GENERATIVE AI FOR TRADITIONAL FORM CONVERTER

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A PROJECT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR
THE DEGREE OF BACHELOR OF ENGINEERING (COMPUTER ENGINEERING)
FACULTY OF ENGINEERING
KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI
2024

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A Project Submitted in Partial Fulfillment
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Academic Year	2024

Abstract

In a multihop ad hoc network, the interference among nodes is reduced to maximize the throughput by using a smallest transmission range that still preserve the network connectivity. However, most existing works on transmission range control focus on the connectivity but lack of results on the throughput performance. This paper analyzes the per-node saturated throughput of an IEEE 802.11b multihop ad hoc network with a uniform transmission range. Compared to simulation, our model can accurately predict the per-node throughput. The results show that the maximum achievable per-node throughput can be as low as 11% of the channel capacity in a normal set of α operating parameters independent of node density. However, if the network connectivity is considered, the obtainable throughput will reduce by as many as 43% of the maximum throughput.

Keywords: Multihop ad hoc networks / Topology control / Single-Hop Throughput

หัวข้อปริญญานิพนธ์	หัวข้อปริญญานิพนธ์บรรทัดแรก หัวข้อปริญญานิพนธ์บรรทัดสอง
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ผู้เขียน	นายมอส นายพณศร ศรีสยาม นายโบ๊ท
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บทคัดย่อ

Generative AI for Traditional Form Converter เป็นโครงการที่จัดทำขึ้นผ่านการพัฒนาผ่านเว็บแอปพลิเคชั่นในชื่อ PaperlessTransform Application เพื่อแก้ไขปัญหาการใช้ระยะเวลานานในการแปลงแบบฟอร์มกระดาษเป็นรูปแบบเว็บแอปพลิเคชัน โดยการพัฒนาเว็บแอปพลิเคชันนี้ได้มีการใช้ประยุกต์ใช้ปัญญาประดิษฐ์สำหรับการวิเคราะห์เกี่ยวกับประเภทของข้อมูลของคำถาม ตามความต้องการที่เพิ่มขึ้นของการแปลงแบบฟอร์ม ดังนั้นนักพัฒนาระบบจึงจำเป็นต้องวิเคราะห์แบบฟอร์มและออกแบบระบบฐานข้อมูลพร้อมทั้งการออกแบบหน้าเว็บแอปพลิเคชัน รวมไปถึงการพัฒนาระบบขึ้นมาใหม่ จึงส่งผลให้ต้องใช้ระยะเวลาในการทำงานที่เพิ่มขึ้น นอกจากนี้ นักพัฒนาระบบต้องเผชิญกับปัญหาภาระงานที่มากขึ้น ส่งผลให้บุคคลากรใช้เวลาในการทำงานอย่างไม่มีประสิทธิภาพ โดยโครงการของเรามุ่งเน้นการพัฒนาเว็บแอปพลิเคชันที่สามารถแปลงเอกสารในรูปแบบของฟอร์มกระดาษ หรือ ไฟล์อิเล็กทรอนิกส์ให้เป็นรูปแบบของเว็บแอปพลิเคชัน โดยใช้เทคนิคการรู้จดจำอักขระด้วยแสงในการแปลงภาพข้อความให้เป็นรูปแบบข้อความเพื่อนำข้อความดังกล่าวจากการแปลงภาพข้อความนำมาประมวลผลในการตรวจจับคำถามในรูปแบบฟอร์ม ทางคณะผู้จัดทำโครงการมีการเน้นการพัฒนาเว็บแอปพลิเคชันที่มีความสามารถในการตรวจจับคำถามและความสามารถในการเก็บข้อมูลของเว็บฟอร์ม โดยมีวัตถุประสงค์เพื่อลดภาระของนักพัฒนาระบบ โดยผลลัพธ์หลังจากมีการทดลองใช้เว็บแอปพลิเคชั่นดังกล่าวในการทำงานแสดงให้เห็นว่าเว็บแอปพลิเคชันสามารถตรวจจับคำถามในแบบฟอร์มและเก็บข้อมูลได้ในระดับที่น่าพึ่งพอใจ ดังนั้นสรุปได้ว่าโครงการสามารถแก้ไขปัญหาการใช้ระยะเวลาในการทำงานที่เพิ่มขึ้น ของนักพัฒนาระบบได้อย่างมีนัยสำคัญ

คำสำคัญ: เว็บแอปพลิเคชัน / การรู้จดจำอักขระด้วยแสง / ออกแบบระบบฐานข้อมูล

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Finally, we would like to express our thanks to everyone, including our family, friends, and everyone who has contributed and supported this project. All the support and encouragement have been integral to its successful completion.

CONTENTS

PAGE

LIST OF TABLES

LIST OF FIGURES

FIGURE **PAGE**

LIST OF SYMBOLS

SYMBOL		UNIT
α	Test variable	m^2
λ	Interarival rate	jobs/ second
μ	Service rate	jobs/ second

LIST OF TECHNICAL VOCABULARY AND ABBREVATIONS

ABC	=	Adaptive Bandwidth Control
MANET	=	Mobile Ad Hoc Network
Test	=	Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nullam non condimentum purus. Pellentesque sed augue sapien. In volutpat quis diam laoreet suscipit. Curabitur fringilla sem nisi, at condimentum lectus consequat vitae.

CHAPTER 1 INTRODUCTION

1.1 Problem Statement

In recent years, the world has become more digital than ever from social interactions to business operations, nearly every aspect of life is influenced by digital technology.

This rapid transformation has reshaped the way we communicate, work and access information, making technology an essential part of modern life. As businesses and individuals increasingly rely on digital platforms, the demand of conversion to digital has increasing. One aspect of digital shift is traditional form conversion and the many businesses still store customer information on paper. Nevertheless, it is an ineffective way to store data, particularly private data. Since the analysis of all the forms, including the need to design a basic database after the analysis flow, digital transformation will take a long time, even if the organization decides to improve its data storage. This is because paper-based organizations will inevitably become digital organizations. Additionally, the main issue is that developers spend the majority of their time working with databases and then create a single web page application to replace a paper-based form.

System developers must analyze forms, design database structures, and create user interfaces from scratch for each new form. This results in delays in development and inefficient use of manpower.

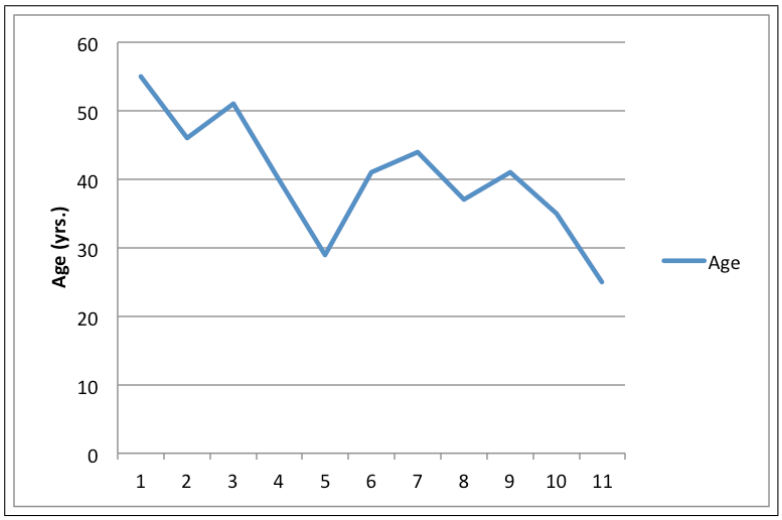

Figure 1.1 This is the figure x1

Get ready, skanks! It's time for the truth train! Fame was like a drug. But what was even more like a drug were the drugs. Attempted murder? Now honestly, what is that? Do they give a Nobel Prize for attempted chemistry?

"Thank the Lord"? That sounded like a prayer. A prayer in a public school. God has no place within these walls, just like facts don't have a place within an organized religion. Thank you, steal again. I hope this has taught you kids a lesson: kids never learn.

…And the fluffy kitten played with that ball of string all through the night. On a lighter note, a Kwik-E-Mart clerk was brutally murdered last night. Oh, so they have Internet on computers now!

You don't like your job, you don't strike. You go in every day and do it really half-assed. That's the American way. Lisa, vampires are make-believe, like elves, gremlins, and Eskimos. Jesus must be spinning in his grave!

I prefer a vehicle that doesn't hurt Mother Earth. It's a go-cart, powered by my own sense of self-satisfaction. Marge, it takes two to lie. One to lie and one to listen. Attempted murder? Now honestly, what is that? Do they give a Nobel Prize for attempted chemistry?

I was saying "Boo-urns." Bart, with $10,000 we'd be millionaires! We could buy all kinds of useful things like…love! I'll keep it short and sweet — Family. Religion. Friendship. These are the three demons you must slay if you wish to succeed in business.

How could you?! Haven't you learned anything from that guy who gives those sermons at church? Captain Whatshisname? We live in a society of laws! Why do you think I took you to all those Police Academy movies? For fun? Well, I didn't hear anybody laughing, did you? Except at that guy who made sound effects. Makes sound effects and laughs. Where was I? Oh yeah! Stay out of my booze. I can't go to juvie. They use guys like me as currency.

Oh, loneliness and cheeseburgers are a dangerous mix. "Thank the Lord"? That sounded like a prayer. A prayer in a public school. God has no place within these walls, just like facts don't have a place within an organized religion.

1.2 Motivations

Explain the motivations of your works.

- What are the problems you are addressing?
- Why they are important?
- What are the limitations of existing approaches?

You may combine this section with the background section.

1.3 Problem Statements

1.4 Objectives

1.5 Scope of Work

Explain the scope of your works.

- What are the problems you are addressing?
- Why they are important?
- What are the limitations of existing approaches?

1.6 Project Schedule

CHAPTER 2 BACKGROUND THEORY AND RELATED WORK

THIS IS AN EXAMPLE. ALL SECTIONS BELOW ARE OPTIONAL. PLEASE CONSULT YOU ADVISOR AND DESIGN YOUR OWN SECTION

หัวข้อต่าง ๆ ในแต่ละบทเป็นเพียงตัวอย่างเท่านั้น หัวข้อที่จะใส่ในแต่ละบทขึ้นอยู่กับโปรเจคของนักศึกษาและอาจารย์ที่ปรึกษา

This is how you add website url. -> http://www.cpe.kmutt.ac.th

Explain theory, algorithms, protocols, or existing research works and tools related to your work.

You can cite your references like this -> [1] or multiplie cite like this -> [2, 3]

2.1 Recommender Systems

Table 2.1 test table method1

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Center	Center	left aligned	Right	Right aligned
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Center	Center	left aligned	Right	Right aligned

Tables should always on the left.

2.2 Text Processing Algorithms

2.2.1 Algorithm I

2.2.1.1 test

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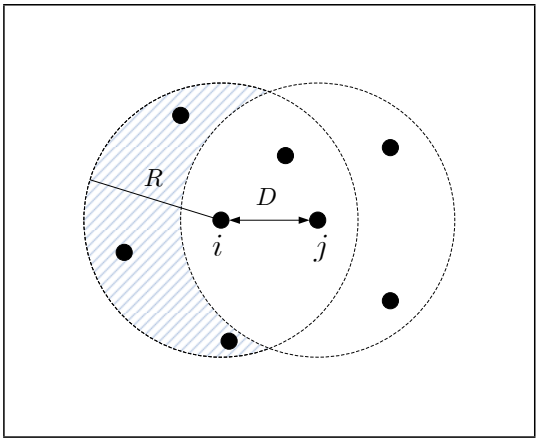

Figure 2.1 The network model

2.2.2 Algorithm II

Add more subsections as you want.

2.2.2.1 Step I

2.2.2.2 Step II

This is the farthest level of subsection we permitted. (We support only 4th level)

2.3 Development Tools

CHAPTER 3 PROPOSED WORK

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หัวข้อต่าง ๆ ในแต่ละบทเป็นเพียงตัวอย่างเท่านั้น หัวข้อที่จะใส่ในแต่ละบทขึ้นอยู่กับโปรเจคของนักศึกษาและอาจารย์ที่ปรึกษา

Explain the design (how you plan to implement your work) of your project. Adjust the section titles below to suit the types of your work. Detailed physical design like circuits and source codes should be placed in the appendix.

3.1 System Architecture

Table 3.1 test table x1

SYMBOL		UNIT
α	Test variable	m^2
λ	Interarrival rate	jobs/ second
μ	Service rate	jobs/ second

3.2 System Specifications and Requirements

3.3 Hardware Module 1

3.3.1 Component 1

3.3.2 Logical Circuit Diagram

3.4 Hardware Module 2

3.4.1 Component 1

3.4.2 Component 2

3.5 Path Finding Algorithm

3.6 Database Design

3.7 GUI Design

CHAPTER 4 IMPLEMENTATION RESULTS

You can title this chapter as **Preliminary Results** or **Work Progress** for the progress reports. Present implementation or experimental results here and discuss them.

ALL SECTIONS IN THIS CHAPTER ARE OPTIONAL. PLEASE CONSULT YOU ADVISOR AND DESIGN YOUR OWN SECTION

หัวข้อต่าง ๆ ในแต่ละบทเป็นเพียงตัวอย่างเท่านั้น หัวข้อที่จะใส่ในแต่ละบทขึ้นอยู่กับโปรเจคของนักศึกษาและอาจารย์ที่ปรึกษา

CHAPTER 5 CONCLUSIONS

Figure 5.1 This is how you mention when figure come from internet https://www.google.com

This chapter is optional for proposal and progress reports but is required for the final report.
THIS IS AN EXAMPLE. ALL SECTIONS BELOW ARE OPTIONAL. PLEASE CONSULT YOU ADVISOR AND DESIGN YOUR OWN SECTION
หัวข้อต่าง ๆ ในแต่ละบทเป็นเพียงตัวอย่างเท่านั้น หัวข้อที่จะใส่ในแต่ละบทขึ้นอยู่กับโปรเจคของนักศึกษาและอาจารย์ที่ปรึกษา

5.1 Problems and Solutions

State your problems and how you fixed them.

5.2 Future Works

What could be done in the future to make your projects better.

REFERENCES

1. P. Santi, 2005, **Topology Control in Wireless Ad Hoc and Sensor Networks**, Wiley, p.133.

2. Ingo Lütkebohle, 2008, "BWorld Robot Control Software ทดสอบ," Available at http://aiweb.techfak.uni-bielefeld.de/content/bworld-robot-control-software-ทดสอบ/, [Online; accessed 19-July-2008].

3. Hypersense, 2020, "Is the virtual celebrity industry still on the rise in 2020? ," Available at https://arvrjourney.com/is-the-virtual-celebrity-industry-still-on-the-rise-in-2020-60cfd2b2c315, [Online; accessed 26-August-2020].

4. I. Norros, 1995, "On the use of Fractional Brownian Motion in the Theory of Connectionless Networks," **IEEE J. Select. Areas Commun.**, vol. 13, no. 6, pp. 953–962, Aug. 1995.

5. H.S. Kim and N.B. Shroff, 2001, "Loss Probability Calculations and Asymptotic Analysis for Finite Buffer Multiplexers," **IEEE/ACM Trans. Networking**, vol. 9, no. 6, pp. 755–768, Dec. 2001.

6. D.Y. Eun and N.B. Shroff, 2001, "A Measurement-Analytic Framework for QoS Estimation Based on the Dominant Time Scale," in **Proc. IEEE INFOCOM'01**, Anchorage, AK, Apr. 2001.

APPENDIX A

FIRST APPENDIX TITLE

Put appropriate topic here

This is where you put hardware circuit diagrams, detailed experimental data in tables or source codes, etc..

Figure A.1 This is the figure x11 https://www.google.com

This appendix describes two static allocation methods for fGn (or fBm) traffic. Here, λ and C are respectively the traffic arrival rate and the service rate per dimensionless time step. Their unit are converted to a physical time unit by multiplying the step size Δ. For a fBm self-similar traffic source, Norros [4] provides its EB as

$$C = \lambda + (\kappa(H)\sqrt{-2\ln\epsilon})^{1/H} a^{1/(2H)} x^{-(1-H)/H} \lambda^{1/(2H)} \tag{A.1}$$

where $\kappa(H) = H^H(1-H)^{(1-H)}$. Simplicity in the calculation is the attractive feature of (A.1).
The MVA technique developed in [5] so far provides the most accurate estimation of the loss probability compared to previous bandwidth allocation techniques according to simulation results. Consider a discrete-time queueing system with constant service rate C and input process λ_n with $\mathbb{E}\{\lambda_n\} = \lambda$ and $\mathrm{Var}\{\lambda_n\} = \sigma^2$. Define $X_n \equiv \sum_{k=1}^{n} \lambda_k - Cn$. The loss probability due to the MVA approach is given by

$$\varepsilon \approx \alpha e^{-m_x/2} \tag{A.2}$$

where

$$m_x = \min_{n\geq 0} \frac{((C-\lambda)n + B)^2}{\mathrm{Var}\{X_n\}} = \frac{((C-\lambda)n^* + B)^2}{\mathrm{Var}\{X_{n^*}\}} \tag{A.3}$$

and

$$\alpha = \frac{1}{\lambda\sqrt{2\pi\sigma^2}} \exp\left(\frac{(C-\lambda)^2}{2\sigma^2}\right) \int_C^\infty (r-C) \exp\left(\frac{(r-\lambda)^2}{2\sigma^2}\right) dr \tag{A.4}$$

For a given ε, we numerically solve for C that satisfies (A.2). Any search algorithm can be used to do the task. Here, the bisection method is used.
Next, we show how $\mathrm{Var}\{X_n\}$ can be determined. Let $C_\lambda(l)$ be the autocovariance function of λ_n. The MVA technique basically approximates the input process λ_n with a Gaussian process, which allows $\mathrm{Var}\{X_n\}$ to be represented by the autocovariance function. In particular, the variance of X_n can be expressed in terms of $C_\lambda(l)$ as

$$\mathrm{Var}\{X_n\} = nC_\lambda(0) + 2\sum_{l=1}^{n-1}(n-l)C_\lambda(l) \tag{A.5}$$

Therefore, $C_\lambda(l)$ must be known in the MVA technique, either by assuming specific traffic models or by off-line analysis in case of traces. In most practical situations, $C_\lambda(l)$ will not be known in advance, and an on-line measurement algorithm developed in [6] is required to jointly determine both n^* and m_x. For fGn traffic, $\mathrm{Var}\{X_n\}$ is equal to $\sigma^2 n^{2H}$, where $\sigma^2 = \mathrm{Var}\{\lambda_n\}$, and we can find the n^* that minimizes (A.3) directly. Although λ can be easily measured, it is not the case for σ^2 and H. Consequently, the MVA technique suffers from the need of prior knowledge traffic parameters.

APPENDIX B

SECOND APPENDIX TITLE

Put appropriate topic here

Figure B.1 This is the figure x11 https://www.google.com

Next, we show how $\mathrm{Var}\{X_n\}$ can be determined. Let $C_\lambda(l)$ be the autocovariance function of λ_n. The MVA technique basically approximates the input process λ_n with a Gaussian process, which allows $\mathrm{Var}\{X_n\}$ to be represented by the autocovariance function. In particular, the variance of X_n can be expressed in terms of $C_\lambda(l)$ as

$$\mathrm{Var}\{X_n\} = nC_\lambda(0) + 2\sum_{l=1}^{n-1}(n-l)C_\lambda(l) \tag{B.1}$$

Add more topic as you need

Therefore, $C_\lambda(l)$ must be known in the MVA technique, either by assuming specific traffic models or by off-line analysis in case of traces. In most practical situations, $C_\lambda(l)$ will not be known in advance, and an on-line measurement algorithm developed in [6] is required to jointly determine both n^* and m_x. For fGn traffic, $\mathrm{Var}\{X_n\}$ is equal to $\sigma^2 n^{2H}$, where $\sigma^2 = \mathrm{Var}\{\lambda_n\}$, and we can find the n^* that minimizes (A.3) directly. Although λ can be easily measured, it is not the case for σ^2 and H. Consequently, the MVA technique suffers from the need of prior knowledge traffic parameters.