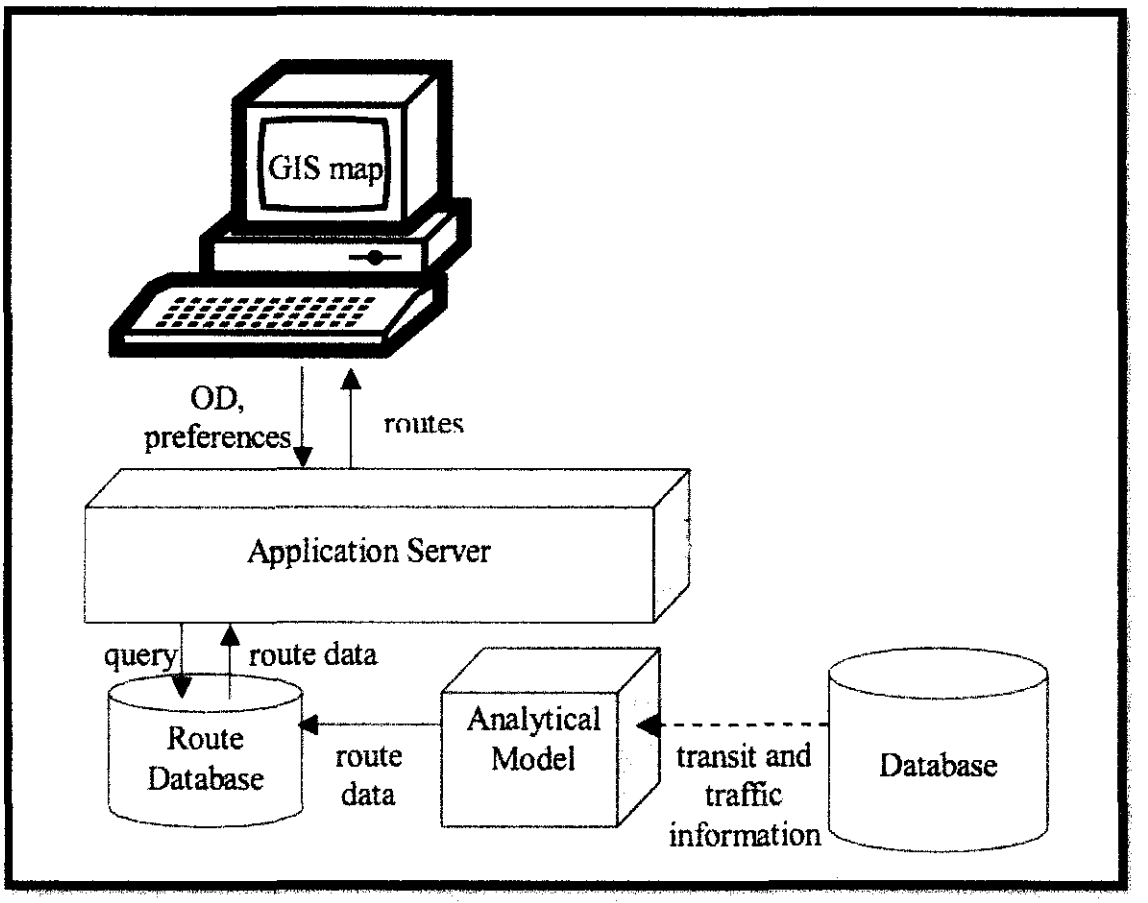


Figure 3.5.1: System Architecture

CHAPTER 4

RESULTS & DISCUSSION

4.1 DATA/INFORMATION GATHERING

Based on the responses that have been gathered through questionnaires and interview, the author have come up with an analysis in order to know what is user's preferences about the public transport in Kuala Lumpur. The questionnaires had been distributed to the UTP students, consists of 50 respondents. The sample of questionnaires is showed in Appendix. While interview are done informally to other respondents, the results are included in the analysis.

From question number 1-5, the questions ask about the basic knowledge about the public transports in Kuala Lumpur. The objective is to know what are their awareness levels about the public transport. According to Figure 4.1.1, majority of them, 48 users, have used the transports and have experience using public transport for their daily purposes and most of them prefer to use light train rather than bus and taxi because it more convenient and near to their house.

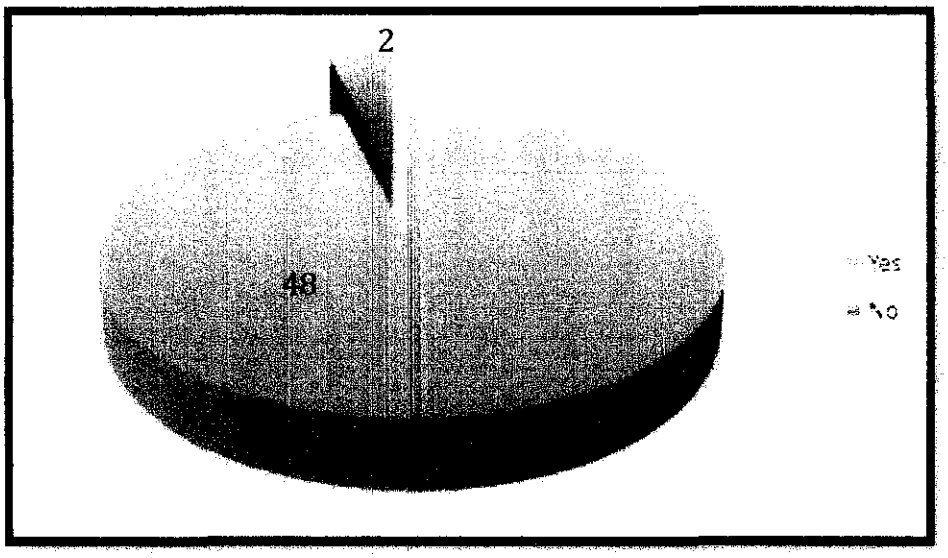


Figure 4.1.1 Pie Chart – User of Public Transport

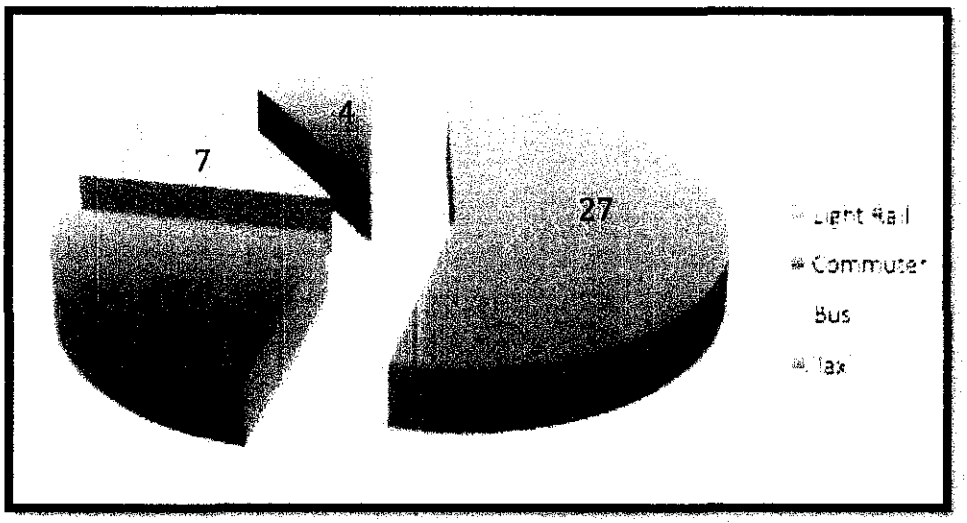


Figure 4.1.2 Pie Chart – User Preferences

For question number 6-9, the main purpose is to know in details about the user's experience with the public transport. From figure 4.1.3, most of the respondents tell that the public transport is so pack, especially during peak hours. For light train users, they sometimes have to wait for 4 or 5 trains before they can go into the train. Meanwhile, for bus users, they have to wait for 15-30 minutes for the next bus if the bus is fully packed. Other problems that arise are the transport is not on time, especially the buses. The reason why the users using light train (Figure 4.1.5) are because of the times it takes to go to their destination. It's because the light train didn't experience traffic jams like buses or taxi.

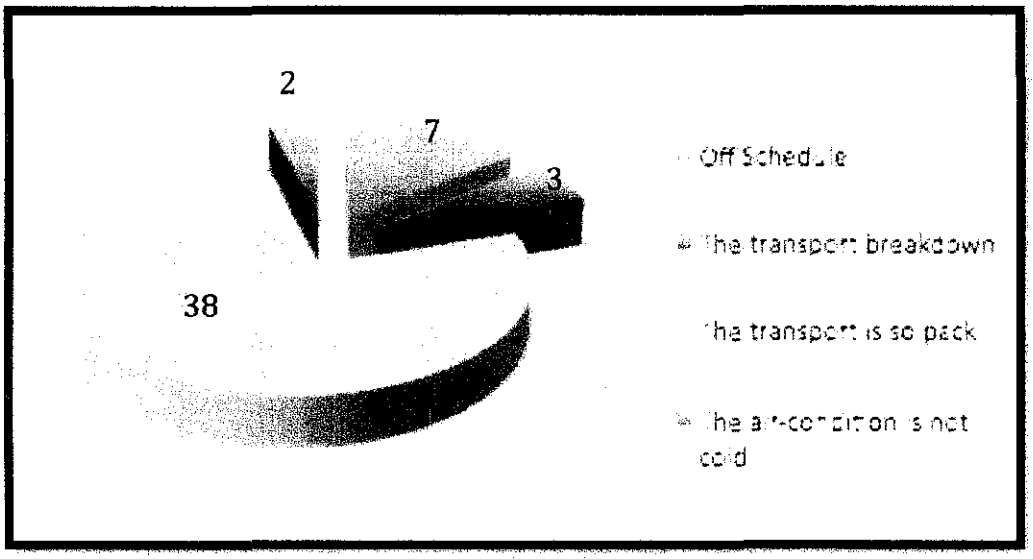


Figure 4.1.3 User's Experience With the Public Transport

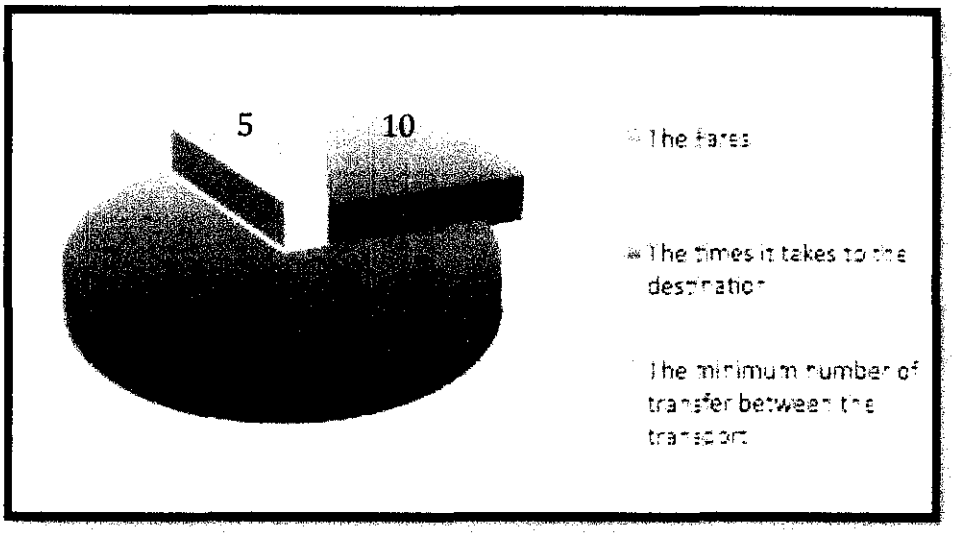


Figure 4.1.4 User's Consideration Before Taking The Public Transport

For questions 10-12, it requires the respondents to determine what they want to see or their preferences in the Trip Planning System.

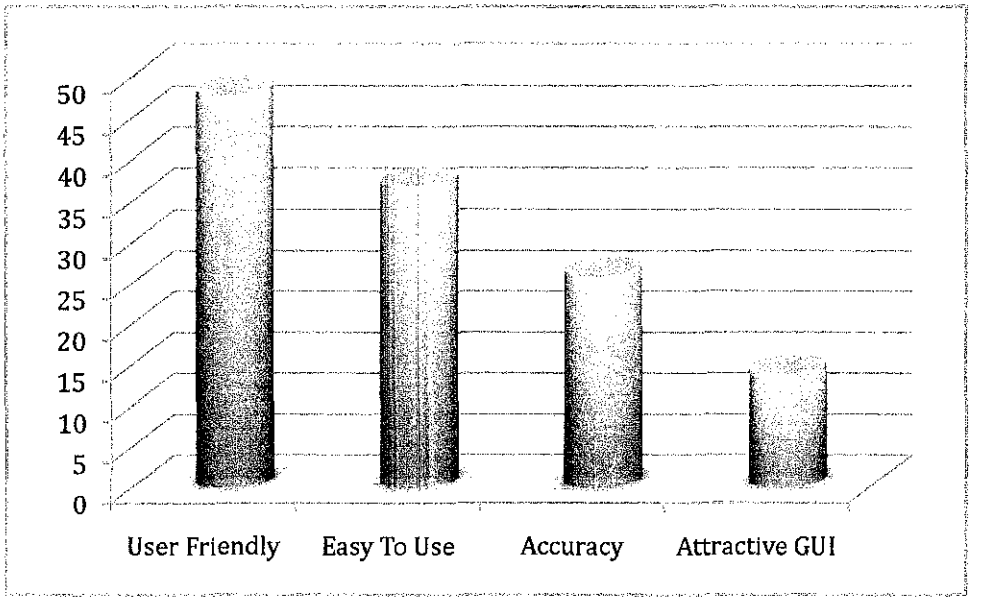


Figure 4.1.5 Bar Chart – Features Needed

4.2 STORYBOARD

In this section, the author will explain a little bit about the system that will be built.

1. Main page

   For the main page, it will display three main panels. First is the left upper side of the page, which is the menu panel. It consist of "Main Menu" button that will bring the users to the default page of the system if the users in the middle of exploring or using other features in the system, "Getting Around" button that will directly bring the user to the page that will give some tips about going around Kuala Lumpur, "View Schedule / Fare" button that will display all the schedule and fare of the train and buses, and the "Places of Interest" button that will show selected places of interest around Kuala Lumpur which are accessible using the public transport.

2. Search

   In the Search page, it will show the heart of the system. It will display the Kuala Lumpur map, which required the users to pinpoint their origin and destination, and the users also can choose what type of public transport they want to use for their journey and their journey constraints such as time or money constraints if any. After entered all information, the users have to click the search button that will bring them to result page.

3. Result

   The system will show this page after the users have entered all the information needed at the search page. Before the result is shown to the users, the system will calculate the shortest path to the destination that the users entered from their origin. After that, the system will show the result. In this page, the system will advice the users some of the routes based on user's input and of course, it first show the shortest path between the origin to the

destination and after that, the system will show other options of journey that the user can choose. Other than that, it will display the fares and timetable according to the user's constraints.

4. Places of Interest

The system will show this page if the users click the "Places of Interest" button at the left hand side of the page. In this page, it will display the selected places of interest around Kuala Lumpur like Petronas Twin Tower, National Museum and Bukit Bintang.

5. View Schedule / Fare

In this page, the system will provide all the trains and buses' schedule with the fares. It might be useful to the users as they can plan their journey with the budget they have.

4.3 COMPILATION OF INFORMATION

After gathering information from the public transport's provider in Kuala Lumpur, the information about the public transport's provider and the fares and destination are as follows:

4.3.1 Rangkaian Pengangkutan Integrasi Deras Sdn Bhd (RapidKL)

RapidKL is the company tasked with providing an integrated public transport system in the Klang Valley incorporating rail and bus services. Incorporated in July 2004 and operational since November the same year, RapidKL today transports approximately 4 million customers per week: 2.1 million on the Ampang Line (formerly known as STAR) and Kelana Jaya Line (formerly known as PUTRA) and 1.9 million on the bus system, previously Intrakota and Cityliner. RapidKL provides services across 48 rail stations and 165 bus routes. A 100% government-owned company under the Ministry of Finance, RapidKL's operating agreement is

conditional upon its ability to meet a set of key performance indicators monitored independently of the company.

4.3.2 Kelana Jaya Line (Formerly known as PUTRA)

Kelana Jaya Line uses the state-of-the-art driverless system by Advanced Rapid Transit Mark II technology from Canada. It has a proven record of very high performance specification in North America and Europe and is designed to meet the demands of a modern city of Kuala Lumpur.

The alignment starts from the Depot in Subang and ends at Terminal Putra in Gombak totaling to 29km in length with a total of 23 stations. Its first operation commenced on 1 st September 1998 between Subang Depot to Pasar Seni Station and section two, between Pasar Seni to Terminal Putra in June 1999.

In 2002, the system carried its 150 millionth passenger, with an average of 160,000 passengers riding the system daily. Today, it carries over 170,000 passengers a day and over 350,000 a day during national events.

4.3.3 Ampang Line (Formerly known as STAR)

Adtranz German is the maker of trains and system for Ampang line. Phase I was opened in September 1998 between Sultan Ismail Station to Sri Petaling and Ampang Stations and in December 1998 from Sultan Ismail Station to Sentul Timur.

Today this line carries over 130,000 to 150,000 per day on a weekday basis and an average of 120,000 per day on weekends. It has 25 stations throughout the 27 km, transporting passengers from the northern, north-eastern and south-western suburbs in the Klang Valley.

4.3.4 RapidKL Bus

Today, RapidKL operates 165 bus routes within the Klang Valley which consist of 10 City Bus routes, 87 Local Bus routes, 65 Trunk Bus routes and 3 Express Bus routes. They currently have 11 bus depots spreading across the Klang Valley and over one thousand buses in operation.

Every day RapidKL buses transport over 192,000 passengers. To continuously encourage the use of public transport and to provide services to the general public, RapidKL is also continuously studying new bus routes with the arrival of more new buses.

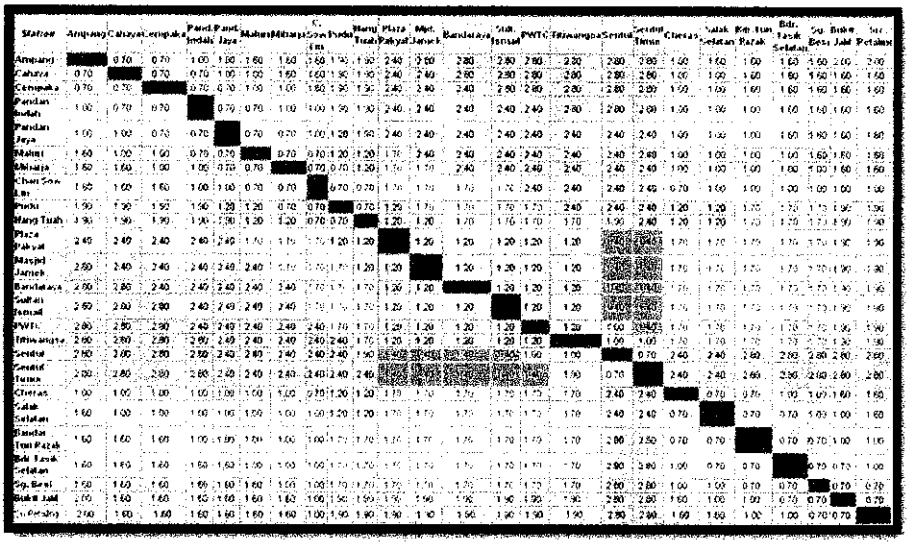


Figure 3.6.1 Ampang – Sri Petaling Fares

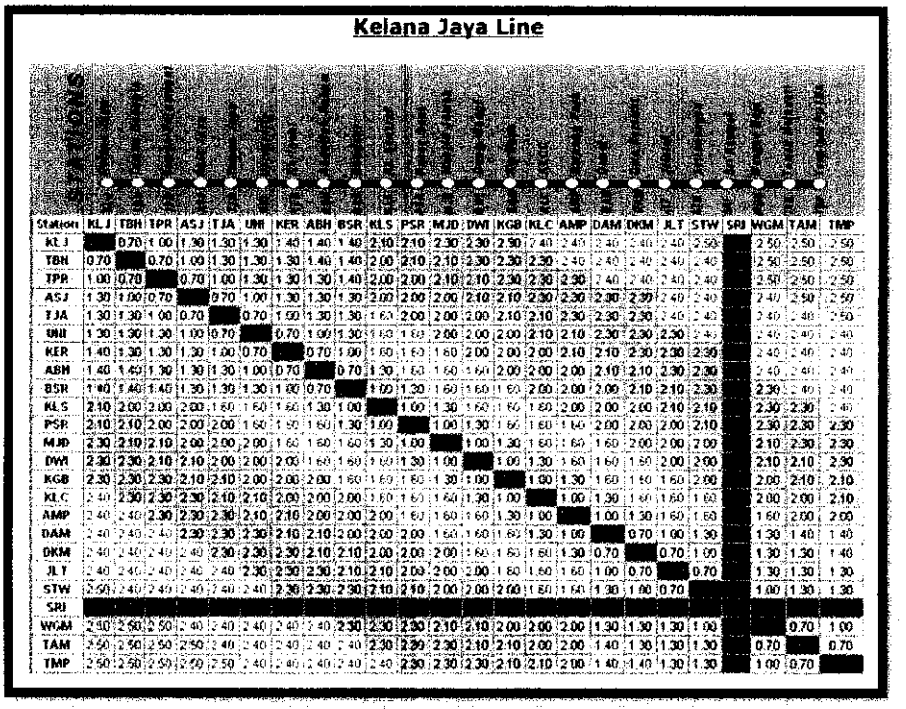


Figure 3.6.2: Kelana Jaya Line Fares

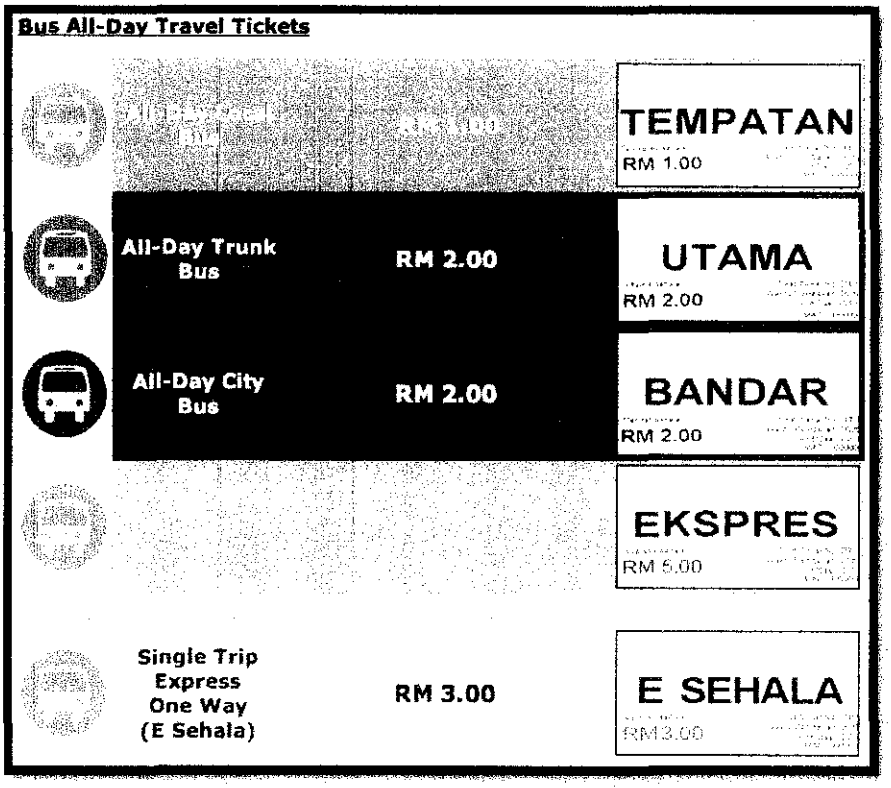


Figure 3.6.3: Rapid Bus Fares

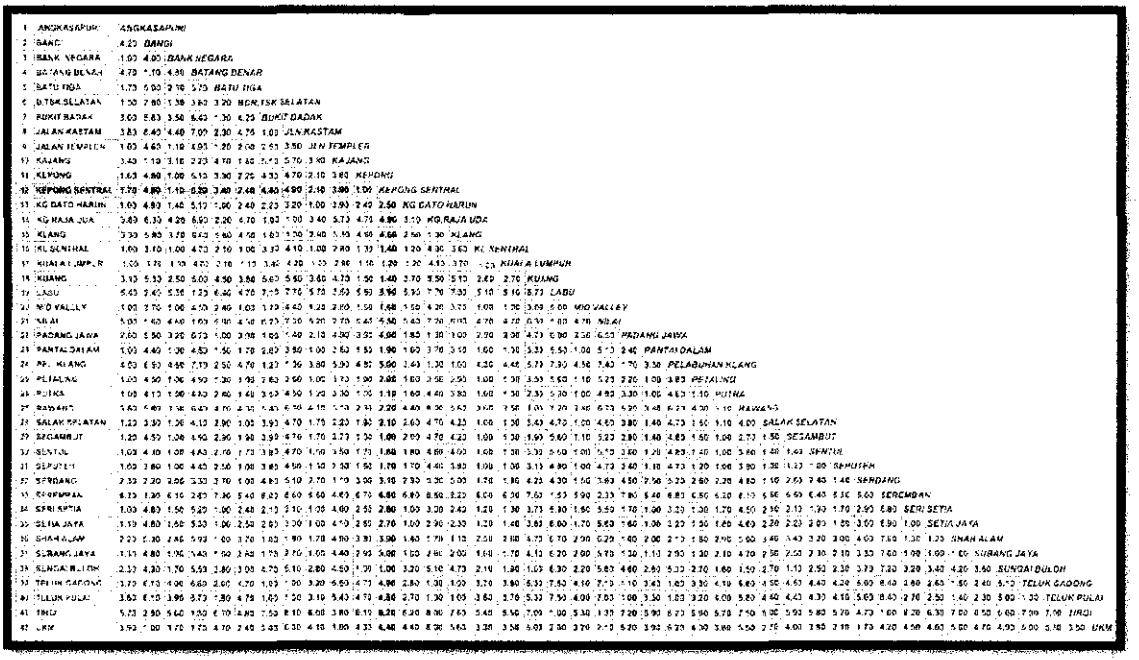


Figure 3.6.4: KTM Commuter Fares

CHAPTER 5

CONCLUSION

In today's world, networking plays an important role in communication between autonomous computers. For this many hardware devices and software algorithms have been designed. So far, the traditional system used for the communication were the hub networking system and many other hardware applications present in the market, but as they operate on electricity, it may lead to the failure of device due to some malfunctioning in the hardware circuitry. Dijkstra Algorithm has been incorporated in 'C', which provides easy understandability and hence its chances of failure is negligible.

Generally, under normal circumstances after we have determined the optimum path for a datagram in a network using Dijkstra Algorithm, if a link failure occurs then the complete network topology changes including the path that the datagram was following. Hence in case of a link failure we have to run the algorithm all over again to provide the shortest path to the datagram. However, we have implemented the Dijkstra Algorithm in such a way that under the context of link failure it will provide the next shortest path from the available alternate paths that has been calculated along with the Optimum Path itself.

There are needs for the public transport as not all can afford to buy private car or motorcycle. Study tells that the trip planner can help and improve the number of public transport users and can help the government to reduce the traffic jams and air pollution in the city. As a result there is no need to execute the algorithm again. By implementing this system, the users will gain many benefits such as:

- Enabling the user to take the route that most closely matches to their requirements. This means the route that takes the shortest, fastest and cheapest.

- To help the user to disperse efficiently so that they will fully utilize all

available routes.

- To help the user to reduce their time traveling and manage their budget properly.

5.1 RECOMMENDATION

There are a few enhancements recommendation to ***Trip Planning System,*** which is:

- Add multiple language selection at the website.
- Use Google Map application for the digital map.
- Use Adobe Flash for the Graphical User Interface (GUI).

REFERENCES

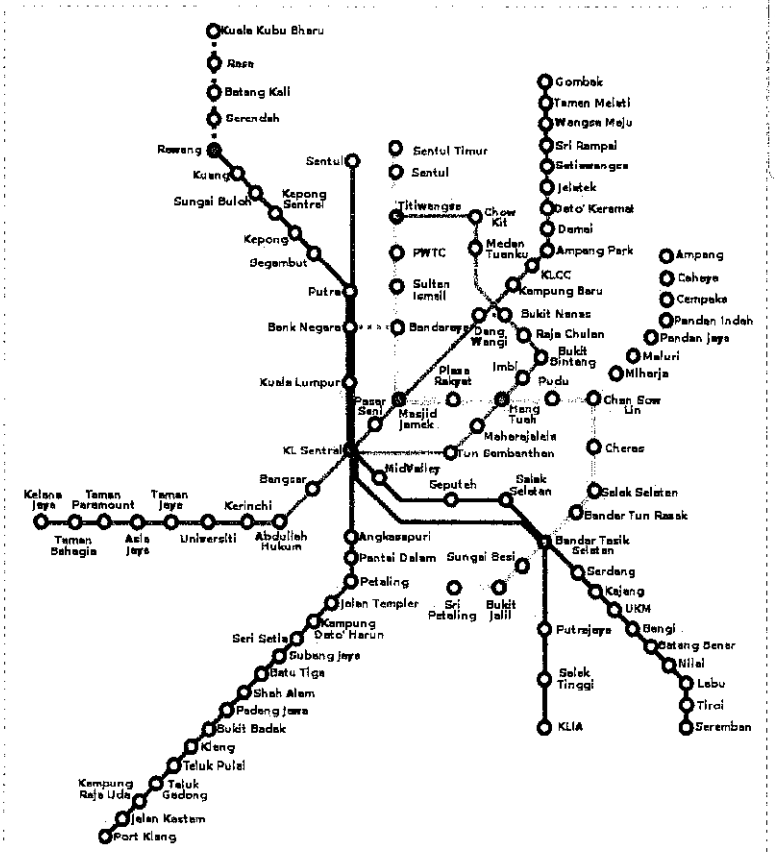
1. James F. Kurose and Keith W. Ross - Computer Networking (2nd Edition)
2. B.M. Waxman, "Routing of Multipoint Connections", IEEE Journal on "Select. Areas Communication", vol. 6, pp. 1617-1622, Dec.1988.
3. W. Stallings - Data & Computer Communication (6th Edition)
4. **Goldberg, A. V., and Radzik, T.** (1993) A Heuristic Improvement of the Bellman-Ford Algorithm. *Applied Mathematics Letter,* 6, 3-6.
5. A.S.Tanenbaum - Computer Networking (3rd Edition)
6. **Gallo, G., and Pallottino, S.** (1988) Shortest Paths Algorithms. *Annals of Operations Research*, 13, 3-79.
7. **Pallottino, S.** (1984) Shortest-Path Methods: Complexity, Interrelations and New Propositions. *Networks*, 14, 257-267.
8. Graph Optimization Algorithm, Milan Martic, Jelena Dragicevic, Faculty of Organizational Science, University of Belgrade, Serbia and Montenegro
9. D. McDermott and **E.** Davis, "Planning Routes through Uncertain Territory," ***Artificial Intelligence,*** Vol. 22, 1984,pp. 107- 156.
10. Three Fastest Shortest Path Algorithms on Real Road Networks: Data Structures and Procedures : JGIDA vol.1, no.1, pp. 69-82
11. B. Kuipers, "Modeling Spatial Knowledge," ***Cognitive Science,*** Vol. ***2,*** No. 2, 1978,pp. 129-154.
12. MANOP Services Ltd., "Review of Accessible Transportation Services: Study Guidelines for Alberta Communities." March 1993.
13. Cormen, Thomas H, et al. Introduction to Algorithms. 1990. The Massachusetts Institute of Technology.New York.
14. "Dijkstra's Algorithm For Shortest Paths." 2005. CProgramming.com. < http://cprogramming.com/tutorial/computersciencetheory/dijkstra.html>
15. Wikipedia. Web Site. URL <http://www.wikipedia.org>
16. Chrisman, N., (1997) Exploring Geographic Information Systems. John Wiley and Sons;
17. Dr Barr Simpson. Urban Public Transport Today. Routledge (1993)
18. http://www.cs.cornell.edu/courses/cs312/2002sp/lectures/lec20/lec20.htm

19. Mapping Malaysia on GPS, New Straits Times
20. Simulation of Dijkstra Routing Algoritm, Sriram Narayanan, BE Electronics, 2002-03
21. Dijkstra's Shortest Path Algorithm Java Implementation, Carla Laffra of Pace University
22. http://www.mot.gov.my/stat/rel/rel%202.9.pdf
23. RapidKL. Web Site. URL <http://www.rapidkl.com.my>
24. Keretapi Tanah Melayu, KTM Komuter. Web Site. URL <http://www.ktmb.com.my>
25. KL Monorel. Web Site. URL http://www.monorel.com.my
26. Washington Metropolitan Area Transit Authority. Web Site. URL <http://www.wmata.com>
27. The Star Online. Web Site. URL <http://thestar.com.my>
28. Department of Environment, Environmental Quality Report, 1990 & 2006, Malaysia. Ministry of Science, Technology and Development, Malaysia, Kuala Lumpur.

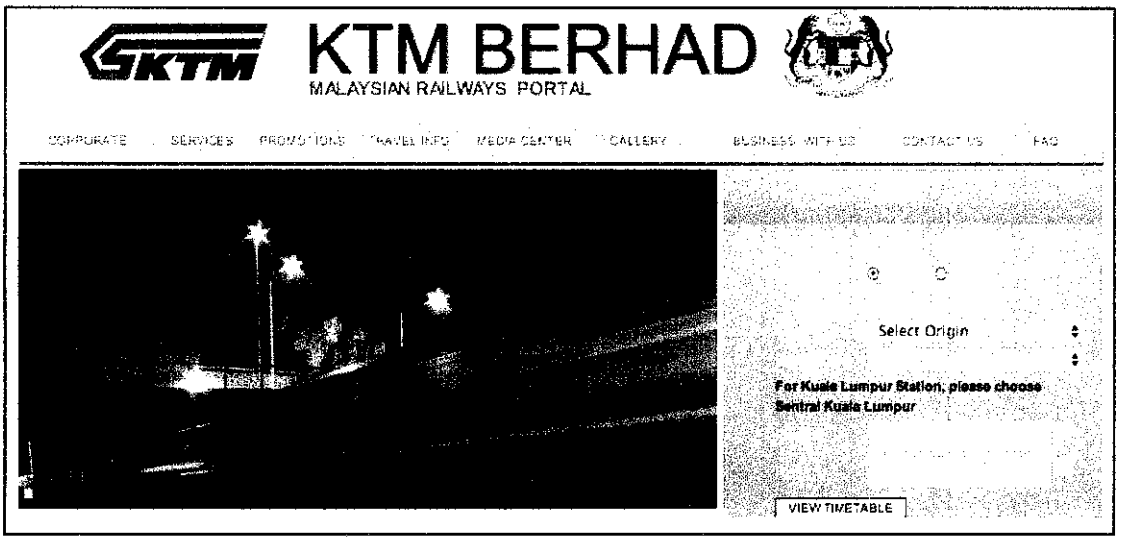
APPENDICES

Kuala Lumpur Rail Transit Journey Planner

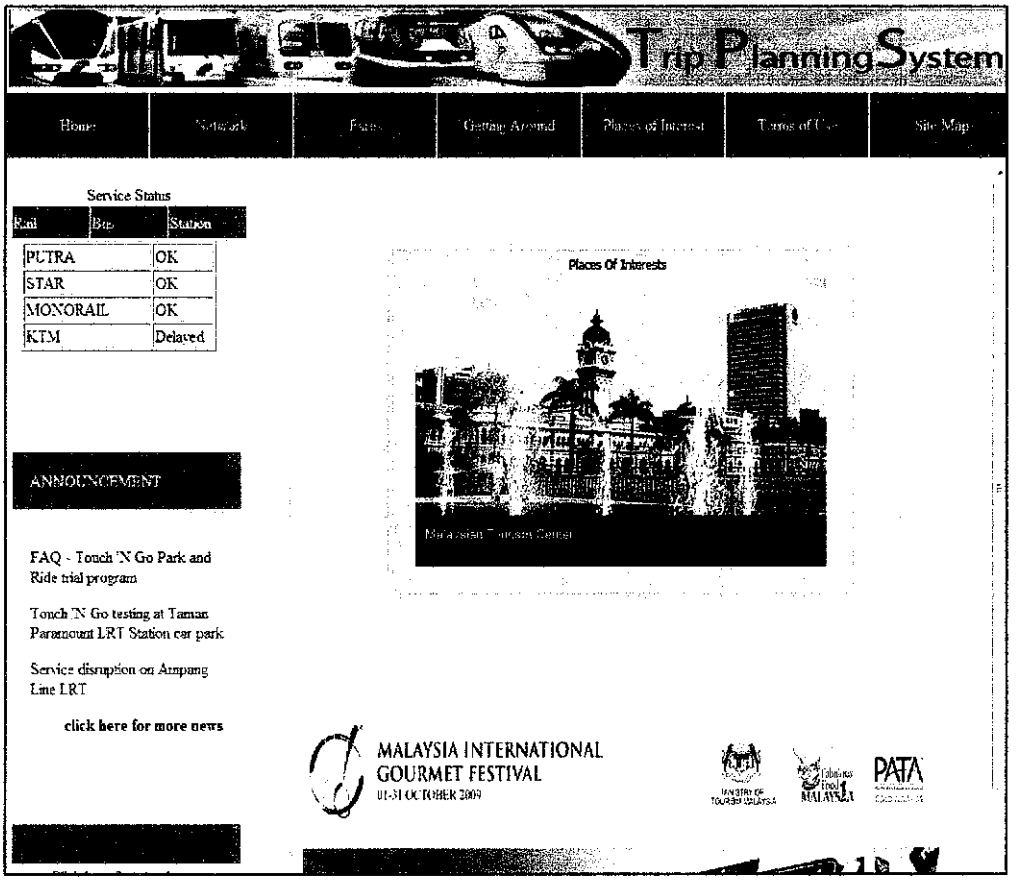
[From Wikipedia] Kuala Lumpur's rail-based transit system consists of two Light Rail Transit (LRT) lines, one monorail line, two commuter rail systems consisting four lines, and an airport rail line. The various lines are operated by different companies, hence rail network is not well-integrated.



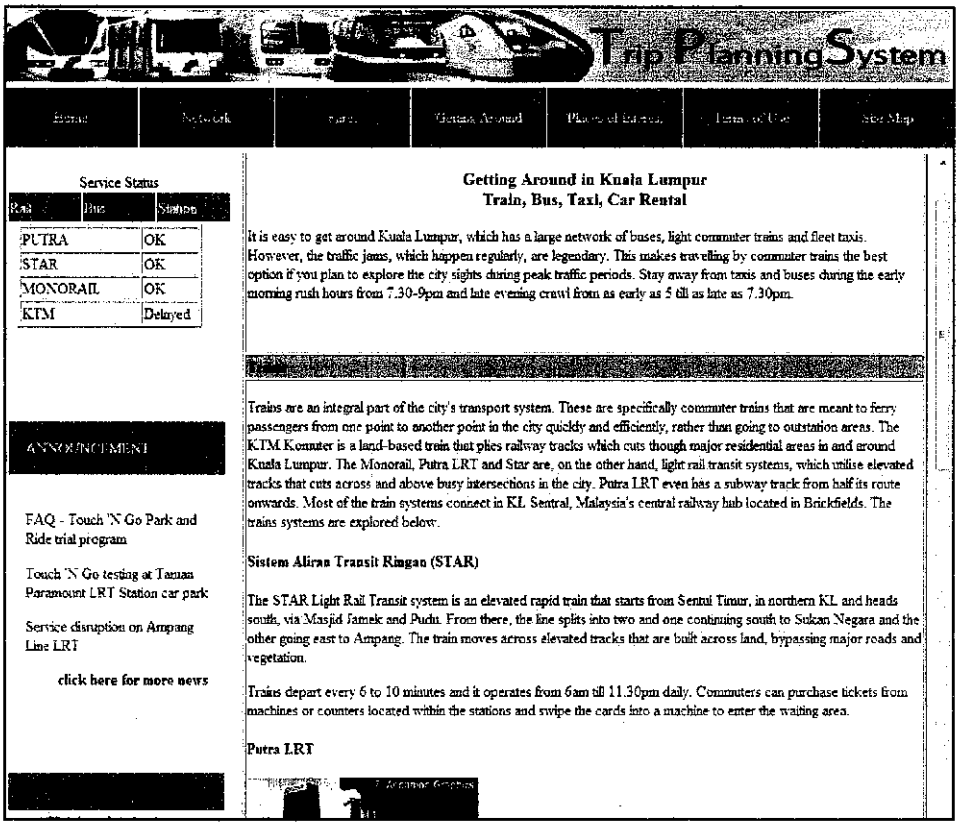
Appendix I: PriceChat Journey Planner



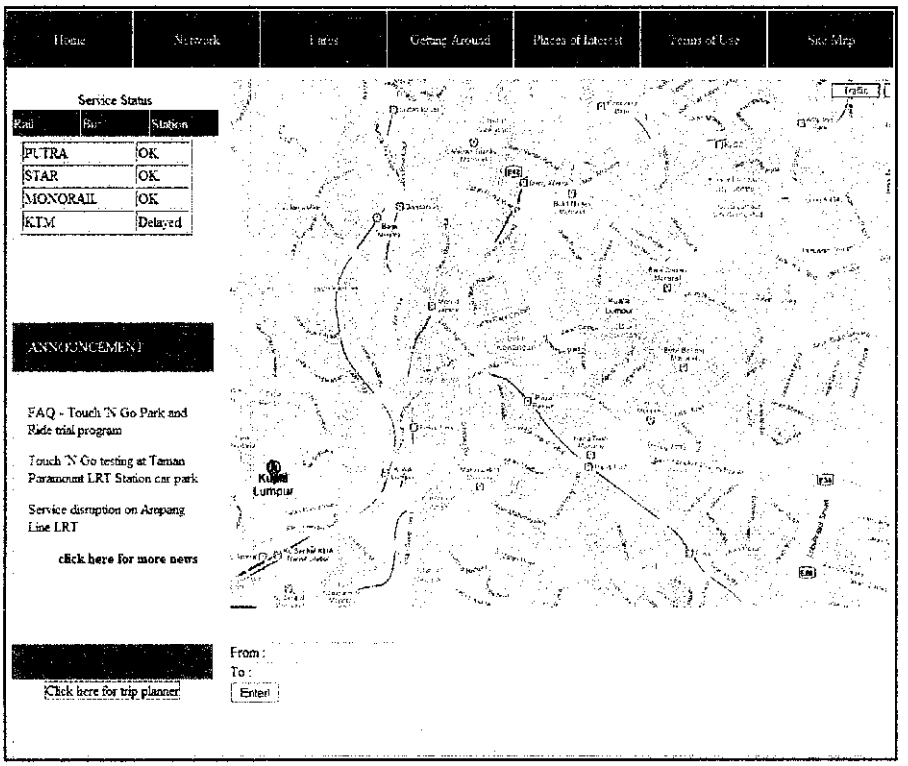
Appendix II: KTMB Intercity Ticketing System



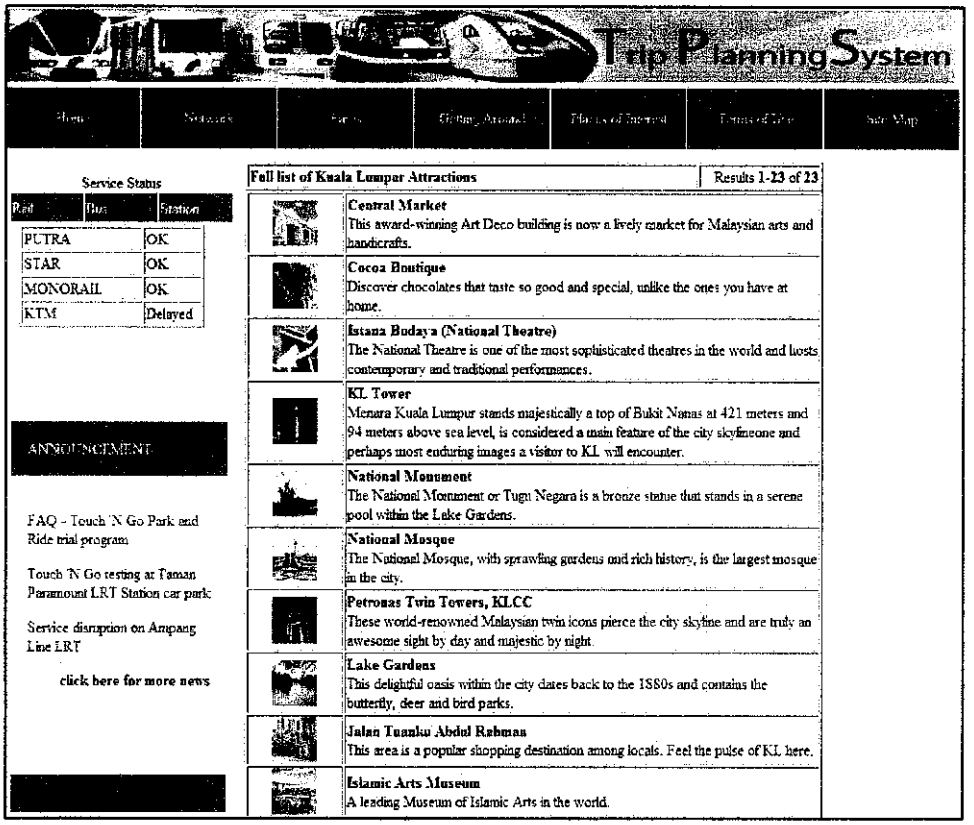
Appendix iii: TPS Interface



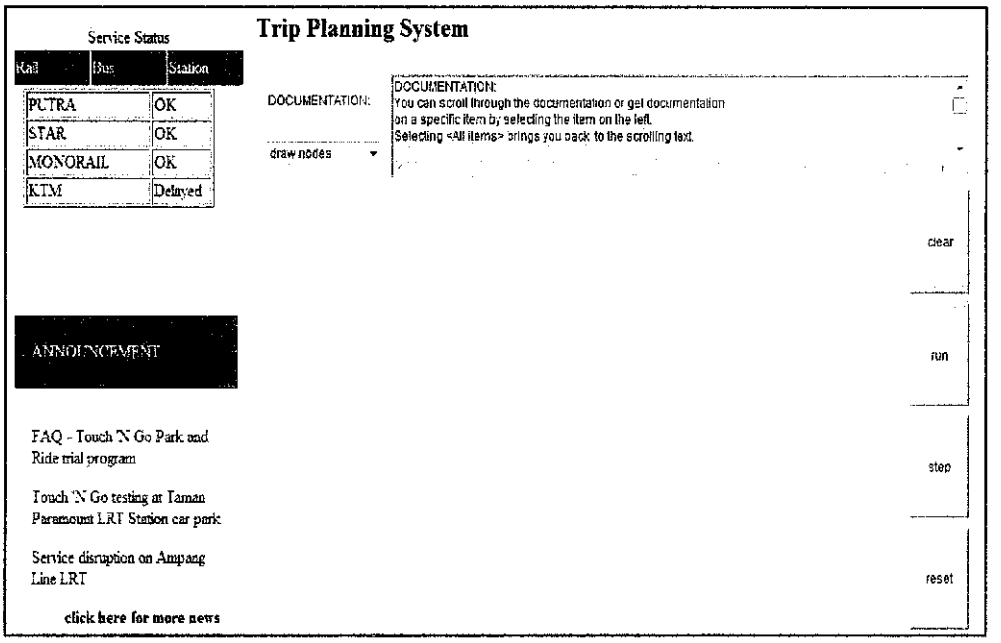
Appendix iv: TPS Site



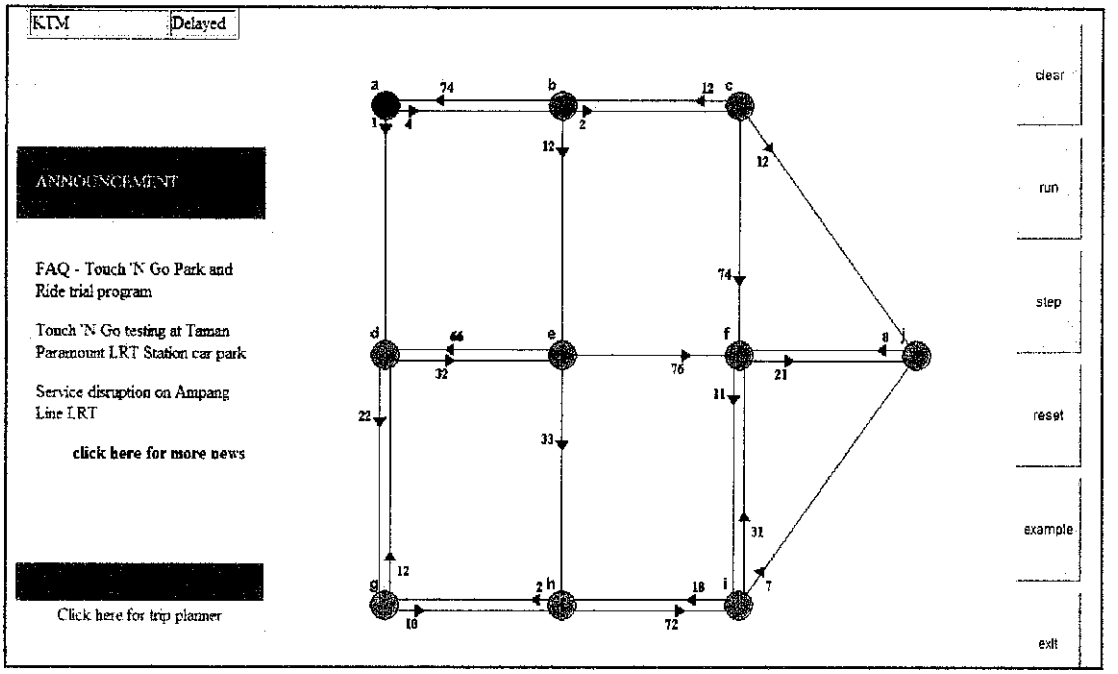
Appendix v: TPS Site



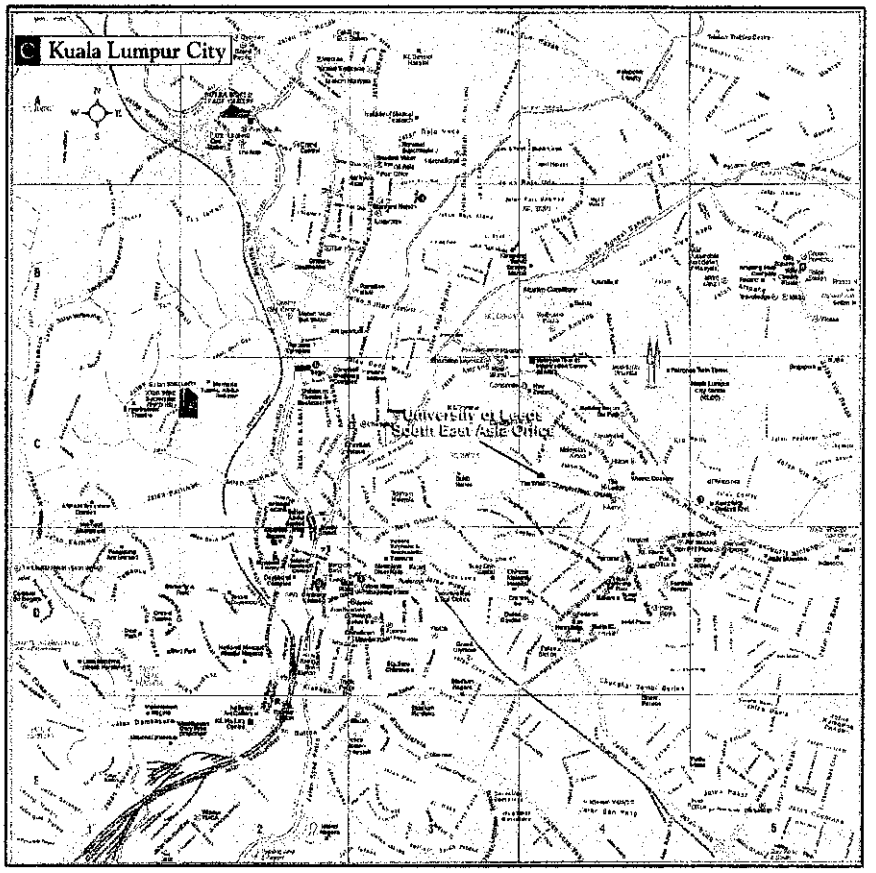
Appendix vi: TPS Site



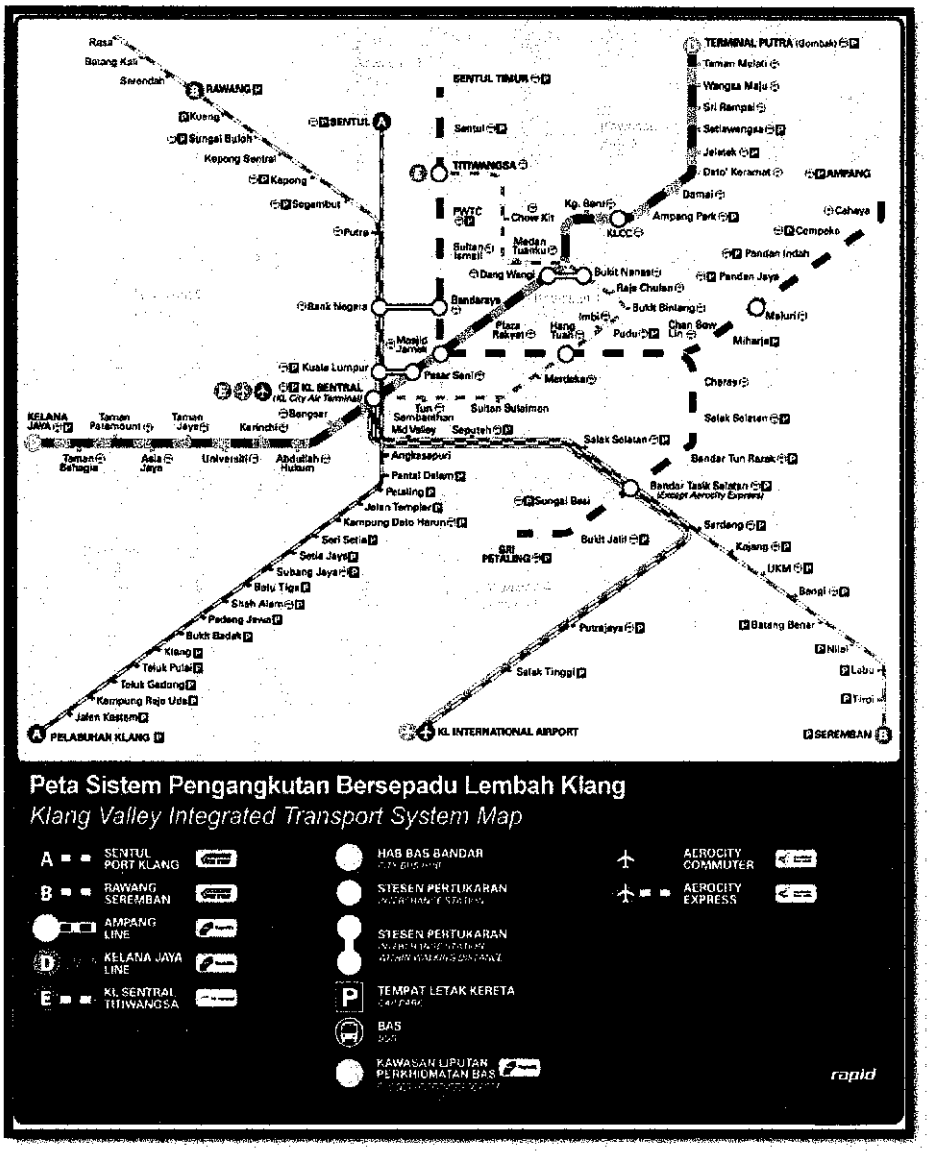
Appendix vii: TPS Site



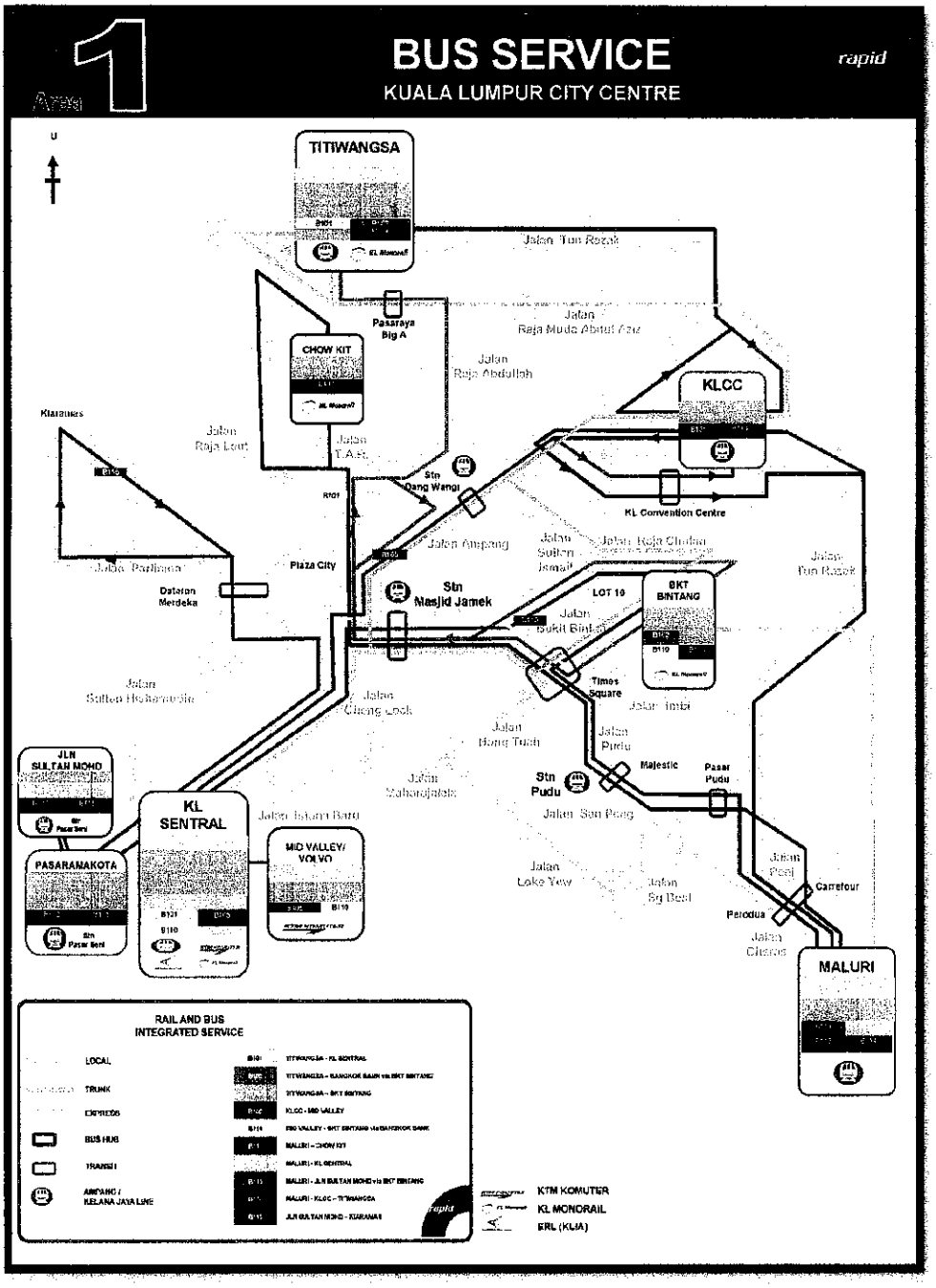
Appendix vii: TPS Site



Appendix viii: Kuala Lumpur Map



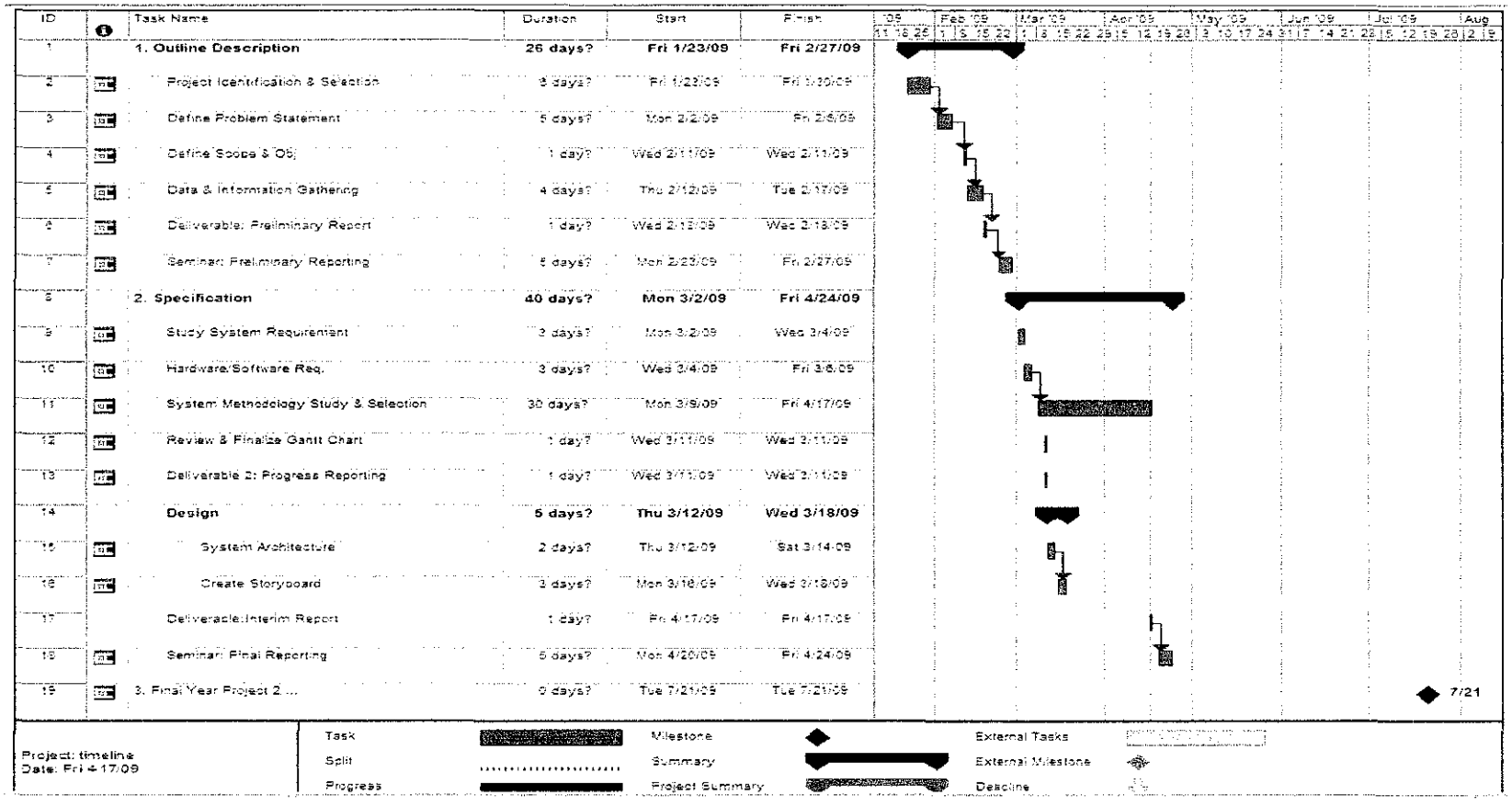
Appendix ix: Klang Valley Integrated Transport System Map



Appendix ix: Rapid Bus Route in Kuala Lumpur

Category	Trip Planning System	KTM Interactivity Train Timetable	Washington Metropolitan Area Transit Authority	London Underground - Tube
Service	Covering all public transport's network in Kuala Lumpur	Facilitate intercity train service within KTM network	Facilitate public transport (bus and trains) operated in Washington	Facilitate public transport service (bus and trains) operated in London
User Control	User need to input their origin, destination, preferred travel method and date/time of departure	User need to input their origin, destination and date of departure/arrival	User need to input their origin, destination, preferred travel method, date/time, and also have advance search.	User need to input their origin and destination. System will assume that user will travel on that time.
Generated Results	System will generate the best results by providing shortest route and the cheapest fares needed in the journey.	System will generate results by providing train name, departure and arrival time.	System will generate results base on previous input.	System will generate few different options with combination of traveling mode
Flexibility	Flexible - Base on the result, user can choose which option the want. User can compare results on number of transfer, minimum cost/time	Not flexible – Data not accurate and late update. Users only have an option to choose base on time of arrival/departure	Flexible – All information already provided in each of suggested itinerary.	Flexible – All information already provided in each of suggested itinerary.
Accessibility	Can be access using internet	Can be access using internet	Can be access using internet and wireless devices	Can be access using internet

Appendix x: Comparison Between Existence System



Appendix xi: Project Timeline

TRIP PLANNING SYSTEM QUESTIONNAIRE

Trip Planning System is a system that can find the shortest path for user using public transportation is Kuala Lumpur. This project is done in conjunction with Final Year Project. Please take a moment to fill in the questionnaire. Thank you for your cooperation.

SECTION A: GENERAL

1. How old are you?

   [ ] 12-17 [ ] 18-23 [ ] 24-30 [ ] 31-40 [ ] > 41

2. Where do you live?

   [ ] Klang Valley [ ] Shah Alam [ ] Petaling Jaya [ ] Others

3. Do you find yourself easily get lost when you are in a new place?

   [ ] Yes [ ] No

4. Do you own a Global Positioning System (GPS) device?

   [ ] Yes [ ] No

5. Have you ever used Digital Map like Google Map or Wikimapia?

   [ ] Yes [ ] No

SECTION B: BASIC KNOWLEDGE ABOUT PUBLIC TRANSPORT IN KUALA LUMPUR

1. Have you ever using public transport in Kuala Lumpur?

   [ ] Yes [ ] No

2. What do you think about the public transport in Kuala Lumpur?

   [ ] Excellent [ ] Good [ ] Moderate [ ] Poor [ ] Really Poor

3. How often do you use the public transport?

   [ ] Very Often [ ] Often [ ] Sometimes

4. What type of public transport do you prefer most?

   [ ] Light Rail [ ] Commuter [ ] Busses [ ] Taxi

5. What do you think about the public transports' fares?

   [ ] Cheap [ ] Affordable [ ] Expensive [ ] Very Expensive

SECTION C: EXPERIENCE WITH THE PUBLIC TRANSPORTS

1. What are the difficulties that you are usually face when using the public transport?

   [ ] Off Schedule [ ] Transport Breakdown [ ] Transport too pack
   [ ] Air-condition not so cold

2. What are the considerations that you may take before planning your trip using public transport?

   [ ] The Fares [ ] The times it takes to the destination
   [ ] The maximum number of transfer between the transport

3. How much do you spend for public transport's tickets?

   [ ] <= RM 3.00 [ ] <= RM 5.00 [ ] Don't Care

4. Will you use the public transport after this?

   [ ] Yes [ ] No

SECTION C: TRIP PLANNER SYSTEM INFORMATION GATHERING

1. Have you ever see or use any trip planner system (for public transport) to help their users to facilitate and assist them to plan their journey in Kuala Lumpur?

   [ ] Yes [ ] No

2. If you answered yes for question no 8, is the system reliable? Why?

3. If you answered no for question no 8, what features do you want to see in the system?

Trip Planning System Usability Test (Test Scenarios)

Task List

Network Tab

1. View the network of trains
2. View the network of buses

Fares Tab

1. View the fares and information for Ampang Lines
2. View the fares and information for Kelana Jaya Lines

Places of Interest Tab

1. Scroll item to view
2. View details of the places of interest in Kuala Lumpur

Trip Planner tab

1. View the map of Kuala Lumpur
2. Able to click to choose origin and destination
3. Able to view the result of the search
4. Able to view the options of traveling based on shortest path between the origin and destination

Pre-test questionnaires

Age	
Gender	☐ Male ☐ Female
Number of year experience using public transportation?	☐ < 1 ☐ 2 to 5 ☐ > 5
Money spends on public transport per day?	☐ < RM 3 ☐ RM 4 to 6 ☐ > RM 6
Have you use trip planner before?	☐ Yes ☐ No
If yes, please state the site	
Having vision problem?	☐ Yes ☐ No
Having hearing problem?	☐ Yes ☐ No
Having mobility problem?	☐ Yes ☐ No

Post-test Question:

1. What type Internet connection you are using?
   A.56kb/s b.128kb/s c. 256kb/s d. other faster e. others slower

2. How do you find about our pre-page loading?
   a. Very slow b. Slow c. Normal d. Fast e. Very Fast

3. Do you like the homepage to be more dynamic or static?
   a. Not at all b. Disagree c. Not sure d. Agree e. Totally Agree

4. Do you think the information in the site is enough?
   a. Yes b. No

   If NO, please suggest what information do we need to put.
   .....
   .....

5. Is our web site self-explain enough for you?
   a. Not at all b. Disagree c. Not sure d. Agree e. Totally Agree

6. How do you think about our website respond time?
   a. Very slow b. Slow c. Normal d. Fast e. Very Fast

7. Is there any improper respond that you have found though out your testing?
   For example, button did not work properly, result not clear enough.

   .....
   .....
   .....

8. We would be happy if you have any suggestion or comment.
   .....
   .....
   .....