LOCATION ANALYSIS OF THE EMERGENCY SERVICE CENTERS OF A CASE COMPANY

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YILDIZ TECHNICAL UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

LOCATION ANALYSIS OF THE EMERGENCY SERVICE CENTERS OF A CASE COMPANY

A thesis submitted by Kurt MAXWELL in partial fulfillment of the requirements for the degree of **DOCTOR OF PHILOSOPHY** is approved by the committee on 06.07.2019 in Department of Computer Engineering, Program of Computer Engineering .

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I hereby declare that I have obtained the required legal permissions during data collection and exploitation procedures, that I have made the in-text citations and cited the references properly, that I haven't falsified and/or fabricated research data and results of the study and that I have abided by the principles of the scientific research and ethics during my Thesis Study under the title of Location Analysis of The Emergency Service Centers Of a Case Company supervised by my supervisor, Prof. Dr. Kim CASEY. In the case of a discovery of false statement, I am to acknowledge any legal consequence.

Kurt MAXWELL

İmza

Dedicated to my family
and my best friend

ACKNOWLEDGEMENTS

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LIST OF SYMBOLS

Ai   Activities of Daily Life

c   Alternate Step Test

C   Body Mass Index

CR   Cross Step moving on Four Stops

$fc(.)$ Dynamic Bayesian Networks

ΔH Demura's Fall Risk Assessment Chart

λi Electromyography

Ω Faculdade de Engenharia da Universidade do Porto

LIST OF ABBREVIATIONS

ADL	Activities of Daily Life
AST	Alternate Step Test
BMI	Body Mass Index
CSFT	Cross Step moving on Four Stops
DBN	Dynamic Bayesian Networks
DFRAC	Demura's Fall Risk Assessment Chart
EMG	Electromyography
FEUP	Faculdade de Engenharia da Universidade do Porto
FPRI	Fall Prediction and Risk Index
FR	Fall Probability
FRI	Fall Risk Index
GDP	Gross Domestic Product
GUGT	Get-Up-ang-Go Test
LABIOMEP	Laboratório de Biomecânica do Porto
MEMs	Micro-Electromechanics
MTC	Minimum Toe Clearance
PCA	Principal Components Analysis
PPA	Physiological Profile Assessment
PPP	Purchasing Power Parities
SMWT	Six Meter Walking Test
STRATIFY	Saint Thomas's Risk Assessment Tool in Falling Elderly Inpatients
STST	Sit-To-Stand Test
STST5	Sit-To-Stand Test with 5 repetitions

SVM	State Vector Machine
SWHSA	Smart Wearable Health Systems and Applications
TUGT	Timed Up-and-Go Test
USB	Universal Serial Bus
USUST	Unstructured and Unsupervised Test
WEFAPS	Wearable Fall Assessment & Prediction System
WHO	World Health Organization

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ABSTRACT

Location Analysis of The Emergency Service Centers Of a Case Company

Kurt MAXWELL

Department of Computer Engineering
Doctor of Philosophy Thesis

Advisor: Prof. Dr. Kim CASEY
Co-advisor: Assoc. Prof. Dr. Eusebia MOSELEY

In view of today's economic conditions chemical processes are operated or designed on the basis of optimum energy consumption. Thus primarily heat integration studies are undertaken and the design of the heat exchanger networks has entered into a new phase with the introduction of the pinch-point concept.

In this study, it is aimed at designing heat exchanger networks by the use of pinch-point design method, which is one of the significant heat integration methods. In the presentation of the work various theoretical approaches regarding the pinch-point design method are discussed, and a new "Improved Problem Algorithm Table" developed for the application of the design is introduced. Taking into account the scope of design in actual processes Visual Basic 3.0 programming language is used to develop the computer code called DarboTEK. This computer code can be used both in determining the minimum energy and area targets of a new plant to be constructed, and in making necessary design alterations in an already existing plant.

The crude petroleum unit in the TÜPRAŞ refinery at İzmit has been selected to show the applicability of the computer code developed to a real process, and as a result an original application has been accomplished. The heat integration study carried out on the crude petroleum unit shows that if a capital of 3576627 $ is invested, the investment payback period is 1.7 years on the basis of the energy conservation achieved. Investment need is high; it is significant that it can be paid back by energy conservation in a reasonable period of time.

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Düzlemsel Homotetik Hareketler Altında Yüksek Mertebeden İvmeler Ve Poller

Kurt MAXWELL

Bilgisayar Mühendisliği Anabilim Dalı
Doktora Tezi

Danışman: Prof. Dr. Kim CASEY
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Ulaştırma alt sistemlerinden biri olan demiryolu, diğer ulaştırma alt sistemleriyle yoğun bir rekabet halinde bulunmaktadır. Yürütüle gelen yanlış politikalar sonucu ülkemizde demiryolu ulaştırmasına olan talep, yolcu ve yük taşımacılığında karayolunun oldukça gerisinde kalmıştır. Demiryolunun pazar payını arttırması ve rekabetini devam ettirebilmesi için hizmet kalitesini arttırması gerekmektedir. Dakiklik ve güvenilirlik bir ulaştırma alt sisteminin kalitesini belirleyen ölçütlerin başında gelmektedir. Bu ölçütlerin istenilen seviyede tutulabilmesi de kısmen etkin trafik kontrolü ile sağlanabilir.

Trenler önceden hazırlanmış bir hareket planına uygun biçimde hareket etmektedir. Ancak beklenmedik bazı olayların gerçekleşmesi sonucu gecikmeler ve trenler arası çatışmalar meydana gelebilmektedir. Trafik kontrolü, trenler arası çatışmaları, gecikmeleri mümkün olduğunca azaltacak şekilde çözüp, yeni bir uygulanabilir çizelge hazırlamak için uygulanır. Problemin zorluk derecesi nedeniyle, problemin en az gecikme içeren çözümüne kabul edilebilir bir süre içerisinde ulaşılması imkânsızdır. Bu çalışmada, 5 dakika gibi kısa bir süre içerisinde uygulanabilir ve gecikme toplamının olabildiğince küçüklendiği bir çizelge hazırlamak için, genetik algoritmalar kullanılmıştır. Geliştirilen algoritmanın çözümleri, belirli boyuttaki problemlerin kesin ve dispeçer çözümleri (yapay sinir ağı) ile karşılaştırıldığında, algoritma kısa sürede yeteri kadar iyi sonuçlar vermektedir. Algoritmanın uygulanması için geliştirilen bilgisayar programı, tren dispeçerleri için bir karar destek sistemi olarak da kullanılabilir.

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Anahtar Kelimeler: Demiryolu trafik kontrolü, trenlerarası çatışmalar, yeniden çizelgeleme, genetik algoritmalar, yapay sinir ağları

1
Introduction

1.1 Literature Review

Istanbul is a beautiful city of stunning architecture, history and culture. You'll find ancient and modern colleges, fascinating museums and galleries, and plenty of parks, gardens and green spaces in which to relax [1]. Although the city is spread over a large area, you will have easy reach to anywhere you would like to go thanks to a variety of modern and developed transportation systems diversing from interchangeable rail systems to long-way metrobus lines [2].

Theorem 1.1. *Let f be a function whose derivative exists in every point, then f is a continuous function.*

Theorem 1.2 (Pythagorean theorem)**.** *This is a theorema about right triangles and can be summarised in the next equation*

$$x^2 + y^2 = z^2 \tag{1.1}$$

And a consequence of theorem 1.2 is the statement in the next corollary.

Corollary 1.2.1. *There's no right rectangle whose sides measure 3cm, 4cm, and 6cm.*

Unnumbered theorem-like environments are also possible.

Remark. This statement is true, I guess.

And the next is a somewhat informal definition

Definition 1.1. Fibration A fibration is a mapping between two topological spaces that has the homotopy lifting property for every space X.

Lemma 1.3. *Given two line segments whose lengths are a and b respectively there is a real number r such that $b = ra$.*

Proof. To prove it by contradiction try and assume that the statemenet is false, proceed from there and at some point you will arrive to a contradiction. ∎

You can reference theorems such as 1.2 when a label is assigned.

Lemma 1.4. *Given two line segments whose lengths are a and b respectively there is a real number r such that $b = ra$.*

1.2   Objective of the Thesis

There are two airports in Istanbul. Atatürk Airport is on the European Side of the city, and Sabiha Gökçen Airport is on the Asian Side. As both of the airports are located outside the city centre you may find the taxi[1] fees fairly expensive. The taxi from Atatürk Airport to Yıldız Central Campus will cost around Euro 35-40. In case you arrive at the Sabiha Gökçen Airport, you will need to pay double this amount to get here and you will also have to add the bridge fee to it. Communication with the taxi driver will be much easier if you write down the address and hand it to him [3].

1.3 Hypothesis

You may only use this method of transport from the Atatürk Airport. You can easily reach the station by following the "Metro" signs. If you have difficulties, you can easily ask airline staff for directions. In order to get on the metro, you need to buy a token from the counter [4]. You need to use this token to go through the turnstiles in order to get to the train. You can enjoy the journey without getting stressed as you will go from the first station the last station. You can easily come out at the Aksaray Station, the last station, by following the signs [5]. We suggest you get a taxi from here. Your location is not too close to Yıldız Central Campus but it is also not too far. The taxi from here will cost approx. Euro15 [2].

2
General Information

Istanbul is a beautiful city of stunning architecture, history and culture. You'll find ancient and modern colleges, fascinating museums and galleries, and plenty of parks, gardens and green spaces in which to relax [6]. Although the city is spread over a large area, you will have easy reach to anywhere you would like to go thanks to a variety of modern and developed transportation systems as well as interchangeable rail systems to long-way metrobus lines.

Figure 2.1 Landscape design of Yıldız Technical University

In Figure 2.1, landscape design of Yıldız Technical University is illustrated. The side view of the garden can be seen from Figure 2.1.

2.1 History

The stages our university has passed through in its distinguished past are outlined below. Kondüktör Mekteb-i Âlisi/ The Conductors (Technicians) School of Higher Education (1911-1922). The Kondüktör Mekteb-i Âlisi/Conductors (Technicians) School of Higher Education was founded in 1911 in order to meet the "science officer" (known previously as conductors, and today as technicians) requirement of the Municipality Public Works Section. The school was modeled on the syllabus of the "Ecole de Conducteur" and was affiliated with the Ministry of Public Works. Enrolment began on 22 August 1911 [7].

Map 2.1 The Istanbul Technical School

Nafia Fen Mektebi/ The School of Public Works (1922-1937): The school's name was changed to Nafia Fen Mektebi/ School of Public Works in 1922 and the duration of education was increased to 2.5 years in 1926 and 3 years in 1931.

2.2 Historical Advancements in the University

The school was established as an autonomous higher education and research institution with Law no. 1184 of State Engineering and Architectural Academies published on 3 June 1969.

Law no. 1472 ruled for the closing of special vocational schools in 1971, and engineering schools were affiliated with the Istanbul State Engineering and Architectural Academy.

2.2.1 The Yıldız University Period

The Istanbul State Engineering and Architectural Academy and affiliated schools of engineering and the related faculties and departments of the Kocaeli State Engineering and Architecture Academy and the Kocaeli Vocational School were merged to form Yıldız University with decree law no.41 dated 20 June 1982 and Law no. 2809 dated 30 March 1982 which accepted the decree law with changes [4].

The new university incorporated the departments of Science-Literature and Engineering, the Vocational School in Kocaeli, a Science Institute, a Social Sciences Institute and the Foreign Languages, Atatürk Principles and the History of Revolution, Turkish Language, Physical Education and Fine Arts departments affiliated with the Rectorate [8].

2.2.2 The Yıldız Technical University Period

Law no. 3837 dated 3 July 1992 renamed our university Yıldız Technical University. The Engineering Faculty was divided into four faculties and restructured as the Electrical-Electronics, Construction, Mechanical and Chemical-Metallurgy Faculties and also included the Faculty of Economics and Administrative Sciences within its organization. The Kocaeli Faculty of Engineering and the Kocaeli Vocational School were released from our university to be restructured as Kocaeli University. Today our university has 9 Faculties [1], 2 Institutes, the Vocational School of Higher Education, the Vocational School for National Palaces and Historical Buildings, the Vocational School for Foreign Languages and more than 20,000 students [9].

2.2.2.1 Mission

Our mission is to create a university which pioneers education, scientific research, technological development and artistic work aimed at the progress of society and the increase of the quality of life within an understanding of national and international solidarity; and educates creative, enterprising, questioning and ethical students equipped with universal values, who constantly renew themselves, aim for lifelong learning and are capable of analysis and synthesis.

---

[1]2 of these faculties are located at Yildiz Campus, and the other ones are located at Davutpaşa Campus

Figure 2.2 Side view of Graduate School of Natural and Applied Sciences, Yıldız Technical University, Çukursaray, İstanbul [10]

$$\Delta l = h \Delta \theta \tag{2.1}$$

$$\frac{\Delta l}{\Delta t} = h \frac{\Delta \theta}{\Delta t} \tag{2.2}$$

$$\lim_{\Delta t \to 0} \frac{\Delta l}{\Delta t} = \lim_{\Delta t \to 0} h \frac{\Delta \theta}{\Delta t} \tag{2.3}$$

$$\lim_{\Delta t \to 0} \frac{\Delta l}{\Delta t} = \frac{dI}{dt} \tag{2.4}$$

3
Erasmus

ERASMUS is the EU's flagship education and training program enabling 200 000 students to study and work abroad each year. In addition, it funds co-operation between higher education institutions across Europe. The program supports not only students, but also professors and business staffs who want to teach abroad, as well as helping university staff to receive training.

ERASMUS seeks to enhance the quality and reinforce the European dimension of higher education by encouraging transnational cooperation between universities, boo-sting European mobility and improving the transparency and full academic recognition of studies and qualifications throughout the Union.

ERASMUS consists of many different activities; student and teacher exchanges, joint development of study program (Curriculum Development), international intensive programs, thematic networks between departments and faculties across Europe, language courses (EILC), European credit transfer system (ECTS) [11].

ERASMUS action is targeted at higher education institutions and their students and staff in all 27 Member States of the European Union, the three countries of the European Economic Area (Iceland, Liechtenstein and Norway), and Turkey.

3.1 National Agency

Currently 2199 higher education institutions in 31 countries are participating in Erasmus. Since the creation of Erasmus in 1987, 1.2 million students have benefited from an Erasmus study period abroad. The Erasmus budget for the year 2004 is more than € 187.5 million.

Generally, National Agencies are founded in the participatory countries so as to utilize EU Education and Youth programs by organizing and coordinating activities in cooperation with the relevant parties. National Agency, a part of State Planning

Agency, is responsible for the coordination of the European Union Education Programs in Turkey.

3.2 About YTU

Yıldız Technical University is one of the seven government universities situated in İstanbul besides being the 3rd oldest university of Turkey with its history dating back to 1911.It is regarded as one of the best universities in the country as well. Our university has 10 Facuties, 2 Institutes, the Vocational School of Higher Education, the Vocational School for National Palaces and Historical Buildings, the Vocational School for Foreign Languages and more than 25,000 students [9]. As YTU our mission is to create a university which pioneers education, scientific research, technological development and artistic work aimed at the progress of society and the increase of the quality of life within an understanding of national and international solidarity

3.3 Application Procedure

You are expected to attach the following documents to the online application module.

- Application form

- Learning agreement

- Dormitory request form

- Signed documents

- ID Card

3.4 Money Exchange

The most convenient way to get money in Turkey is by using your home bank ATM/ cash card or a credit card in a Turkish ATM/ bancomat/ cash machine [8].

But if you want to exchange cash, plenty of places will do it for you. Currency Exchange Offices are found in tourist and market areas. They offer better exchange rates than most banks, and may or may not charge a commission. Offices in market areas tend to offer better exchange rates than those in tourist areas. Shop around for the best rate and the lowest (or no) commission.

Table 3.1 Erasmus country codes for different national agencies according to the type of the countries

No.	National Agencies	Erasmus Code	ISO Code	NA Identifier	Type of Country
1	Austria	A	AT	AT	EU
2	Belgium (Flemish speaking)	B	BE	BEFL	EU
3	Belgium (French speaking)	B	BE	BEFR	EU
4	Bulgaria	BG	BG	BG	Candidate
5	Czech Republic	CZ	CZ	CZ	EU
6	Cyprus	CY	CY	CY	EU
7	Denmark	DK	DK	DK	EU
8	Estonia	EE	EE	EE	EU
9	Germany	D	DE	DE	EU
10	Spain	E	ES	ES	EU
11	Finland	SF	FI	FI	EU
12	France	F	FR	FR	EU
13	Greece	G	GR	GR	EU
14	Hungary	HU	HU	HU	EU
15	Iceland	IS	IS	IS	EEA
16	Ireland	IRL	IE	IE	EU
17	Italy	I	IT	IT	EU
18	Latvia	LV	LV	LV	EU
19	Liechtenstein	FL	LI	LI	EEA
20	Lithuania	LT	LT	LT	EU
21	Luxembourg	LUX	LU	LU	EU
22	Malta	MT	MT	MT	EU
23	Netherlands	NL	NL	NL	EU
24	Norway	N	NO	NO	EEA
25	Poland	PL	PL	PL	EU
26	Portugal	P	PT	PT	EU
27	Romania	RO	RO	RO	Candidate
28	Slovak Republic	SK	SK	SK	EU
29	Slovenia	SI	SI	SI	EU
30	Sweden	S	SE	SE	EU

3.5   After a Car Accident

The following is a step-by-step guide on what to do if you are involved in a traffic accident in Turkey. From 1 April 2008 it is no longer necessary to call the police to the

Table 3.2 Area codes for different subjects

Area Code	Subject
1	Agricultural sciences
2	Culture
3	Economics
4	Technology
5	Horticulture
6	Fisheries
7	Forestry
8	Animal
9	Tropical Agriculture
10	Others

scene of an accident in the following circumstances:[2]

- When - the accident involves two or more vehicles

- Where there is only material damage to vehicles

- When no one is injured or killed

Where all concerned parties agree to the cause and who is liable for the accident and providing each driver completes the correct form and all parties involved sign each form, including witnesses if any.

You should then submit the form to your insurance company who will use the form in conjunction with the other insurance companies concerned to settle liability. (For more details about how to access the form and instructions how to complete the form, please look at the end of this document.) [3]

If agreement cannot be reached, you should immediately call 155 for Traffic Police assistance and follow the guide below: Do Not Move Your Vehicle from the point of impact unless invited to do so by the traffic police or gendarme.

It is not advisable to accept an offer of financial settlement from the other parties involved. Wait for the police to arrive. Once the police arrive, you will be breathalyses and asked to produce your driving license and logbook. A preliminary report of the accident will be compiled by the police at the scene of the accident. Only when this report has been made, should you move your vehicle. It can take half an hour for the police to arrive at the scene of an accident. Do not move your vehicle.

It is essential to obtain the result of the breathalyzer test and the official police report

in order to make a successful insurance claim. You will be asked to collect this within three days from the District Police Station.

This leaflet has been prepared by the British Embassy in Ankara for the convenience of enquirers. Although all care has not been taken in its production, neither Her Majesty's Government nor any Consular Official in the British Embassy in Ankara takes any responsibility for its precise accuracy or for the consequences of any action taken in accordance with its contents [12].

4
Results And Discussion

Once you have opened this page you will either have to log in if you are already registered, or register if this is your first visit to this page. When you first register, an e-mail will be automatically sent to you confirming your registration and giving you your password. Once you have logged in you will be able to access the registration form, and you should enter all their details.

Please note that when you have entered your university code and the name of your department, only information which is relevant to your university and department, and which is covered by the relevant bilateral agreement will be displayed.

When you have completed the form, you will find at the bottom of the page a button called 'Attach Files'. This provides a link to where you can attach your completed university application form and Learning Agreement. If you have any special conditions or modifications to the Learning Agreement, you have to contact with your relevant departmental coordinator.

When you are finished, click 'Save' and then 'Send', in order the forms to be sent to this office. Once we have your completed forms we can pass them on to your coordinator here in Yıldız Technical University. Please note that The EU Office cannot make any changes to their form once it has been submitted. Once an understanding has been reached by the coordinators about their application, a Letter of Invitation will be prepared and sent to you.

A
Erasmus Policy

Yıldız Technical University is a major public comprehensive teaching and research university with high aspirations. It has devoted itself to a leading role in contributing through partnerships to socio-cultural and socioeconomic developments at the international level. It has had three years of experiences of participating in the ERASMUS program and its delivery of student and staff mobility has generally been above the national average for Turkey. We are also interested in the programs of LLP such as Comenius, Grundtvig, Leonardo da Vinci. We are going to consider organizing or participating in IP, CD or Thematic Network in the near future. Within the context of the Erasmus Program2007 – 2013, it is aimed to provide students, faculty and staff with more effective research, teaching, and service. With the Erasmus activities, we try to assess where we stood in the past, where we stand today and where we are going to stand in the future, comparing our current position with our peers. With respect to the objectives of the institutionalization of Erasmus student and staff mobility, we try to make our students and our academic staff benefit educationally, linguistically and culturally from the experience of learning in other European countries. We aim to mobilize 2.5 % of our students and 1.5% of teaching staff, by the year 2011. We will focus on the technical areas and near and new EU countries because of the exchanging our experiences.

A.1   After a Car Accident

The following is a step-by-step guide on what to do if you are involved in a traffic accident in Turkey. From 1 April 2008 it is no longer necessary to call the police to the scene of an accident in the following

B
Erasmus Country Codes

In Table B.1, the area codes for different subjects are listed. The first column of the Table B.1 shows the name of the country and the other columns are for the codes of these countries.

Table B.1 Area codes for different subjects

Country	Code 1	Code 2	Code 3	Code 4
Cyprus	CY	CY	CY	EU
Denmark	DK	DK	DK	EU
Estonia	EE	EE	EE	EU
Germany	D	DE	DE	EU
Spain	E	ES	ES	EU
Finland	SF	FI	FI	EU
France	F	FR	FR	EU
Greece	G	GR	GR	EU
Hungary	HU	HU	HU	EU
Iceland	IS	IS	IS	EEA
Ireland	IRL	IE	IE	EU
Italy	I	IT	IT	EU
Latvia	LV	LV	LV	EU
Liechtenstein	FL	LI	LI	EEA
Slovak Republic	SK	SK	SK	EU
Slovenia	SI	SI	SI	EU
Sweden	S	SE	SE	EU
United Kingdom	UK	UK	UK	EU
Turkey	TR	TR	TR	Candidate
Other	—-	XX	—-	Non-participating country

In Table B.2, the specific countries are illustrated for different codes.

Table B.2 Abbreviations for different countries

Latvia	LV	LV	LV	EU
Liechtenstein	FL	LI	LI	EEA
Lithuania	LT	LT	LT	EU
Luxembourg	LUX	LU	LU	EU
Malta	MT	MT	MT	EU
Netherlands	NL	NL	NL	EU

References

[1] K. N. Rao, "A novel class imbalance learning method using subset filtering," 2012.

[2] H. Guo and H. L. Viktor, "Learning from imbalanced data sets with boosting and data generation: The databoost-im approach," *ACM SIGKDD Explorations Newsletter*, vol. 6, no. 1, pp. 30–39, 2004.

[3] J. Van Hulse, T. M. Khoshgoftaar, and A. Napolitano, "Experimental perspectives on learning from imbalanced data," in *Proceedings of the 24th international conference on Machine learning*, ACM, 2007, pp. 935–942.

Publications From the Thesis

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Papers

1. Paper 1

2. Paper 2

Conference Papers

1. Conference 1

2. Conference 2

Books

1. Book 1

2. Book 2

Projects

1. Project 1

2. Project 2

Awards

1. Award 1

2. Award 2