

University of Pennsylvania

Electrical & Systems Engineering Undergraduate Laboratories

ESE 112: Introduction to Electrical & Systems Engineering

Lab 6: Technical Writing, Information Retrieval and Evaluation

Objective

Students will

- Understand the basic structure of a published survey paper, as demonstrated by the ability to map the contents of the Abstract onto the contents of the paper, and to answer specific questions about the structure of the paper.
- Write a well-structured paper comparing the ability of EduBot with that of another robot to perform a specific task, and proposing modifications to EduBot to allow it to have the capability of the other robot.
- Use authoritative published resources to find information relevant to the topic.

Background

This lab will involve reading a published paper, finding and using other information sources, and writing a paper. This section presents material to help you with these three tasks.

A: Description of survey papers

B: Guidelines for writing papers

C: Guidelines for evaluating sources of information.

A. Survey Papers: Organization and Content

Not all published papers are research papers. **Research papers** describe specific work (research, experimentation, or development of theory) done by the author or authors. **Survey papers** (also called **review** papers) summarize the current state of work in a particular field. While experts find survey papers useful for keeping up on their field, such papers are particularly useful for those who are not experts. This is because they provide an overview of the main issues, results, and open questions in that field.

A survey paper, like a research paper, may be written by an expert in the field, or by a relative novice in the field. (How can you determine the authority of the author of a survey paper, or of any paper?)

A **research paper** usually consists of the following sections, in this order:

- **Abstract:** a general summary of the paper
- **Introduction:** background information, and the motivation for this study
- **Materials and Methods:** exactly what was done in this study
- **Results:** outcome of the process detailed in Materials and Methods
- **Discussion:** a detailed analysis of the results. This section might include conclusions, or a separate **Conclusions** section might put the results in a larger context.

Readers hardly ever sit down with a paper and read it from beginning to end, straight through. A reader might read the Abstract, flip to the Discussion to learn more about the results, and then decide whether or not to read the entire paper.

A **survey paper** differs from a research paper in that no new results are being presented for the first time. For this reason, there is no Materials and Methods section in a survey paper. The paper will have an Abstract, and it may have a section called Introduction. However, the rest of the paper will be an overview of the topic, perhaps organized historically, perhaps organized by different treatments of the problems connected with the topic.

Both research papers and survey papers begin with an Abstract. Readers expect the Abstract of a paper to summarize the main points of the paper in 200 words or less. A simple way to see the difference between a survey paper and a research paper is to note the differences between the Abstracts. The chart below summarizes these differences.

Each of the following items will get one or two sentences in the Abstract:

Abstract: Research Paper	Abstract: Survey Paper
Summary of Introduction: Statement of broad problem/background (usually without citations) (In some journals, this part of the Abstract is missing.)	
Scientific hypothesis or goal of this experiment stated in general terms (Full treatment usually concludes the Introduction)	Focus on an issue related to the broad topic. Issue stated in general terms.
Summary of Methods: Specific numbers if it's possible to state them briefly	Statement of how this paper addresses the issue: Survey of relevant experiments and results? Summary of what is known in the field?
Summary of Results: Specific data if possible, with some analysis	
Summary of Discussion: Hypothesis/hypotheses proven? Disproven? Generalizations?	Statement of how the paper concludes: Summary of issues, suggestions for further research.

Other parts of a survey paper. The survey paper, like the research paper, begins with an **Introduction** detailing the broad problem. The Introduction contains background information, and the motivation for the current study or analysis (or experiment, in the case of a research paper). Frequently, the Introduction ends with an explicit description of how the rest of the paper is organized. Introductions always contain frequent citations of other sources.

After the Introduction, the structure of a survey paper diverges from that of a research paper. Survey papers do the following:

- Give enough background so that those learning about the field can get started.
- Contain frequent citations of other work throughout the paper, not just in the Introduction
- Summarize knowledge and trends in the field
- Critique results (results of the author(s), or of other researchers)
- Suggest avenues for future research: problems to solve, gaps in the knowledge to fill, ways to extend results to other materials or applications.

How to use a survey paper. The survey paper is particularly useful to a novice in the field, because it provides a foundation for further research and experimentation. Even an old survey paper can be useful in helping a person understand how a field has developed.

Make good use of a survey paper, not just by carefully reading the paper itself, but by following the links provided by the sources cited in the paper. Make note of any open questions mentioned in the paper, and see if those questions have been answered in later work. Keep track of open questions that might guide your own research.

As you read the paper, note important terms if they are new or unusual. If these terms are not defined, but seem to be commonly used in this field, look them up.

Reading to improve your writing. A skillful writer carefully chooses words and grammatical structure to guide the reader through what may be difficult material. For example, the skillful writer keeps in mind that the reader does not necessarily see the logical connections between sentences within a section. The writer takes pains to make sure that these connections are clear. Whenever you read a paper, take note of ways that the authors enable you to follow the logic of the paper, so you can employ the same techniques in your own writing. If you find that you can't follow the logic of a paper, ask yourself whether the difficulty is the technical content, or the quality of the writing. If the style of writing puts a heavy burden on the reader, note what could have been done to make the reading easier.

B. Writing guidelines for research papers and formal reports

- 1. Choose a logical order in which to present your information.** Clearly indicate the relationship of one idea to another by careful choice of logical connectors.
- 2. Carefully word your discussion to indicate the degree of certainty of your results or your interpretation of them.** This does not mean you should hedge your bets by inserting

“I think” or “In my opinion” in front of assertions. On the other hand, don’t make statements you can’t support.

3. **Accurately and appropriately cite sources in your text.** Each citation must be linked to an item in the List of References at the end of the article (or in your case, in the Appendix to your Lab Report).
4. **Use *we/our* sparingly.** However, this does not mean you need to resort to awkward or unclear use of the passive. Choose an active-voice subject other than *I/we* as in these examples:
 - **The data** show a statistically significant increase
 - **This analysis** indicates a need for....
 - **These data** agree....

Passive allows focus on processes and is appropriate in these examples:

- Significant levels of disease were seen in the cells from Source 1...
- In insects, the front legs are used both for locomotion rather than for carrying objects.

We/our may be the most efficient way to refer to the agent:

- [By] concurrently examining fragile site expression in smokers, nonsmokers, and nonsmoking SCLC patients, **we were able to** demonstrate two significant points.
- **Our findings confirm earlier studies** that compared smokers with nonsmokers...
(Possible rewording: *These findings confirm earlier studies....*)

5. **Make sure your sentence structure is clear.** Avoid leading the reader astray with misplaced modifiers, or introductory modifying phrases that don’t modify what the reader expects them to, like this one:

- After recording the images, they were digitized and transferred to a computer for evaluation....

This sentence momentarily misleads the reader, who expects that the understood subject (*we*) of the modifying phrase will be the same as the subject of the sentence. However, the subject of the sentence is *they*. The following improved sentence keeps the focus on the images and the process, while avoiding the confusion of the first sentence:

- After the images were recorded, they were digitized and transferred to a computer for evaluation....

The following example makes the reader go back to reinterpret the sentence:

- A legged robot is less prone to tip over and more reliable.

By simply adding ‘is’ to the second part of the sentence, we can correct the problem and keep the reader from having to back-track:

- A legged robot is less prone to tip over and is more reliable.

6. Don't use redundant or confusing terms or constructions. An example of redundant wording is the use of 'such as' and 'etc.' (or even worse, 'and etc.')

in the same sentence. *Et cetera* (etc.) should also be avoided if the reader has no way of finishing the list, as in this example:

- The developments made so far in the study of legged robots have dealt mostly with the issues of leg co-ordination, gait control, stability, incorporation of various types of sensors, etc.

Acronyms (expressions consisting only of the first letters of words, such as CIA or VIP) are frequently confusing to the reader. Even if you've identified the acronym somewhere in Section 2, the reader may have forgotten what those letters stood for by Section 3. Reduce use of acronyms to a minimum. Provide a table of important acronyms used.

Avoid writing sentences which can be misinterpreted, such as this one:

- Our lab works with biologically-inspired robots more than their lab.

C. Evaluating Sources of Information

You are required to use authoritative sources for this lab. For the purpose of this assignment, we are going to define authoritative resources as follows:

- Written by scholars or researchers in the field or discipline. Please consider their credentials including educational degrees, occupation/position, and record of other publications in this field.
- Contains references to sources in the form of citations.
- Published in a peer-reviewed journal or a conference sponsored by a scientific organization or society. Peer-review means that experts reviewed the content for accuracy and significance in order for it to be accepted for publication. . If you would like to know whether a journal is peer-reviewed, you can check [Ulrich's Periodicals Index](http://www.ulrichsweb.com/ulrichsweb/) (<http://www.ulrichsweb.com/ulrichsweb/>). Peer-reviewed journals will include an icon that looks like a referee's jersey. This information may also be available on the journal's website under "About" or "Instructions to authors."

OR

- Published in a reference work compiled by an expert or group of experts. Please consider the author/editor's credentials including educational degrees, occupation/position, and record of other publications in this field.

CRITERIA for evaluating sources

- i. Authority/credentials
 1. Who is the author?
 2. What are her/his credentials?
 3. Does s/he have sufficient authority to speak on the subject?
 4. Is there an organizational or corporate sponsor?
- ii. Reliability/Accuracy/Validity
 1. Are the authors up-front about their purpose and content?
 2. Do the authors support their assertions/conclusions and avoid questionable assumptions?
 3. Are there citations and/or a reference list?
 4. Can you verify the information you've located by finding it in other sources?
- iii. Currency
 1. Does the document clearly state its date of publication?
 2. Is the document current enough to include relevant material?
- iv. Objectivity/Bias – How can we tell if it is biased?
 1. Does the work promote a product or service?
 2. Is the bias explicit or hidden?
 3. Does the identity of the author or sponsor suggest a bias?
 4. How does the bias impact the usefulness of the information?
 5. Does the author use strong or emotional language that might suggest a bias?
- v. Relevance
 1. Does the work address your research question?
 2. Is the work at the level of scholarship you require?
 3. Is the work the correct type and format?

STRATEGIES for evaluating sources

- i. Compare
- ii. Corroborate
- iii. Verify
 1. Are there any strange discrepancies/outliers among your sources?
 2. Do the facts from one source check out in another?

Material

Please consult the ESE 112 Library Course Guide at:

<http://gethelp.library.upenn.edu/guides/engineering/ESE112/ese112.html>

It contains a list of resources and instructions to use for the following tasks:

- Prelab questions
- Literature review section of the report
- APA citation style for your reference list

Prelab

Read the paper, **Legged roots – an overview**. Submit typed answers to the following questions.

1. Find two concepts or technical terms which you are not familiar with. Use a scientific dictionary or encyclopedia to discover the meaning of these terms. List the definitions, as well as the source of your information. (See the course website for guidance in accessing a scientific dictionary or encyclopedia.)
2. Using the Web of Science (Science Citation Index) database, find a paper that cites this paper and provide a full citation.
3. The Abstract of the paper outlines what the paper will cover. Does the paper in fact cover this information? Note where in the paper (section heading, page) you found each item of information.
4. The authors of this paper are not native speakers of English, and in some places their usage is unclear or nonstandard. Identify two unclear passages and (if possible) rewrite them to increase clarity. If you can't interpret a passage because of language use, explain the problem.
5. Compare characteristics of bipedal and quadruped robots.

Lab Instructions

Write a well-structured paper comparing the ability of EduBot with that of another robot to perform a specific task, and proposing modifications to EduBot to allow it to have the capability of the other robot.

Literature Review: You have been asked to compare the abilities of EduBot with those of other robots. Before you write the paper, you'll need to choose a topic, and conduct background research. Using one or more of the resources listed on the ESE 112 Library Course Guide (<http://gethelp.library.upenn.edu/guides/engineering/ESE112/ese112.html>) locate two papers that discuss the relevant ability/abilities of other robot(s). At least one paper must be from a peer-reviewed journal. The information you gather from these two sources should be appropriately incorporated in your paper through quotation, paraphrasing or reference. The sources should be cited both in-text and in a reference list at the end of the paper.

Follow the **Writing Guidelines** given in the Background section of this lab description. Divide your paper into the following sections:

Abstract (200 words or less) Provide a general summary of the paper. Review the norms for Abstracts laid out in the Background section of this lab description.

Introduction (1/2 to 1 page) In the Introduction, include a broad introduction to the problem you plan to address. Discuss the motivation for targeting the specific robot capability you've chosen to analyze.

Background (1 – 2 pages) Give a brief description of the two robots (EduBot and the one you choose for comparison) with regard to the capability you have chosen to target. Justify your reasoning. For example, imagine that you are comparing EduBot and another robot on their ability to swim. You won't check EduBot's ability to swim by throwing one in a pool. However, you probably could argue convincingly that it can't swim. You would need to support your argument with specific detail about the robot and the task.

Note: You have some direct experience with EduBot. However, you may not know whether the capability you've chosen has been developed in EduBot. Also, you may not have any direct experience with the other robot you are discussing. This is where you need to conduct research to learn more.

Proposed modifications (1 – 2 pages) Begin this section by stating what modifications would be necessary for EduBot to have the capability you've targeted. Detail the proposed modifications, as well as your proposed method of testing them. State the algorithms you propose to use to help prove your hypothesis that the modifications will actually produce the desired result. Carefully describe and justify any assumption(s) you make and describe the function of any sensors/modification you may be adding to the robot. In this section diagrams, pictures, block diagrams etc are helpful to convey your ideas. This is really the meat of this assignment and should be logical and detailed.

Conclusions (1/2 page) Possible items to include here are a discussion of the viability of the changes you've proposed, and a comment on the value of modifying EduBot to have the capability you've targeted.

Annotated Reference List: List your sources at the end of the paper using APA style. **In addition,** for each source, please provide a brief evaluation using the criteria presented in the Background section of this lab manual.