Tishk International University
Engineering Faculty
Mechatronics Engineering Department
Lecture 5

Research Methodology

Dissertation

Chapter Two: Literature Review

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Lecture Outline

- How to write Chapter Two: Literature Review?

CHAPTER TWO: LITERATURE REVIEW

2.0 CHAPTER TWO: RELATED EXISTING SYSTEMS

Review on the previous studies is very important for evaluating the project work in comparison to the earlier researches. This chapter should contain the most important update information relevant to the project. This review is the cornerstone in the preparation of a high quality graduation project. This chapter includes the following points:

2.1 Introduction: The Introduction is a short essay about the importance and significance of the project, thus giving a motivation for the project.

2.2 The theoretical background: This background covers all the basic principles of the subject matter of the project and the basic procedures used in it.

2.3 The previous studies and works: In this section the previous studies and the applicable works should be mentioned, especially those relevant to the project, mentioning the advantages and disadvantages, and giving clarification for their importance to the project.

2.4 Summary

How to Write a Literature Review | Guide, Examples, & Templates?

- **What is a literature review?** A literature review is a survey of scholarly sources on a specific topic. It provides an overview of current knowledge, allowing you to identify relevant theories, methods, and gaps in the existing research that you can later apply to your paper, thesis, or dissertation topic.

- There are five key steps to writing a literature review:

1. **Search** for relevant literature
2. **Evaluate** sources
3. **Identify** themes, debates, and gaps
4. **Outline** the structure
5. **Write** your literature review

- A good literature review doesn't just summarize sources—it analyzes, synthesizes, and critically evaluates to give a clear picture of the state of knowledge on the subject.

➢ What is the purpose of a literature review?

- ✓ When you write a thesis, dissertation, or research paper, you will likely have to conduct a literature review to situate your research within existing knowledge. The literature review gives you a chance to:
- ✓ Demonstrate your familiarity with the topic and its scholarly context
- ✓ Develop a theoretical framework and methodology for your research
- ✓ Position your work in relation to other researchers and theorists
- ✓ Show how your research addresses a gap or contributes to a debate
- ✓ Evaluate the current state of research and demonstrate your knowledge of the scholarly debates around your topic.

➢ Examples of literature reviews,

Writing literature reviews can be quite challenging! A good starting point could be to look at some examples, depending on what kind of literature review you'd like to write.

- ✓ **Example literature review #1:**
  - "Why Do People Migrate? A Review of the Theoretical Literature" (**Theoretical** literature review about the development of economic migration theory from the 1950s to today.)
- ✓ **Example literature review #2:**
  - "Literature review as a research methodology: An overview and guidelines" (**Methodological** literature review about interdisciplinary knowledge acquisition and production.)
- ✓ **Example literature review #3:**
  - "The Use of Technology in English Language Learning: A Literature Review" (**Thematic** literature review about the effects of technology on language acquisition.)
- ✓ **Example literature review #4:**
  - "Learners' Listening Comprehension Difficulties in English Language Learning: A Literature Review" (**Chronological** literature review about how the concept of listening skills has changed over time.)

STEP 1 – Search for relevant literature,

- Topic,
  - Before you begin searching for literature, you need a clearly defined topic. If you are writing the literature review section of a dissertation or research paper, you will search for literature related to your research problem and questions.
- Make a list of keywords,
  - Start by creating a list of keywords related to your research question. Include each of the key concepts or variables you're interested in, and list any synonyms and related terms. You can add to this list as you discover new keywords in the process of your literature search.
  - Keywords example: (Robotic, Fluid Filling Line, Manufacture / Social media, Facebook, Instagram / Generation Z, teenagers, adolescents, youth)
- Search for relevant sources,
  - Use your keywords to begin searching for sources. Some useful databases to search for journals and articles include: (Your university's library catalogue, Google Scholar, Inspec, Elsevier … etc for (physics, engineering and computer science).
  - You can also use boolean operators to help narrow down your search.
- Make sure to read the abstract,
  - to find out whether an article is relevant to your question. When you find a useful book or article, you can check the bibliography to find other relevant sources.

Step 2 – Evaluate and select sources,

- You likely won't be able to read absolutely everything that has been written on your topic, so it will be necessary to evaluate which sources are most relevant to your research question.
- For each publication, ask yourself:
  - ✓What question or problem is the author addressing?
  - ✓What are the key concepts and how are they defined?
  - ✓What are the key theories, models, and methods?
  - ✓Does the research use established frameworks or take an innovative approach?
  - ✓What are the results and conclusions of the study?
  - ✓How does the publication relate to other literature in the field? Does it confirm, add to, or challenge established knowledge?
  - ✓What are the strengths and weaknesses of the research?
- Make sure the sources you use are credible, and make sure you read any landmark studies and major theories in your field of research
- You can use the following table to summarize and evaluate sources you're thinking about using:

Source Information	Research Objective	Problem or gap addressed	Findings and Conclusions	Limitations or weaknesses	Implications or Suggestions future research	How your research can fill the gap
Lahijan Branch (2016) - URL	Development of effective learning strategies	EFL teachers focus on the wrong language skills	EFL teachers can only help students once their learning difficulties have been identified	Evaluated sources are possibly outdated	Teachers should use different strategies for students with different needs	Look into the most effect EFL teaching method and ways to differentiate

- ✓ Take notes and cite your sources
- ✓ As you read, you should also begin the writing process. Take notes that you can later incorporate in to the text of your literature review.
- ✓ It is important to keep track of your sources with citations to avoid plagiarism. It can be helpful to make an annotated bibliography, where you compile full citation information and write a paragraph of summary and analysis for each source. This helps you remember what you read and saves time later in the process.

Step 3 – Identify themes, debates, and gaps,

- To begin organizing your literature review's argument and structure, be sure you understand the connections and relationships between the sources you've read. Based on your reading and notes, you can look for:
  - ✓ Trends and patterns (in theory, method or results): do certain approaches become more or less popular over time?
  - ✓ Themes: what questions or concepts recur across the literature?
  - ✓ Debates, conflicts and contradictions: where do sources disagree?
  - ✓ Pivotal publications: are there any influential theories or studies that changed the direction of the field?
  - ✓ Gaps: what is missing from the literature? Are there weaknesses that need to be addressed?

Step 4 – Outline your literature review's structure,

There are various approaches to organizing the body of a literature review. Depending on the length of your literature review, you can combine several of these strategies (for example, your overall structure might be thematic, but each theme is discussed chronologically).

1. Chronological
   - ✓ The simplest approach is to trace the development of the topic over time. However, if you choose this strategy, be careful to avoid simply listing and summarizing sources in order.
   - ✓ Try to analyze patterns, turning points and key debates that have shaped the direction of the field. Give your interpretation of how and why certain developments occurred.
2. Thematic
   - ✓ If you have found some recurring central themes, you can organize your literature review into subsections that address different aspects of the topic.
   - ✓ For example, if you are reviewing literature about inequalities in migrant health outcomes, key themes might include healthcare policy, language barriers, cultural attitudes, legal status, and economic access.
3. Methodological
   - ✓ If you draw your sources from different disciplines or fields that use a variety of research methods, you might want to compare the results and conclusions that emerge from different approaches. For example:
   - ✓ Look at what results have emerged in qualitative versus quantitative research
   - ✓ Discuss how the topic has been approached by empirical versus theoretical scholarship
   - ✓ Divide the literature into sociological, historical, and cultural sources
4. Theoretical
   - ✓ A literature review is often the foundation for a theoretical framework. You can use it to discuss various theories, models, and definitions of key concepts.
   - ✓ You might argue for the relevance of a specific theoretical approach, or combine various theoretical concepts to create a framework for your research.

Step 5 – Write your literature review,

Like any other academic text, your literature review should have an introduction, a main body, and a conclusion. What you include in each depends on the objective of your literature review.

- Introduction**:** The introduction should clearly establish the focus and purpose of the literature review.
- Body**:**
  - Depending on the length of your literature review, you might want to divide the body into subsections. You can use a subheading for each theme, time period, or methodological approach.
  - As you write, you can follow these tips:
    - ✓ Summarize and synthesize: give an overview of the main points of each source and combine them into a coherent whole
    - ✓ Analyze and interpret: don't just paraphrase other researchers—add your own interpretations where possible, discussing the significance of findings in relation to the literature as a whole
    - ✓ Critically evaluate: mention the strengths and weaknesses of your sources
    - ✓ Write in well-structured paragraphs: use transition words and topic sentences to draw connections, comparisons and contrasts
- Conclusion**:** In the conclusion, you should summarize the key findings you have taken from the literature and emphasize their significance.

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

CHAPTER TWO

LITERATURE REVIEW

2.1 introduction: -

In making the disinfection cleaning robot, a variety of sensors and components were able to be used depending on the location and job that the robot is meant to do, in this chapter is introducing an over view about what is it used for and how is it used and the years before how it was made depending the applications, so cleaning robot just vacuum some just mop some just disinfect but with this project the robot will be smart enough to do all of those applications at once in sequence.

2.2 the theoretical background: -

As known cleaning is need every day and is essential of life, depending on the materials used for making this robot this robot can be put anywhere at any building or a room, using a microcontroller (raspberry pi, Arduino, PLC or FPGA …etc) and sensors (lidar, IR sensor …etc) to provide with best results.

2.3 the previous studies and works: -

Previously a lot of researchers and company tried to design and implement such as (Vijayalakshmi, 2022) designed a smart vacuuming robot to automize the human task and help through the day, using Arduino uno as a microcontroller and a set of 4 ultra-sonics as direction detecting sensors this project is a working on two DC motors and have a free wheel this features gives the microcontroller full control on how and which direction it needs to go, using a special type of a fan this robot had the ability of cleaning dust from the floor, another smart project by (Khan, 2013) developing and designing mopping robot instead of vacuuming the researcher a mopping functionality which adds a new prospective for the robot as before the project used a Arduino uno microcontroller to prosses and manage the software work, using ultra-sonic sensors gave the ability of automatic for the robot hance the robot will have notice of any wall or object coming by to stop and change direction, introducing new component which was the water DC motors which gave the ability to spread the water evenly along the mop for it to not be so wet not so dry, after that a new concept was found recently which the researcher (Wadibhasme, 2020) talks about sanitising robot this robot can kill the microscopic bacteria and viruses keeping a air/floor or any surface that is touched by UVC led that has an rang of "nm" that can kill the microscopic species that are harmful using Arduino uno to control the software processing and code , and use of ultra-sonic to understand where the robot is and how the robot can define a wall or an object

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

Table 1 reference table

Source Information	Research Objective	Problem or gap addressed	Findings and Conclusions	Limitations or weaknesses	Implications or Suggestions future research	How your research can fill the gap
M. Vijayalakshmi (2022) - URL	Smart Vacuum Robot	Doesn't cover all the area of the room	Arduino uno and Ultrasonic sensor and laptop fan	Room mapping And recharging This robot is un-efficient to clean the room	Developer should use better equipment to implement better use	Adding Lidar sensor and using raspberry
Apeksha Wadibhasme (2020) - URL	SANITIZATION ROBOT	UVC light is exposed to human which is harmful	Arduino uno and ultrasonics and UVC light	Design and implementation The robot will harm human cell	Hiding the UVC light rods	Using UVC led stripes to clean floor too
Md Raisuddin Khan (2013) - URL	Design and Development of Mopping Robot	The mopping roller collect dust and over time become muddy	Arduino uno and ultrasonics and dc water motor	Better way to clean and dust Makes the floor muddy	Need to remove dust before using	Use vacuum to clean the dust before mopping
Wael Abdulmajeed 2022 - URL	Implementing Autonomous Navigation Robot for building 2D Map of Indoor Environment	This robot uses wall follower to map the room	Arduino uno and sonar and wall follower	Can only map and not walk in straight lines to cover all room	Need bigger range to cover	Adding the virtual line creator to map and follow them
Sookhyun Yang 2020 - URL	Cliff-sensor-based Low-level Obstacle Detection for a Wheeled Robot in an Indoor Environment	this robot use cliff sensor to over step unwanted obstacles which will lead it to fall	Advanced manufactured microcontroller and cliff sensor with motor driver	Can only detect high ground and not low ground so it may fall	Need to add cliff lower detector	Adding 3 AR sensor for stopping UV light and avoid obstacle
Anglin Li 2022 - URL	Wireless Charger Design of Robot Vacuum Cleaners with Power Repeaters for High Compatibility	This robot use coil in side of the robot body which is curved and may be un-efficient	RX and TX wireless and primary and secondary compensation	Can only charge from the side and not from underneath may be a problem	Need to add more space for RX in case of misplace	Should add the wireless charging coil under neath all of the parts
KAPIL KUMAR 2020 - URL	IOT BASED AUTONOMOUS FLOOR CLEANING ROBOT	The robot uses close range Wi-Fi and low energy Bluetooth	Arduino Nano and Ultrasonic sensor and Node MCU	Can only be used from close range	Need to add better WIFI connecting from far places	Use raspberry pi for better using of IOT features
Carlos Garcia-Saura 2015 - URL	Self-calibration of a differential wheeled robot using only a gyroscope and a distance sensor	This robot cannot go in straight line	Arduino MEGA and gas sensing capabilities and gyroscope	Can only go in random direction	Need a lidar to drive in straight line while taking data	Should add AR sensor and lidar
Nagesh M S 2018 - URL	Multipurpose cleaning robot	Can't recharge and may fall of stairs and will clean randomly	Arduino uno and ultrasonic and motor drive circuit	Can be used in 1 floor and cleaning un efficient	Need AR sensor to not fall and SLAM to clean more efficient	Adding more AR sensor and adding UVC for sanitizing
Yuda Irawan 2021 - URL	Automatic Floor Cleaning Robot Using Arduino and Ultrasonic Sensor	Can only mop the room and can't go in straight lines and un efficient way for water dispensing	Arduino uno and L298 and dc motor and servo and ultra-sonic	Can't be used in many fields and make the floor muddy	Needs to add a vacuum and AR sensor	Should add lidar and recharging for the battry and IOT tech

Example, Scenario No.2 - (Snake Robot)

Chapter 2: Literature Review

2.1 Introduction:

In the pursuit of enhancing search and rescue operations, especially in the challenging and life-threatening scenarios presented by collapsed buildings, the integration of innovative technologies becomes imperative. This chapter delves into the existing body of knowledge surrounding snake robots and their application in locating survivors within the intricate and perilous environments created by structural failures.

The use of snake robots in urban search and rescue missions has gained significant attention due to their unique ability to navigate through confined spaces and access areas that are difficult for traditional robots or human rescuers to reach. As the demand for more efficient and effective search and rescue methodologies increases, exploring the advancements, challenges, and successes in the realm of snake robot technology becomes crucial.

This literature review aims to provide a comprehensive overview of the key developments in snake robot design, control algorithms, and sensing technologies relevant to the task of finding survivors under collapsed buildings. By synthesizing existing research, we aim to identify gaps in the current understanding, potential areas for improvement, and the most promising avenues for the further development and application of snake robots in urban search and rescue operations.

As we embark on this exploration of the literature, the objective is to lay a solid foundation for understanding the state-of-the-art in snake robot technology, paving the way for the subsequent chapters that will focus on the design, implementation, and evaluation of a snake robot system tailored specifically for the challenging task of locating survivors in the aftermath of structural disasters.

2.2 Theoretical Background:

This section will provide a theoretical background by reviewing existing literature review to determine the challenges that might arise in the aftermath of structural failure such as collapsed buildings

These challenges include:

1. **Search and Rescue Challenges:**

   Theoretical Factors such as:

   - Complex terrain
   - Limited access to the area
   - Hazards environment

   These factors sometimes make the traditional method in insufficient.

2. **Biomimicry and Snake Robot Design:**

   The Theoretical research suggest that robot should have flexible movement that mimics the motion of a snake so that it could move irregular terrain.

3. **Sensing Technologies for Disaster Environments:**

   Theoretical debates suggest that the robot should at least be equipped with a camera model and gas detection, these sensors will help the recuse team to determine the difficulty and danger of the operation.

Example, Scenario No.2 - (Snake Robot)

Ref.	Controller Or Processor	Actuation	Power	Type of movement	Sensors	Wheels	Application
[4]	Raspberry Pi	Hybrid actuation of rigid propulsions and soft joints.	visco-hyperelastic mechanical energy of the soft material & battery	All types of motion (sidewinding, rectilinear, rotational, Lateral undulation, Lateral rolling Flapping locomotion)	Inertial measurement unit (IMU Pressure sensor)	no	serves as a versatile tool for exploration and investigation, navigating both above and below ground levels.
[5]	Raspberry Pi Module 4	Soft	Air compressor	All types of motion	Camera Radiation spectrometer	no	Navigating uneven landscapes or areas that are typically difficult to access, including locations with radioactive elements.
[6]	Spartan 3AN Stick Board	Servo motors DC Motor	battery	All types of motion	Ultrasonic Sensor	yes	Primarily focused on detecting and eliminating obstacles within the pipeline.
[7]	Computer with USB communication convertor (U2D2, Dynamixel)	Servo motors	12v power supply	All types of motion	strain gauges, optics, switches, piezo-resistive pressure sensor	Both with wheels and without wheels.	Adaptable system for navigating diverse environments in essential applications.
[8]	Computer with USB communication convertor (U2D2, Dynamixel)	Dynamixel AX-12 servo motor	12v power supply	sidewinding and rectilinear	IMU and GPS	no	versatility in a wide variety of terrains that conventional robots cannot access.
[9]	ATMEL AT 89S52	DC motors	battery	rectilinear locomotion	IR sensor	no	Space applications Urban Search and Rescue Inspection
[10]	Custom Robot Operating System (ROS) With Ubuntu OS & Arduino mega	Dynamixel XM430-W350-R servo motors	External power supply	sidewinding and rectilinear	3-axis force/torque sensor online camera and a power sensor	yes	Exploration and retrieval, Industrial examination, Ecological surveillance, Extraterrestrial investigation
[11]	Matsuoka CPG system & ESP32 module	Soft joints with rigid body	Lithium-polymer battery	sidewinding and rectilinear	Camera for QR codes detection and movement correction	no	To acquire knowledge about flexible snake-like movement, a study will be conducted using a Central Pattern Generator (CPG) network that replicates the central nervous system of real snakes.

References

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