

Article Title

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Abstract

Purpose – Clearly state the main objective of your research.

Design/methodology/approach – Briefly describe your methodology.

Findings – Highlight the main findings.

Originality/value – State the novelty and contribution of your research.

Keywords Keyword 1, Keyword 2, Keyword 3, Keyword 4, Keyword 5

Paper Type XYZ paper

1. Introduction

The Introduction section should establish the context and importance of your research, identify gaps in existing knowledge, explain your approach, and highlight your contributions. Emerald and Industrial Robot do not impose a strict layout as standard, but if you are in doubt about how to structure it, you can follow these recommendations.

The first paragraph can start with a statement establishing the importance of your research domain within robotics or industrial automation and outline the broader problem or challenge in this field that your research addresses.

The second paragraph summarizes the current state of knowledge and existing approaches to the problem and identifies specific limitations, contradictions, or gaps in the existing literature.

In the third paragraph, you can explain how your research addresses the identified gap or limitations and provide a brief overview of your methodology, experimental setup, or theoretical framework.

In the final fourth paragraph, you can summarize your key findings and their implications while explicitly stating how your work advances knowledge in the field.

You can use an optional fifth paragraph where the outline of the paper is presented, and you can provide a roadmap of the paper's structure to guide readers.

2. Literature Review

When writing your literature review:

- Begin with a brief overview of the scope and organization

The current issue and full text archive of this journal is available on Emerald Insight at: <https://www.emerald.com/insight/XXXX-XXXX.htm>



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of your review.

- Group related studies under meaningful subsections to create a logical narrative.
- For each work you discuss, concisely summarize its approach, findings, and limitations.
- Critically evaluate the strengths and weaknesses of different approaches.
- Highlight contradictions, inconsistencies, or gaps in the existing literature.
- Demonstrate how your research relates to or addresses these limitations.
- Conclude by synthesizing the key themes and establishing the foundation for your own work.

2.1 First Topic Area in Literature

1. Use clear, descriptive headings that reflect the specific aspect of research being discussed.
2. Begin each subsection with a topic sentence that introduces the theme.
3. Organize content logically, moving from general to specific, or from established to emerging approaches.
4. Maintain a critical perspective throughout, evaluating rather than just describing prior work.
5. End each subsection with a brief synthesis that connects to your research.

2.2 Second Topic Area in Literature

2.2.1 Specialized Subtopic of Second Area

3. Methodology

This section should provide sufficient detail to allow other researchers to fully understand and reproduce your work. Clearly and systematically describe your experimental setup, data collection procedures, and analysis methods.

For technical papers, include detailed descriptions of system architectures, algorithms, and implementations, ensuring that all methods are justified and reproducible. Where appro-

appropriate, organize this section into logical subsections for clarity and flow.

Consider including the following subsections:

- **System Architecture or Experimental Design:** Provide an overview of the structure and design of your system or experiment, highlighting the components and their interactions.
- **Data Collection Procedures or Simulation Parameters:** Describe how data was collected or simulated, including any tools, devices, or configurations used. Specify the conditions under which the experiments were conducted.
- **Implementation Details and Parameter Settings:** Include relevant technical details such as algorithms, hardware/software configurations, and parameter values. Provide enough information to enable others to replicate your setup.
- **Evaluation Metrics and Analytical Approaches:** Clearly define the metrics used to evaluate performance and describe the analytical methods applied to interpret the results.

To ensure clarity, support your descriptions with diagrams, tables, and equations where necessary, and reference them appropriately. This section should be written with the goal of enabling reproducibility and transparency in your research.

3.1 System Architecture

The **System Architecture** section should clearly describe the overall structure and components of your system or experimental setup. This section serves to provide readers with a comprehensive understanding of how your system is designed, how its components interact, and how it addresses the research objectives. Here is a proposed structure to ensure this section is detailed, organized, and informative:

1. Overview of the System

Begin with a brief overview of the system or experimental setup. Provide context for why the architecture was designed in its specific form and how it supports your research goals. Highlight the primary purpose of the system or experiment.

2. Key Components

Describe the major components of your system in detail. Break down the architecture into logical subsystems or modules (e.g., sensing, processing, control). For each component, explain:

- Its function within the system.
- The technologies, hardware, or software used (e.g., sensors, algorithms, tools).
- Why this component is necessary for achieving the system's objectives.

3. Interconnections and Workflow

Explain how the components interact and share information. Include a discussion of the data flow or processing pipeline, emphasizing the relationships between modules. Describe any key dependencies or constraints between components.

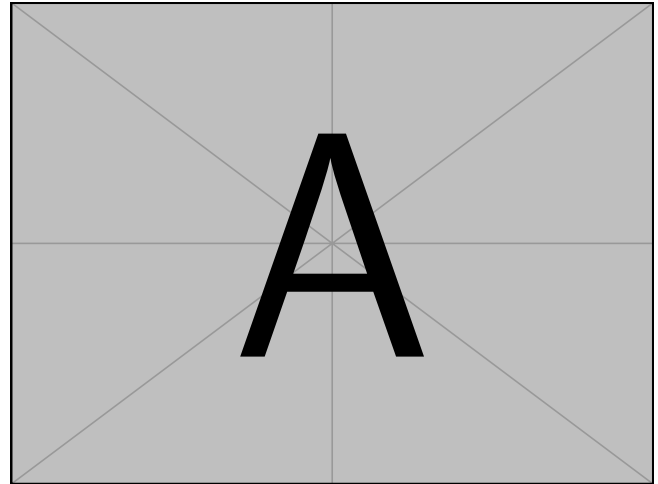


Figure 1: System Architecture with Key Components and Data Flow. This figure illustrates the overall system architecture, highlighting the major components and their interactions. **Source:** Author's own work.

4. Figures and Diagrams

Use figures, diagrams, or flowcharts to visually illustrate the architecture and its components. Ensure that your figure includes:

- Labelled components.
- Arrows or annotations to show data flow or interactions.
- A clear and concise caption explaining the figure. Reference the figure in the text (e.g., "Figure 1 illustrates the overall system architecture.").

5. Design Decisions

Justify the design choices made during the development of the system. For example:

- Explain why specific hardware or algorithms were selected (e.g., cost, performance benefits, scalability).
- Highlight any trade-offs made (e.g., between accuracy and processing speed).
- Discuss how the design aligns with your research objectives and the challenges it addresses.

6. Scalability and Adaptability (Optional)

If relevant, include a discussion of how the architecture might be adapted or scaled to tackle other problems or environments. Mention any modularity or flexibility built into the design.

4. Mathematical Formulations

For displayed equations with auto-generated numbers, you can use the equation and/or align environments.

The following is an example of a norm-based constraint equation:

$$\|\mathbf{X}(k)\|^2 \leq \frac{\sum_{i=1}^p \|\mathbf{Y}_i(k)\|^2 + \sum_{j=1}^q \|\mathbf{Z}_j(k)\|^2}{p+q} \quad (1)$$

The terms are explained in the following set of equations describing system dynamics:

$$\begin{aligned} \dot{\mathbf{x}}(t) &= \mathbf{A}\mathbf{x}(t) + \mathbf{B}\mathbf{u}(t) \\ \mathbf{y}(t) &= \mathbf{C}\mathbf{x}(t) + \mathbf{D}\mathbf{u}(t) \end{aligned} \quad (2)$$

Notice the use of `\nonumber` in the align environment at the end of each line, except the last, so as not to produce equation numbers on lines where no equation numbers are required. The `\label{}` command should only be used at the last line of an align environment where `\nonumber` is not used.

An example of a convergence equation for optimization is shown below:

$$J_\infty = \left(\frac{m}{\text{kg}}\right)^{-2} \left[1 + \frac{\ln(m/\text{kg})}{10} + \frac{\ln(c_1/2)}{10}\right] \quad (3)$$

The class file also supports the use of `\mathbb{R}` and `\mathcal{R}` commands. As such, `\mathbb{R}` and `\mathcal{R}` produce \mathbb{R} and \mathcal{R} respectively.

An example of a simple resource allocation equation is as follows:

$$R_i = \alpha \frac{1}{D_i^2} + \beta V_i + \gamma P_i \quad (4)$$

For multiple aligned equations, the align environment is used:

$$\dot{\mathbf{q}} = \mathbf{J}(\mathbf{q})\mathbf{v} \quad (5)$$

$$\mathbf{F} = \mathbf{J}^\top(\mathbf{q})\boldsymbol{\tau} \quad (6)$$

The following is an example of a transfer function, often used in control systems:

$$H(s) = \frac{b_0 + b_1s^{-1} + \dots + b_ms^{-m}}{1 + a_1s^{-1} + \dots + a_ns^{-n}} \quad (7)$$

For matrix equations, commonly used in robotics, the Jacobian matrix representation is as follows:

$$\begin{bmatrix} \dot{x} \\ \dot{y} \\ \dot{z} \end{bmatrix} = \begin{bmatrix} J_{11} & J_{12} & J_{13} \\ J_{21} & J_{22} & J_{23} \\ J_{31} & J_{32} & J_{33} \end{bmatrix} \begin{bmatrix} \omega_x \\ \omega_y \\ \omega_z \end{bmatrix} \quad (8)$$

5. Experiments

This section is critical for explaining your experimental design and validating the results of your research. It should include detailed, structured subsections to guide readers through your methodology and its reproducibility. This section must be transparent and provide enough detail for other researchers to replicate your work.

5.1 Experimental Setup

The experimental setup should provide an overview of the environment or system used to conduct the experiments. Clearly describe the hardware, software, and configuration parameters. For example, Table I summarizes key experimental variables such as lighting, obstacle density, and movement speed.

Table I: Experimental Conditions

Variable	Levels	Description
Lighting	3	Bright, Medium, Low
Obstacle Density	3	Sparse, Moderate, Dense
Movement Speed	3	Slow, Medium, Fast

Source: Author's own work.

Ensure that the setup description aligns with the goals of your study. For example, if your study involves testing the navigation capabilities of a robot, include details about the sensors, controllers, and environmental configurations used. For simulation-based studies, describe the software framework (e.g., ROS, Gazebo) and parameter settings in detail. Use diagrams or flowcharts if necessary to illustrate the experimental setup.

5.2 Validation and Benchmarks

Validation and benchmarks are essential to establish the credibility of your results. Describe the baseline methods or benchmarks used for comparison. Clearly articulate the metrics used to measure performance, such as accuracy, speed, efficiency, or robustness. Include a detailed explanation of why these benchmarks are relevant to your research objectives.

For example, to validate a robotic navigation algorithm, you might measure the path efficiency (ratio of actual to optimal path length), obstacle avoidance success rate, and computational cost. Be sure to explain how each metric is calculated and why it is significant for your study.

5.3 Data Collection

Data collection methods should be described in detail to ensure reproducibility. Specify the types of data recorded (e.g., position, velocity, power consumption), the tools or sensors used, and the frequency of data collection. Mention any preprocessing steps applied to the data, such as filtering or normalization.

5.4 Figures and Tables

Figures and tables play a crucial role in presenting experimental results. Use single-column tables for concise data presentation, as shown in Table I. For more complex setups or workflows, consider using full-page figures. For example, Figure 2 could illustrate the experimental environment, including key components and configurations in a full-page format.

All tables and figures should be properly labelled and referenced in the text. Ensure that captions are descriptive and

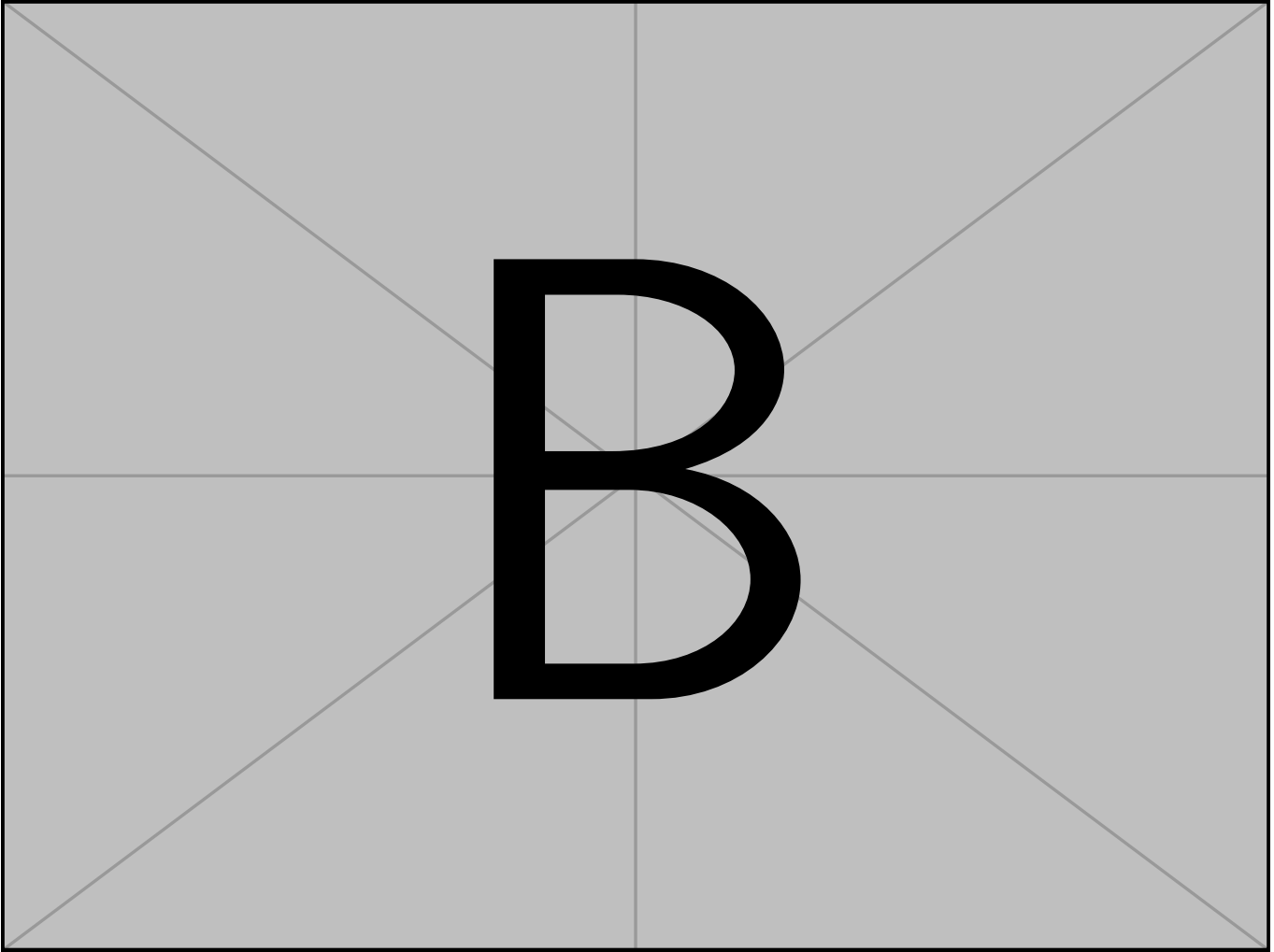


Figure 2: Experimental Setup: A robotic manipulator equipped with sensors and cameras in a controlled environment. The figure shows varying obstacle densities and lighting conditions used in the experiments. **Source:** Author's own work.

provide enough context for readers to understand the content without referring to the main text.

6. Results

The **Results** section presents findings objectively, without interpretation, and uses advanced formatting to accommodate more complex data presentation. This section demonstrates how to use full-page subfigures and tables with merged cells, both of which are common in academic papers for presenting detailed results concisely.

6.1 Performance Across Scenarios

Performance results across different scenarios are presented in Figure 3. The full-page figure consists of four subfigures, each potentially illustrating a key aspect of system performance, such as accuracy trends (Fig. 3a), processing time (Fig. 3b), task completion rates (Fig. 3c), and success rates under varying obstacle densities and lighting conditions (Fig. 3d).

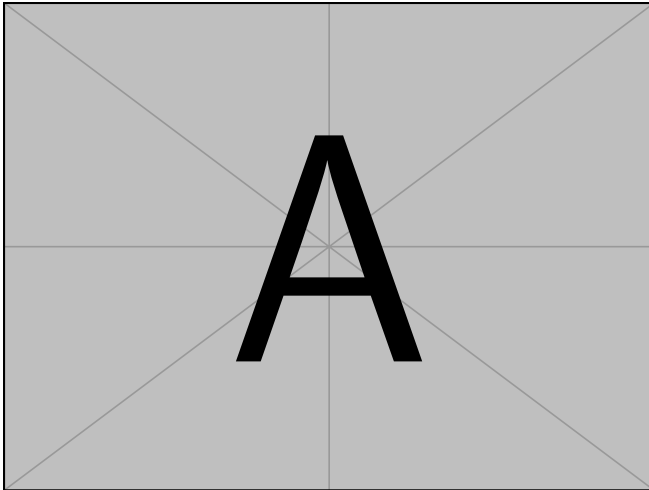
The use of subfigures enables a side-by-side comparison

of different performance metrics, providing a comprehensive view of the system's capabilities under various conditions. Each subfigure should be labeled and referenced in the text, ensuring clarity and readability.

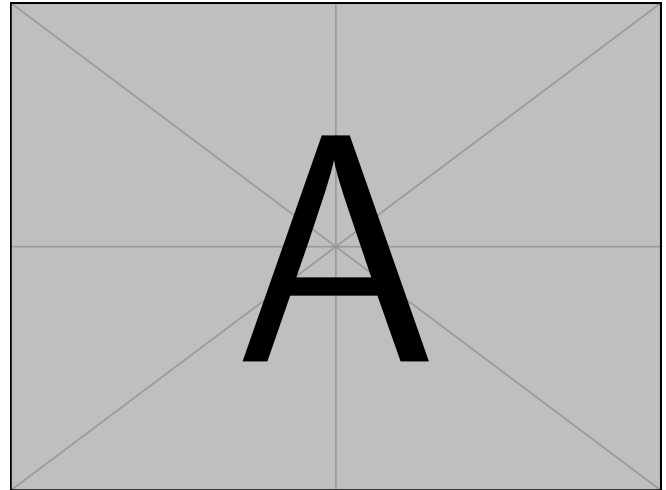
6.2 Detailed Comparison of Conditions

Table II provides a detailed comparison of hypothetical motion tests under varying conditions by grouping similar categories using merged cells. This format is ideal for presenting hierarchical or grouped data in a compact and visually organized manner.

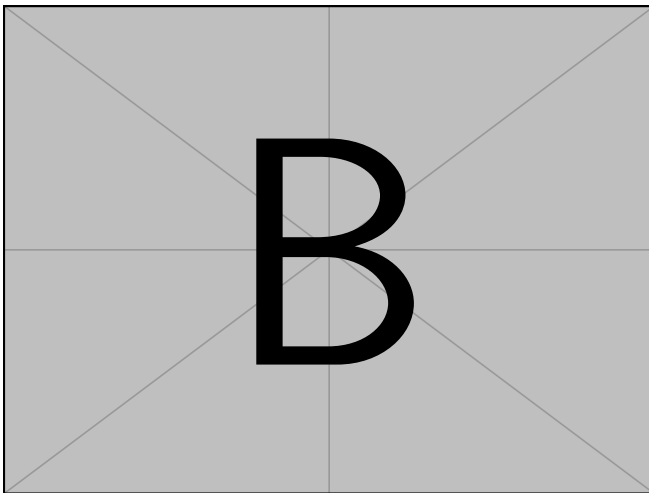
Table II uses merged cells effectively to group performance metrics across two distinct motion test types: "Plane Motion Test" and "Symmetric Motion Test." This approach organizes the data for clear comparisons of metrics such as X, Y, and Z axis measurements, as well as overall score and accuracy (Acc %). Each row represents a distinct point in the experiment, and the table provides a comprehensive view of the system's performance under varying conditions.



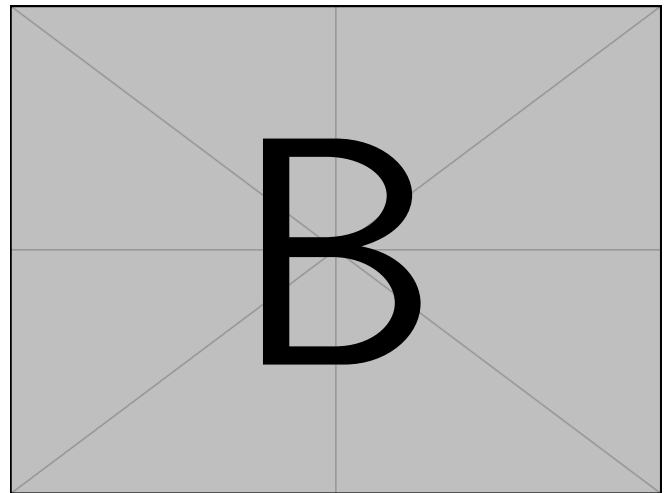
(a) Accuracy Trends Across Scenarios



(b) Processing Time for Different Conditions



(c) Task Completion Rates



(d) Obstacle Avoidance Success Rates

Figure 3: Performance Metrics Across Different Scenarios. Each subfigure highlights a specific performance metric for the proposed system under varying environmental conditions. **Source:** Author's own work.

Table II: Results of Performance Evaluation Under Different Motion Tests

Points	Plane Motion Test			Symmetric Motion Test			Score	Acc (%)
	X axis	Y axis	Z axis	X axis	Y axis	Z axis		
1	501.6	161.8	375.7	-527.6	-466.6	698.8	86.9	96.5
2	472.1	133.7	366.1	-517.3	-475.3	689.9	98.8	95.0
3	452.6	118.2	361.8	-472.6	-484.9	666.6	95.8	98.4
4	422.8	93.0	358.6	-290.0	-446.9	654.6	87.7	96.9
5	390.1	44.8	346.4	-222.3	-388.3	681.4	71.4	98.9
6	353.7	-12.9	314.0	-180.4	-347.8	725.4	62.8	97.1
7	315.2	-77.7	282.6	-161.4	-329.5	757.6	84.1	95.1
8	291.2	-147.9	242.5	-155.4	-316.9	792.3	97.6	98.4

Source: Author's own work

In Table II, the use of merged cells ensures that related metrics (e.g., X, Y, Z axes for each test type) are grouped visually, making the table easier to interpret. This format is particularly useful for studies involving multiple performance dimensions, as it presents data in a compact and structured way.

7. Discussion

The **Discussion** section interprets the results of your study and places them within the broader context of your research field. This section aims to explain the significance of your findings, address limitations, and discuss their implications for theory and practice. Some suggestions are given to ensure a concise, focused, and effective discussion.

Interpretation of Key Findings. Begin by summarizing the most important results presented in the **Results** section and explaining their meaning. Avoid restating the results; instead, provide insights into why they occurred and what they imply. Focus on trends and patterns rather than isolated data points, and explain how these findings align with or deviate from expectations.

Comparison to Existing Literature Relate your findings to previous studies, highlighting areas of agreement, contradiction, or extension. For example: *The superior obstacle avoidance performance of the proposed system aligns with the findings of [Author et al., 20XX], who reported similar improvements using advanced sensor integration* or *In contrast, the slight increase in completion time under dense obstacle conditions diverges from the results of [Another Author et al., 20XX], potentially due to differences in environmental complexity or algorithmic constraints.*

Explicitly compare your results to key studies from your literature review to strengthen the relevance and credibility of your findings.

Addressing Unexpected Results If unexpected or contradictory results were observed, discuss possible explanations and their implications: Acknowledge uncertainties and propose future investigations to clarify these findings. Avoid introducing new results in this section. Focus on interpreting and contextualizing the results already presented in the **Results** section.

Limitations of the Study Recognize the limitations of your study and their potential impact on the interpretation of your results. Some examples:

- *Sample Size: The experiments were conducted on a limited number of scenarios, which may restrict the generalizability of the findings.*
- *Environmental Constraints: The controlled testing environment may not fully replicate real-world conditions, limiting the applicability of the results.*
- *Computational Resources: The hardware and software configurations used in this study may influence performance metrics, and results may vary on different systems.*

By transparently addressing any limitations, you provide a balanced and credible discussion.

Practical Applications IR journal focuses heavily on the real-world implementations of research in robotics so here you could discuss the potential real-world applications of your findings.

8. Conclusion

The Conclusion section should provide a concise summary of your key findings, emphasizing their significance to the field. Avoid repeating the **Results** section verbatim; instead, synthesize the main outcomes and their implications. Highlight the theoretical contributions of your work, such as advancing models or frameworks, as well as its practical applications in relevant domains. This ensures readers understand the value of your research and how it addresses the problem or gap identified in the introduction.

In addition, outline specific recommendations for future research, linking them to the limitations or open questions in your study. Propose actionable directions, such as testing in more diverse environments, optimizing methodologies, or exploring additional applications. Conclude with a strong statement that underscores the broader impact of your work and its potential to drive progress in the field, leaving readers with a clear impression of its importance.

9. Appendices

Appendices contain supplementary material that would disrupt the flow of the main text but provides valuable details to interested readers. They are normally placed after the conclusions and before the references. References are always the last part of the paper.

9.1 When to Use Appendices

Include appendices when you have:

1. Mathematical proofs or derivations that are too lengthy for the main text.
2. Additional experimental results or data tables that support but are not central to your main findings.
3. Technical details of protocols, algorithms, or procedures that would interrupt the flow of the Methods section.
4. Extensive code snippets or implementation details.
5. Questionnaires, interview protocols, or other research instruments.
6. Supporting figures or alternative analyses that enhance but are not essential to the narrative.

Always refer to your appendices from the main text to guide readers to this supplementary material when relevant e.g., "See Appendix A for the acronyms."

A. List of Acronyms

Technical papers often use specialized acronyms. Creating a dedicated list helps readers understand your terminology and notation. Introduce each acronym at its first occurrence in the text by writing out the full term followed by the acronym in parentheses. Once introduced, use only the acronym in subsequent mentions. Finally, include all acronyms in an alphabetical list such as the one in Table III.

Table III: List of Acronyms

Acronym	Definition
AI	Artificial Intelligence
CNN	Convolutional Neural Network
DOF	Degrees of Freedom
IoT	Internet of Things
LSTM	Long Short-Term Memory
MIMO	Multiple-Input Multiple-Output
PID	Proportional-Integral-Derivative
SLAM	Simultaneous Localization and Mapping
UAV	Unmanned Aerial Vehicle

B. List of Symbols

For papers with substantial mathematical content, a list of symbols improves readability. Organize symbols logically, for example, by category or alphabetically within categories:

Table IV: List of Mathematical Symbols

Symbol	Unit	Description
<i>System Variables</i>		
x, y, z	m	Cartesian coordinates in world frame
α, β, γ	rad	Rotation angles around principal axes
v	m/s	Linear velocity magnitude
ω	rad/s	Angular velocity magnitude
<i>Control Parameters</i>		
K_p	–	Proportional gain constant
K_i	–	Integral gain constant
K_d	–	Derivative gain constant
τ	s	Time constant
<i>Performance Metrics</i>		
ε	varies	Error measure
σ^2	varies	Variance of measurement
ρ	–	Correlation coefficient
η	%	Efficiency measure

C. Algorithms, Program codes and Listings

In case you wish to show your algorithm or program code, packages `algorithm`, `algorithmicx` and `algpseudocode` are used for setting algorithms in L^AT_EX using the format:

```
\begin{algorithm}
\caption{<alg-caption>}\label{<alg-label>}
\begin{algorithmic}[1]
. . .
\end{algorithmic}
\end{algorithm}
```

You may refer above listed package documentations for more

details before setting algorithm environment. For program codes, the “verbatim” package is required and the command to be used is `\begin{verbatim} ... \end{verbatim}`.

Similarly, for listings, use the `listings` package. `\begin{lstlisting} ... \end{lstlisting}` is used to set environments similar to `verbatim` environment. Refer to the `lstlisting` package documentation for more details.

A fast exponentiation procedure:

```
begin
  for i:=1 to 10 step 1 do
    expt(2,i);
    newline() od
where
proc expt(x,n) ≡
  z:=1;
  do if n=0 then exit fi;
  do if odd(n) then exit fi;
  comment: This is a comment statement;
  n:=n/2; x:=x*x od;
  { n > 0 };
  n:=n-1; z:=z*x od;
  print(z).
end
```

Algorithm 1 Calculate $y = x^n$

Require: $n \geq 0 \vee x \neq 0$

Ensure: $y = x^n$

```
1:  $y \leftarrow 1$ 
2: if  $n < 0$  then
3:    $X \leftarrow 1/x$ 
4:    $N \leftarrow -n$ 
5: else
6:    $X \leftarrow x$ 
7:    $N \leftarrow n$ 
8: end if
9: while  $N \neq 0$  do
10:  if  $N$  is even then
11:     $X \leftarrow X \times X$ 
12:     $N \leftarrow N/2$ 
13:  else[ $N$  is odd]
14:     $y \leftarrow y \times X$ 
15:     $N \leftarrow N - 1$ 
16:  end if
17: end while
```

```
for i:=maxint to 0 do
begin
{ do nothing }
end;
Write('Case-insensitive-');
Write('Python-keywords-');
```

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