Tishk International University

Engineering Faculty

Mechatronics Engineering Department

Lecture 4

Research Methodology

Dissertation

Chapter One: Introduction

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Lecture Outline

- Dissertation Template
  - Arrangement
  - Contents
- How to write Chapter One: Introduction?

Dissertation Template

ARRANGEMENT AND CONTENTS

Arrangement, The contents should be arranged in the following order:

1. COVER & SPINE
2. TITLE PAGE
3. ABSTRACT
4. ACKNOWLEDGEMENTS
5. TABLE OF CONTENTS
6. LIST OF TABLES
7. LIST OF FIGURES
8. LIST OF SYMBOLS/ABBRAVIATIONS/TRANSLATIONS, ETC.
9. BODY OF THE TEXT
10. REFERENCES
11. APPENDICES

Dissertation Template

ARRANGEMENT AND CONTENTS

Contents, Body of the Text:

1.0 CHAPTER ONE: INTRODUCTION

1.1 Synopsis

1.2 Significance and Motivation

1.3 Aims and Objectives

1.4 Methodology

2.0 CHAPTER TWO: RELATED EXISTING SYSTEMS

2.1 Introduction

2.2 The theoretical background

2.3 The previous studies and works

2.4 Summary or (Conclusion)

3.0 CHAPTER THREE: SYSTEM DESIGN (METHODOLOGY)

3.1 Introduction

3.2 Context Diagram

3.3 Data Flow Diagram (if available)

3.4 Summary

4.0 CHAPTER FOUR: SYSTEM IMPLEMENTATION

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4.2 Hardware Requirements

4.3 Software Requirements

4.4 Full System Implementation

4.5 Summary

5.0 CHAPTER FIVE: TEST and EXPEREMNTAL RESULTS

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5.3 Results Evaluation

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6.0 CHAPTER SIX: DISCUSSION, CONCULSION, and FUTURE WORKS

6.1 Introduction

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6.3 Conclusion

6.4 Future Work

REFERNCES

APPENDIX

CHAPTER ONE: INTRODUCTION

1.0 CHAPTER ONE: INTRODUCTION,

1.1 Synopsis or (Preface): The preface expresses simply the idea of the project and its importance, the main reasons for choosing this project and presenting the goals of the project. This may be copied from other references concerned with this subject.

1.2 Significance and Motivation: Here the problems of the project must be explained in general terms easy to understand.

1.3 Aims and Objectives: The goals of the project must be written clearly. There may be some sub goals derived from the original one, besides the main goal.

1.4 Methodology: In this paragraph the scientific methods used in the project must be defined.

How to Write a Thesis or Dissertation Introduction?

- The **introduction** is the first section of your thesis or dissertation, appearing right after the table of contents. Your introduction draws your reader in, setting the stage for your research with a clear focus, purpose, and direction on a relevant topic.
- Your introduction should include:
    1. Your topic, in context: what does your reader need to know to understand your thesis dissertation?
    2. Your focus and scope: what specific aspect of the topic will you address?
    3. The relevance of your research: how does your work fit into existing studies on your topic?
    4. Your questions and objectives: what does your research aim to find out, and how?
    5. An overview of your structure: what does each section contribute to the overall aim?

NOTE: Refer to the following article to check out the quality of your dissertation introduction, How to Write a Thesis or Dissertation Introduction

- **Table of contents:**

Example, Scenario No.1 - (Disinfection Cleaning Robot)

CHAPTE0R ONE TITLE

INTRODUCTION

1.1 Synopsis

After coved-19 pandemic and viruses spreading everywhere sanitizing and disinfecting the work area became a critical matter and procedure for health care hance the reason of most offices is in need of keep working to assist the person in need such as hospitals and health institution while keeping the minimum amount of worker, the disinfecting robot will clean and sanitize with ease and reliably, using the UVC sanitizing LED or mopping features with H_2O_2 for killing the 99.99% including the coved -19 viruses .

1.2 Significance and Motivation

Disinfection cleaning robot is a robot working on sanitizing and deep cleaning while dust collecting, this robot is a smart obstacle avoiding robot using the Lidar to map the room and avoid all object that the robot won't be able to get under it can even clean spots that other human being are be able to clean, which leads to one of the biggest problems in the world which is the speeding deadly viruses among human at home or in hospital or office, this robot will insure that the surface is cleaned for the purpose of not allowing the viruses to spread, most of all cleaning reductive rooms or disgrace viruses studying room since the robot w be at a health risk and can avoid dumping into anything and breaking it

1.3 Aims and Objectives

The aim from this robot is to clean and sanitize and mop the floor all in one while avoiding the obstacle to not break anything and keep the life of the worker in their safety and allowing the robot to places that the janitor can't go to clean such as dangerous viruses room.

1.4 Methodology

The disinfecting cleaning robot has a variety of components the microcontroller will be raspberry pi this will work as the brain of the robot processing all of the code and running full time with great speed collecting information from the lidar sensor to map the room and use the sensor to find the way around all objects in the room to avoid absolutely any obstacle in way, while the robot will be moving a variety of tasks will be done first the collector brush will collect the dust from the sounding of the robot allowing it to cover more area in less time going to vacuum this feature is going to have low noise fast speed fan with special type of blades that when turn will take air in instead of out allowing the dust to be collected, collecting dust will be useful hance to the next feature which is going to be the mopping as the robot goes on the surface of the floor the piece of cloth will be touching the floor and dispensing a liquid to clean and extra sanitize the main idea of this project is the UVC which is going to light up in specific wave length to kill and burn the viruses and clean the floor as intended leaving with 99.99% of viruses and bacteria killed, the movement of the robot will be slow hance the reason the time needed to kill the viruses with UVC light using gearbox motor reducing the speed and increasing the torque and the wireless charging to make it fully automatic

Example, Scenario No.2 - (Snake Robot)

Chapter 1: Introduction

1.1 Introduction:

In the aftermath of natural disasters or man-made incidents, the imperative to swiftly locate and rescue survivors trapped under collapsed buildings is paramount. Traditional search and rescue methodologies often face challenges in navigating confined spaces with limited access. As technology continues to advance, the integration of robotics in disaster response has become increasingly prevalent. Among these technological innovations, snake robots have emerged as a promising solution, offering unique capabilities that prove invaluable in navigating complex and hazardous environments.

This research project focuses on the development and implementation of a snake robot designed specifically for search and rescue operations in the aftermath of building collapses. The robot's serpentine design allows it to traverse through narrow crevices, tight spaces, and debris-laden environments, providing access to areas that would otherwise be inaccessible using conventional methods. By mimicking the locomotion of a snake, the robot demonstrates unparalleled agility and maneuverability, making it an ideal candidate for efficient exploration in challenging terrains.

References to prior research play a pivotal role in substantiating the need for and potential of snake robots in search and rescue scenarios. Recent studies (e.g., [1]) have delved into the design and development of robotic systems tailored for disaster response, showcasing the efficacy of such technologies in improving the efficiency and safety of search and rescue operations. Additionally, the study presented in [2], titled " Snake Robot Urban Search After the 2017 Mexico City Earthquake" sheds light on the application of robotic systems in urban environments, highlighting the critical role they play in enhancing the capabilities of response teams.

Furthermore, the newly released paper [3], "Robotics in Search and Rescue (SAR) Operations: An Ethical and Design Perspective Framework for Response Phase." provides a comprehensive overview of the latest advancements in robotic technologies for disaster response. This paper, which we have incorporated into our research, explores cutting-edge developments that have the potential to significantly impact the field of search and rescue robotics.

In summary, this research project seeks to contribute to the evolving landscape of disaster response robotics, with a particular focus on snake robots. Through a synthesis of recent research findings, we aim to develop a state-of-the-art snake robot that stands at the forefront of technological innovation in search and rescue operations.

1.2 Problem Statement:

The problem is traditional search method is sometimes inefficient & ineffective at locating the people that require recuse in disaster situations because of the complexity of the environment after the disaster such as limited access, and unstable structure. Therefore, there is a need to enhance the current method or create a new efficient solution to increase the effectiveness of search operations.

1.3 Aim:

Our aim is to create a robotic system capable of navigating through the rubble and the uneven terrain that happens form a collapsed building to search and locate the people trapped under it more efficiently and accurately

1.4 Objective:

1. **Enhance Maneuverability in Confined Spaces:**
   Create a snake robot design that can move through complex environment easily, the locomotion of the robot should mimic the snake movement to some extent.

2. **Real-Time Communication and Data Transmission:**
   Implement a communication system that enables the snake robot to transmit real-time data and vital information to the recuse team.

3. **Implement Sensor Fusion for Enhanced Perception:**
   Include multiple sensors such as camera, gyro, gas sensors to enhance the capability of the snake robot to detect the survivors.

4. **Autonomous Navigation and Mapping:**
   Integrate an AI algorithm to make the snake navigate autonomously and to create a map of the environment using the equipped sensors

1.5 Scope:

This project will focus on the development of snake robots to increase the effectiveness of locating the people trapped under collapsed buildings. This research will include the designing process with all the documentation needed to create a similar model.

The outcome of this research is to provide valuable insights for developing a robotic snake so that we can ultimately enhance the response of search operations.

IMPORTANT DATES

TASK	DATE
Proposal	October 2024
Approve it	1st November until 15th November 2024
Chapter 1 Submission for Review (Draft)	23rd November 2024
Chapter 2 Submission for Review (Draft)	7th December 2024
Chapter 3 Submission for Review (Draft)	23rd December 2024
Submission for Plagiarism and AI check for three chapters (Revised)	1st January 2025
CH1, 2 and 3 Final submission	8th or 11th January 2025
Presentation and Oral Examination	9th or 26th January 2025

References

- Introduction to research. (n.d.). *Scribbr*. Retrieved October 24, 2022, from: https://www.scribbr.com/category/methodology/

- McCombes, S., & George, T. (2022, October 12). How to Write a Research Proposal | Examples & Templates. *Scribbr*. Retrieved October 24, 2022, from https://www.scribbr.com/research-process/research-proposal/

- Thiel DV. Research Methods for Engineers. Cambridge University Press; 2014. Retrieved from: Research Methods for Engineers