CHAPTER I

INTRODUCTION

I.1 Overview of Project Area

Paris Metropolitan is the major transport systems that serving millions of commuters everyday in metropolitan areas. The networks are a high frequency service established mainly in underground tunnels or on elevated tracks separated from other traffic. There are 16 lines that are mostly in underground railway tunnel with 214 km in length and 301 stations which 62 of them to facilitate transfer to another line. Paris metro is also the second busiest metro sytem in Europe after Moscow. Wikipedia,2012[1]S explained Paris metro runs the surface consists of the viaduct sections within Paris (on lines 1,2,5,6) and the suburban ends of lines 1,5,8, and 13. The system's tunnels are relatively close to the surface due to the variable nature of Paris's earth which doesn't permit deep digging ; exceptions include parts of line 12 under the hill of Montmartre and line 2 under Menilmontant. The width of the carriages, 2.4 metres across, is narrower than that of newer French systems (such as the 2.9m carriages in Lyon, one of the largest in Europe) and lines 1, 4 and 14 have capacities between six and seven hundred passengers; against two thousand six hundred on the Altéo MI 2N trains of RER A. The size of the Metro cars (and tunnels) was deliberately chosen by the City of Paris to prevent the running of French mainline trains in the Paris Metro system; the city of Paris and the nation of France had historically poor relations. In contrast to many other metro systems (such as those of the New York, London, and Boston), all of Paris's lines have tunnels and operate trains with the same dimensions. Five Parisian lines (1, 4, 6, 11 and 14) are capable of running on a rubber tire system developed by the RATP in the 1950s; later exported for use on the Métros of Montréal, Santiago and Mexico City.The number of cars in each train varies line by line from three to six; most have five and eight is possible on the new line 14. Just two lines, 7 and 13, have branches at the end, and trains serve every station on the line except when they are closed for renovations.

The first train leaves the terminus at either end of each line at 5:30 am, although, on some lines, additional trains may also start from an intermediate station. The last train, often called the "balai" (broom) because it sweeps up remaining

passengers, arrives at the terminal station at 1:15 am, except on Fridays, Saturdays and on nights before a holiday, when the service ends at 2:15 am.

Paris and the existing railway companies were already thinking by 1845 about an urban railway system to link inner districts of the city. The railway companies and the French national government wanted to extend existing mainline railroads into a new underground network in Paris, whereas the Parisians favoured a new and independent network and feared national takeover of any system it could build. The disagreement lasted from 1856 to 1890. Meanwhile, the population became more dense and traffic congestion grew massively. The deadlock put pressure on the authorities and gave the city the chance to enforce its vision.

Prior to 1845, Paris's urban transport network consisted primarily of a large system of omnibus lines, consolidated by the French national government into a regulated system with fixed and unconflicting routes and schedules. The first concrete proposal for an urban rail system in Paris was put forward by engineer named de Kerizouet. This plan called for a surface cable car system. In 1855, civil engineers Edouard Brame and Eugene Flachat proposed an underground freight urban railroad for Paris, due to the high rate of accidents on surface rail lines. On November 19, 1871, the General Council of the Seine commissioned a team of 40 engineers to plan an urban rail network. This team proposed a network with a pattern of routes "resembling a cross enclosed in a circle" with axial routes following large boulevards. On May 11, 1872, the Council endorsed the plan, but the French national government turned down the plan. After this point, a serious debate occurred over whether the new system should consist of elevated lines or of mostly underground lines; this debate involved numerous parties in France (including Victor Hugo, Guy de Maupassant, and the Eiffel Society of Gustave Eiffel) and continued until 1892. Eventually, the underground option emerged as the preferred solution because of the high cost of buying land for rights-of-way in downtown Paris (required for building elevated lines), estimated at 70,000 francs *per meter* of line for a 20 meter-wide railroad.

I.2 Background

Mass Rapid Transit in tunnel system is one of the major mass transportation is most of the countries around the world. With the increasing of population,commercial activities, industrial and social activities turns out to the demand of safe, comfortable and reliable railway sevice. Any delays and interruption on railway service can bring a city to a standstill that may occurs to a significant economic loss. One of the major problem in the subway system is the operational

cost that cause by the energy consumption need to be reduce. The reducing of energy consumption also lead to the “green transportation” and stakeholders (major of the city) could use the budget for the transportation to another field like education, rural area development, etc.

I.3 Research Project

This research is start from evaluating the effectiveness and efficiency. Efectiveness in engineering terms means “do the right things” that related to the service quality. Sevice quality itself in this research related to the end user. Efficiency in engineering terms means “do the things right” that related to the energy consumption. The typical inter-station run out, a train accelerates from a station to maximum speed and maintains the train speed as much as possible until it is necessary to brake to a halt for the next station. Usually, the running time is the shortest and the energy consumption is the highest as the train is running close to the maximum permissible speed throughout the trip. The traction motors are allowed to turn off once the train accelerates above a certain speed if coasting is allowed. With the application of coasting, the momentum of the train carries it through and the brake is still needed to bring the train to stop at the next station. Inter-station run time is longer but the energy saving can be achieved because the train spends less time on motoring.

I.4 Intellectual Challenge

Most of the research are focus on the inter-station with the single link but at the real world problem, we face a raliway network with multiple link. This research also examine the energy consumption by the multiple trains and taking interactions as the consideration. This research will use genetic algorithm integrated with simulation is designed to seek the approximate optimal coasting control strategies on the railway network. The control strategies that will be examine is network-based strategy which on other research examine link-based coasting strategy.

I.5 Research Objectives

There are 2 objectives for this research which is :

1. To know the performance and the amount of the energy that could be reduced.
2. To know the performance and the travelling time that could be reduced with the proposed approach.
3. To know the Carbon and CO_2 reduced with the proposed approach.

I.6 Steps of the Research

There are 4 steps for this research which is

1. Collecting Data

   On this part, the researcher collecting the data that will be use for the simulation. The data that will be require for this research are weight of the train, path of the train, the length of the railway, a control strategy, traction of the train, velocity of the train, braking force of the train, etc.

2. Processing Data

   All the data will be process with Microsoft Excel.

3. Verification of the proposed approach

   The verification of the proposed approach is to identify whether the proposed approach has reduced the energy consumption or not.

I.7 Scope and Limitations

There are several assumptions of this research which is :

1. The railway network system are on the flat ground without deviation degree.
2. There is no disruption on the MRT systems. One example for the disruption is there is no people entering the train at the time when the door will be close because it will disrupt the system because the door will be open again and it will takes time to close the door again and the train has to move faster in order to reach the punctuality on the next station which means there are more energy consume at that time.

There are several limitations of this research which is :

1. There are not enough time to study the correlation between the tunnel systems with the energy that being used for the air-conditioning system.
2. This research doesn't include the assessment of the proposed approach control strategy.
3. This proposed approach of this research is only focus on the control strategy while in the planning systems, we can try to simulate and decide where is the best stop for the metro so that the persons can easily access to this transportation.

I.8 The Advantages

This research could give advantages to both the researcher and the company. There are some advantages from this research which is :

I.8.1 The Advantages for the Researcher

There are several advantages that could be gained from this research for the researcher.

1. The researcher could apply the knowledge of engineering in order to participate in urban and regional planning.
2. The researcher could know how to minimalize the energy consumption by using genetic algorithm to design a "*greener*" transportation system.
3. The researcher could know how to minimalize the travelling time by using genetic algorithm
4. The researcher could know what is the main problem in the railway network systems.

I.8.2 The Advantages for the Company

There are several advantages that could be gained from this research for the company.

1. The company can know the way to minimalize the energy consumption.
2. The company can reduce the energy cost that could lead to a higher profit.
3. The company can increase customer satisfaction by reducing the travelling time of the train.

I.9 Research Methodologies

The methodology in this research could be examine by several steps that has to be done for this research which is :

I. Problem Identification

In this phase, the researcher doing problem identification according to the topic that has been chosed.

II. Problems Limitation

To keep the issues that been discussed in this study focused then the researcher determined some limitations according to the problems.

III. Data Retrieval and Data Calibration

In this phase, the researcher go directly to the company that run paris metro which is RATP and ask for the data that will be used to conduct this research. There are several data that also can be obtained by the website of the company (www.ratp.fr), for example the target time for interstation can be obtained by the time-table for the train.

IV. Analysis

In this phase, the researcher is going to do analysis to all steps starting from analysis the data that been obtained. Analysis for the calibration of the data.

V. Conclusion and Recommendation

This step is the final step is to conclude from the data analysis has been made previously and then give advice as an input to the company for further research and development.

I.10 Systematic of Writing

The Preparation of this research is made in a systematic way so that it could be easily understood in its presentation. Systematic study is made as follows:

CHAPTER I : INTRODUCTION

Chapter I provides background issues, identification and formulation of the problem, assumptions and limitations issue, the purpose of the research, the benefits of the research, research methodologies and the systematic of writing. In this chapter, the authors explain the reasons for the selection of topics, find out the purpose and benefits of the selection of topics, as well as the author knows how to solve the problem based on a topic that is taken.

CHAPTER II : Literature Review

This chapter contains concepts that can be used as the theoritical foundation for the author in making this research. This chapter contains the general knowledge about the modeling, railway system, mechanical, and simulation. With the existence of this chapter is expected to assist inresolving issues that have been formulated. This chapter will also lead in determining the steps performed in obtaining an improved proposal.

CHAPTER III COLLECTING AND PROCESSING DATA

This chapter contains the processing of data, testing data, the present system modeling, and modeling the proposed system to be able to answer the problem.

CHAPTER IV ANALYSIS

This chapter contains the analysis of the data collection, analysis of data processing, analysis of the present system modeling, system modeling and analysis of the proposal.

CHAPTER V CONCLUSIONS AND RECOMMENDATIONS

This chapter contains the conclusions derived from research that was done, the advice is addressed to the company for further research and development.