Module E: Thesis Abstracts

Abstracts can be divided into two types: ***"Informative"*** or ***"Indicative"*** abstracts. *Informative* abstracts focus on providing the results of the research and describing the conclusions that can be drawn from these results. In contrast, *indicative* abstracts do not supply specific results but rather aim to provide the reader with brief summaries (1-2 sentences) of each of the four sections of the research report (i.e., *Introduction, Methods, Results, Discussion*).

INFORMATIVE ABSTRACTS

ABSTRACT 1:

[1]Hypertext is an effective way of organizing and presenting data or text for information retrieval. [2]Computer-based hypermedia tools have been successfully employed for training purposes. [3]However, the manufacturing industry still continues to rely heavily on paper versions of technical manuals for trouble shooting, maintenance, and calibration tasks. [4]**This paper compares** the effectiveness of a computer-based hypermedia tool against a paper version of the same manual **to assist** operators in a local manufacturing industry to perform complex maintenance and calibration tasks. [5]**The results of the study indicate that** 1) the performance of the subjects were superior while using the hypertext based manual; 2) the hypertext system **can be used for** training even those subjects with minimal computer knowledge; and 3) hypertext systems **can be considered an effective** training delivery system.

AIMS

CONCLUSIONS

Thomas T. Koshy, Anand K. Gramopadhye, William J. Kennedy and N. V. Ramu. Application of hypertext technology to assist maintenance on the shop floor. *Computers & Industrial Engineering*, 20(2), (1996).

Although most abstracts, should aim to be ***informative*** (i.e., express the main results), this is often not possible in research reports concentrating on theoretical topics. In such cases, writers are more likely to take an ***indicative*** approach.

INDICATIVE ABSTRACTS

ABSTRACT 2:

[1]Various studies in inspection have demonstrated the usefulness of feedforward and feedback in improving performance. [2]However, these studies have looked at the search and decision making components separately. [3]Hence, it is difficult to draw generalized conclusions on the effects of feedforward and feedback for inspection tasks that have both search and decision making components. [4]In response to this need, **this study evaluates** the individual and collective effect of feedforward and feedback on an inspection task that has both the search and decision-making components. [5]**For this purpose, the study used** a computer-simulated inspection task generated by the VisIns program. [6]Twenty-four subjects, **randomly assigned** to various conditions, performed an inspection task wherein the feedforward and the feedback conditions **were manipulated** between subjects. [7]Defect probability and the number of defects **were** also **manipulated** within subjects. [8]Subsequently, the search and decision-making performances **were analyzed** and **interpreted**.

AIMS

PROCEDURES

Thaker, J. *Effects of Feedback and Feedforward on Overall Inspection Performance*. Master's thesis. Clemson University, Department of Industrial Engineering. (1999).

STRUCTURING YOUR ABSTRACT

The linguist Ken Hyland (2000) has identified the following **five "moves"** to describe the structure of research abstracts. All five of these moves rarely occur in a single abstract, and the combination of moves and their ordering depends on the exact field of study and type of research.

Move 1: Introduction

Establishes context of the paper and motivation for the research.

- **Step 1:** **Arguing for topic prominence** ("Centrality claim")
- **Step 2:** **Making topic generalizations**
- **Step 3:** **Defining terms, objects, or processes**
- **Step 4:** **Identifying a problem or gap in current knowledge**

Move 2: Purpose

Outlines what the study seeks to achieve or create in terms of the aims, research questions or tasks.

Move 3: Methods

Provides information on study design, procedures, assumptions, research approach, data collection, materials, equipment and test environment.

Move 4: Results / Contribution

States either the main **outcome** of a **design process** (e.g., system, model, method, tool, process, framework) or **knowledge** (experimental results) identified to improve future engineering solutions.

Move 5: Conclusion

Interprets or extends results beyond the scope of the paper, draws inferences, points to new applications, or wider applications.

- **Step 1:** **Deducing conclusions from results**
- **Step 2:** **Evaluating value of the research**
- **Step 3:** **Presenting recommendations**

Figure 1. Hyland's (2000) five-move model for abstracts in science research articles

MOVE 1: INTRODUCTION

By including a brief introduction in their abstract, you can provide readers with enough background information and context to enable them to follow your description of your research. This introductory move can be divided into at least four types of content (Feltrim, 2003):

Step 1: Arguing for topic prominence

This type of introductory information is similar to **MOVE 1-1: Making a Centrality claims** in the Mice Model. Writers can choose to introduce their topic by emphasizing the **relevance**, **significance**, or **importance** of their topic area to their audience and the real world.

> **ABSTRACT 3:**
>
> [1]Coverage is a **very important issue** in wireless sensor networks. [2]Current literature defines a point to be covered if it is within the sensing radius of at least one sensor. [3]In this paper, we argue that this is a conservative definition of coverage. [4]This definition implicitly assumes that each sensor makes a decision independent of other sensors in the field. [5]However, sensors can cooperate to make an accurate estimation, even if any single sensor is unable to do so. [6]We then propose a new notion of information coverage and investigate its implications for sensor deployment. [7]Numerical and simulation results show that significant savings in terms of sensor density for complete coverage can be more easily achieved using our definition of information coverage.

Step 2: Making topic generalizations

Another possible strategy for beginning an abstract is to outline what is currently **known** or is **common/standard practice** within the field of study. This information can also include **definitions** of terms, objects, or processes. This strategy mirrors that of the same name used in research article introductions.

> **ABSTRACT 4:**
>
> [1]IEEE 802.11 MAC based Mobile Ad-hoc Networks (MANETs) **are known to** experience serious unfairness problems, particularly for TCP connections. [2]The unfairness **is caused by** a number of factors and to date, **no solution has completely addressed** all the factors, so that the unfairness is never completely solved. [3]The work presented here identifies the common factors that lead to the unfairness, and from a consideration of these, a novel solution based on carrier sensing is developed, that can completely solve the serious unfairness problem in MANETs. [4]Simulation results are presented which show the effectiveness of our solution.

Step 3: Defining terms, objects, or processes

When reporting research that focuses on the development of a new **device** or **software** application, writers may often begin their abstracts by first announcing the **name** of their new creation and then **defining** it in terms of its *function*, *purpose*, and *other important features*. This strategy, though more common in computer science, can also be found in other fields of science and technology. (See also **"Move 4: Product"**).

ABSTRACT 5:

[1]**This paper presents POLUS, a software maintenance tool capable of iteratively evolving running software into newer versions**. [2]POLUS's primary goal is to increase the dependability of contemporary server software, which is frequently disrupted either by external attacks or by scheduled upgrades. [3]To render POLUS both practical and powerful, we design and implement POLUS aiming to retain backward binary compatibility, support for multithreaded software and recover already tainted state of running software, yet with good usability and very low runtime overhead. [4]To demonstrate the applicability of POLUS, we report our experience in using POLUS to dynamically update three prevalent server applications: vsftpd, sshd and apache HTTP server. [5]Performance measurements show that POLUS incurs negligible runtime overhead: a less than 1% performance degradation (but 5% for one case). [6]The time to apply an update is also minimal.

In research articles, the verbs **"present", "propose"** and **"introduce"** are commonly used to combine the definition with a **purpose statement**. Note in abstract 6 below how this strategy typically precedes and anticipates **an evaluation** of the value of the new application (Sen. 3-4).

ABSTRACT 6:

[1]**This paper proposes** a method for recognizing scene categories based on approximate global geometric correspondence. [2]This technique works by partitioning the image into increasingly fine sub-regions and computing histograms of local features found inside each sub-region. [3]The resulting "spatial pyramid" is **a simple and computationally efficient** extension of an orderless bag-of-features image representation, and it shows **significantly improved performance** on challenging scene categorization tasks. [4]Specifically, our proposed method **exceeds the state of the art** on the Caltech-101 database and **achieves high accuracy** on a large database of fifteen natural scene categories. [5]The spatial pyramid framework also offers insights into the success of several recently proposed image descriptions, including Torralba's "gist" and Lowe's SIFT descriptors.

Step 4: Identifying a problem /gap in current knowledge

Writers often try to justify the relevance of their research by demonstrating that a **"gap"**, **problems**, or **deficiencies** exist in current *applications*, *methods* or *knowledge*. This strategy is identical to that used in **MOVE 2: Problem** in the MICE Model. In the following introduction, sentences 1-4 describe current models, and sentences 5-7 the deficiencies in these models that have motivated the current study.

ABSTRACT 7:

[1]The modeling of TCP transfer latency **has received significant attention** in the last decade. [2]Several models **have been proposed** for TCP performance under various conditions. [3]**All the available models predict** TCP performance for a single link. [4]Furthermore, **all models** relate timeouts to packet drops either due to congestion or due to transmission errors. [5]**However,** TCP connections may be running over a multilink connection that aggregates the bandwidth of multiple links into a single logical pipe using the multilink point-to-point protocol (MLPPP). [6]In such aggregate links, packet drops occur if any of the individual links experience a call drop. [7]**None of the available models account for** call drops as a possible source of performance degradation. [8]In this paper, we study the call drop phenomenon under MLPPP and incorporate our results into a method that predicts TCP latency for a long transfer. [9]The performance model is experimentally evaluated by running TCP over MLPPP over multiple Iridium satellite links.

MOVE 2: PURPOSE

The purpose is the most common function included in abstracts. See **Move 4-1** in **Appendix 3 (The MICE Model)** for more information on the language forms used to describe research purposes. Abstracts 4-7 above included the following examples of *purpose statements*:

ABSTRACTS 4-7:

[3]**The work presented here identifies** the common factors that lead to the unfairness, and from a consideration of these, a novel solution based on carrier sensing is developed, that can completely solve the serious unfairness problem in MANETs.

[1]**This paper presents** POLUS, a software maintenance tool capable of iteratively evolving running software into newer versions.

[1]**This paper proposes** a method for recognizing scene categories based on approximate global geometric correspondence.

[8]**In this paper, we study** the call drop phenomenon under MLPPP **and incorporate** our results into a method that predicts TCP latency for a long transfer.

MOVE 3: METHODS

Most abstracts also contain at least a brief mention of the main **procedures**, **criteria or conditions**, or the **materials and equipment** used to create the final 'product' or outcome of the research. See *Move 1: Methods* in the model presented in Session 4 (Results-Discussion) for a description of the language used to describe methods.

ABSTRACT 7:

[8]In this paper, we study the call drop phenomenon under MLPPP and incorporate our results into a method that predicts TCP latency for a long transfer. [9]The performance model **is** experimentally **evaluated by** runn**ing** TCP over MLPPP over multiple Iridium satellite links.

ABSTRACT 8:

[1]We investigate the variation of measured multiple-input multiple-output (MIMO) channel capacity for line-of-sight (LOS) Ricean scenarios inside a typical indoor environment for various transmitter-receiver positions at a center frequency of 2.45 GHz. [2]**In order to** quantify the effect of LOS component on indoor MIMO performance, an absorber-loaded metal panel **was utilized to** artificially obstruct the LOS path between the transmit and receive antennas. [3]Our results confirm that MIMO capacity decreases with the increase in the values of Ricean factor. [4]We have also observed that the variation in channel capacity closely follows the corresponding deviations in root mean square (rms) delay spread of the channel.

MOVE 4: RESULTS / CONTRIBUTION

In engineering, the most important function in the abstract is the result or outcome of the research—its "product". This move states experimental results, the argument, or what was accomplished, as well as includes a description of the main **features** or **properties** of the solution or product. In engineering research article, this move may often overlap with / be identical to a **purpose statement** (See Move 2 above) and may also include language evaluating the value of the product (See **Move 5-2** below).

ABSTRACT 9:

[1]A compact 100-GHz corrugated platelet array antenna **has been developed** based on a corrugated feed design for the background emission anisotropy scanning telescope (BEAST). [2]The antenna **results in** a gain of 20 dB, and a bandwidth across the full range of W-band 75–110 GHz. [3]The sidelobes are down by about -25 dB, a requirement comparable to feed horns used for observation of the cosmic microwave background. [4]The design and fabrication presented in this paper is straightforward and inexpensive. [5]A feature is that because the plates are not permanently bonded, the horn can be disassembled and modified to change its properties.

ABSTRACT 10:

[1]**The development of** dual-frequency (14 and 35 GHz), dual-polarization microstrip antenna arrays **is presented** for the first time on liquid crystal polymer (LCP) multilayer technology. [2]Some of the properties of LCP, such as multilayer (three-dimensional) vertical integration capability, good electrical and mechanical properties, and near-hermetic nature, make this substrate a practical choice for the design of low-cost antenna arrays that can be integrated with remote sensing applications operating in the Ku and millimeter-wave frequency bands. [3]This work illustrates the potential of LCP as a low-cost, “all-package” solution for developing compact, flexible, antenna arrays that can be used in future communication and remote sensing systems.

MOVE 5: CONCLUSION

Less common to engineering research abstracts is the need to draw conclusions from their findings. When conclusions do occur, they tend to extend the results beyond the scope of the paper. This concluding move can be divided into at least three types of content (Feltrim, 2003):

Step 1: Deducing conclusions from results

Writers can conclude by **commenting on** and **interpreting** the results, or **deducing** claims from the results.

EXAMPLES:

Analyses of the results **showed that** defect standard complexity had a negative influence on both visual search and decision making.

The simulation models **indicate that** the innovations, with the exception of the GFX system, can significantly reduce the time and direct labor costs associated with plumbing or fire protection installation while simultaneously improving worker safety.

Our results **confirm that** MIMO capacity decreases with an increase in the values of the Ricean factor.

Step 2: Evaluating value of the research

Writers in engineering often conclude the abstract by evaluating the **suitability** or **efficiency** of the "product", or wider potential applications of the studied technology. Important to such evaluation is the use of adjectives expressing a **positive evaluation** of the study's **product**.

EXAMPLES:

The simulation results show that our hybrid method approximates the throughput performance of an arbitrary-sized TCP connection with wireless losses **much better than** other proposed models.

This **significantly increases the flexibility** of such FFT-based algorithms for computational electromagnetics.

These results will be **useful** in designing **more robust** SSA templates through switch redundancy near the feed.

This work illustrates **the potential** of LCP as a low-cost solution for developing **compact, flexible**, antenna arrays that **can be used in** future communication and remote sensing systems.

Step 3: Presenting recommendations.

In addition to evaluating the outcome/product, the conclusion can also present **recommendations** derived from the study results, as well as future work necessary to improve the outcome.

EXAMPLES:

Several strategies are recommended for particular building types, and for three individual case study buildings.

Based on our analysis results, **we make some suggestions for** TCP performance enhancement for overcoming the serious effect from wireless losses.

The study helps recommend design guidelines for the most appropriate type of multimedia to be used in designing web-based asynchronous learning system for different levels of procedural tasks.

References

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Example Abstracts:

1. Koshy, TT, Gramopadhye, AK, Kennedy, WJ & Ramu, NV, 'Application of hypertext technology to assist maintenance on the shop floor' *Computers and Industrial Engineering*, vol 30, no. 2, pp. 283-295, 1996, 10.1016/0360-8352(95)00172-7
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