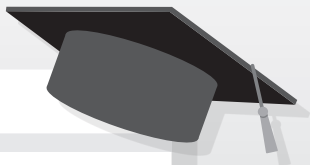
Unit 1
Introduction



Learning Objectives

Upon the completion of learning this unit, you will be able to

- command the basic concepts of the CARS model;
- analyze the structural features of the Introduction section;
- use different sentences to form moves in introduction writing;
- use proper words and phrases to form contrasting relations in a paragraph;
- use acronyms properly in paper writing;
- introduce a distinguished researcher in your field.

I Bridge-in

❶ Arrange the following items in order and form a cohesive passage.

(1) _____	(2) _____	(3) _____
(4) _____	(5) _____	(6) _____

a. The computational results for this paper were obtained using the set of public domain C source codes for computing shortest paths provided by Cherkassky et al. (1993) with only slight modifications. Their implementations proved to be fast with respect to computation time and efficient with respect to storage requirements.

b. The development, computational testing, and efficient implementation of shortest path algorithms have remained important research topics within related disciplines such as operations research, management science, geography, transportation, and computer science (Dijkstra, 1959; Dial et al., 1979; Glover, Klingman, & Philips, 1985; Ahuja et al., 1990; Goldberg & Radzik, 1993).

c. The primary goal of this paper is to identify which algorithms run the fastest on real road networks. The second goal is to better understand the sensitivity of algorithm performance to input data.

d. Although a number of computational evaluations have been reported in the literature (e.g., Hung & Dlvoky, 1988; Gallo & Pallottino, 1988; Cherkassky et al., 1993), there is no clear answer as to which algorithm, or set of algorithms, runs the fastest on real road networks, the most common type of network faced by practitioners.

e. The computation of shortest paths is an important task in many network- and transportation-related analyses.

f. The remainder of this paper is organized as follows. Section 1 provides some background on the prior study of Cherkassky et al. (1993) and summarizes the algorithms tested in our study. Section 2 details the computational study and results. Section 3 concludes the paper with a set of recommendations regarding algorithm selection.

[Zhan, F. B. & Noon, C. E. (1998). Shortest path algorithms: An evaluation using real road networks. *Transportation Science*, *32*(1), 65–73. https://doi.org/10.1287/trsc.32.1.65]

❷ Compare your answers in groups. Discuss which section it may serve as in the whole research paper and give your reasons.

II Reading

Sometimes getting through the Introduction section can be the most difficult part of reading a research paper. In his Creating a Research Space (CARS) model, Swales describes three "moves" that almost all research introductions have. Swales's model is summarized here as a kind of shorthand to help you in both reading and writing research papers.

The CARS Model for Writing Introductions

Introduction

John Swales's CARS model was developed based on his analysis of journal articles representing a variety of discipline-based writing practices. His model attempts to explain and describe the organizational pattern of writing the introduction to scholarly research studies. Following the CARS Model can be a useful approach because it can help you begin the writing process, understand how an Introduction section sets the stage for the rest of your paper, and assess how the introduction fits within the larger scope of your study.

The model assumes that writers follow a general organizational pattern in response to two types of challenges relating to establishing a presence within a particular domain of research: the competition to create a rhetorical space and the competition to attract readers into that space. The model proposes three actions and Swales calls them "moves", accompanied by specific steps, that reflect the development of an effective introduction for a research paper. These "moves" and steps can be used as a **template** (模板) for writing the Introduction section to your own research paper. The following is the model.

Move 1: Establishing a Territory (the situation)

This is generally accomplished in two ways: by demonstrating that a general area of research is important, critical, interesting, problematic, relevant, or **otherwise** (在其他方面) worthy of investigation, and by introducing and reviewing key sources of prior research in that area to show where gaps exist or where prior research has been inadequate in addressing the research problem.

Step 1: Claiming Centrality (中心性). The author asks the discourse community (the audience of the paper) to accept that the research to be reported is part of a lively, significant, or well-established research area. To claim centrality, the author might write:

- *Recently there has been a **spate** (一连串) of interest in...*
- *Knowledge of X has great importance for...*

This step is used widely across the academic disciplines, though less in the physical sciences than in the social sciences and the humanities.

And/or

Step 2: Making Topic Generalizations. The author makes statements about current knowledge, practices, or phenomena in the field. For example:

- *The properties of X are still not completely understood.*
- *X is a common finding in drivers with...*

And/or

Step 3: Reviewing Previous Items of Research. The author relates what has been found on the topic and who found it. For example:

- *Both Johnson and Morgan claim that the biographical facts have been misrepresented.*
- *Several studies have suggested that... (Gordon, 2003; Ratzinger, 2009).*
- *Reading to children early and often seems to have a positive long-term correlation with grades in English courses (Jones, 2002; Strong, 2009).*

In citing the research of others, the author may use integral citation (citing the author's name in the sentence, as in the first example above) or non-integral citation (citing the author's name in parentheses only, as in the second and third examples above). The use of different types of verbs (e.g., reporting verbs such as "claim" or "show") and verb tenses (past, present perfect, or present) varies across disciplines.

Move 2: Establishing a Niche (the problem)

This action refers to making a clear and **cogent** (有说服力的) argument that a particular piece of research is important and possesses value. This can be done by indicating a specific gap in previous research; challenging a broadly accepted assumption; raising a question, a hypothesis, or a need; or extending previous knowledge in some way.

Step 1a: Counter-Claiming (反诉)**.** The author refutes or challenges earlier research by making a counter-claim. For example:

- *While Jones and Riley believe X method to be accurate, a close examination demonstrates their method to be flawed.*

Or

Step 1b: Indicating a Gap. The author demonstrates that earlier research does not sufficiently address all existing questions or problems. For example:

- *While existing studies have clearly established X, they have not addressed Y.*

Or

Step 1c: Question-Raising. The author asks questions about previous research, suggesting that additional research needs to be done. For example:

- *While Jones and Morgan have established X, these findings raise a number of questions, including...*

Or

Step 1d: Continuing a Tradition. The author presents the research as a useful extension of existing research. For example:

- *Earlier studies seemed to suggest X. To verify this finding, more work is urgently needed.*

Move 3: Occupying the Niche (the solution)

In this move, the author turns the niche established in Move 2 into the research space that will be filled; that is, the author demonstrates how he or she will **substantiate** (证实) the counter-claim made, fill the gap identified, answer the question(s) asked, or continue the research tradition. The author makes this move in several steps, as described below. The initial step (1a or 1b) is obligatory, though many research papers stop after that step.

Step 1a: Outlining Purposes. The author indicates the main purpose(s) of the current article. For example:

- *In this paper, we propose...*
- *The present research tries to clarify...*

Or

Step 1b: Announcing Present Research. The author describes the research in the current paper. For example:

- *This paper describes three separate studies conducted between March 2018 and January 2019.*

Step 2: Announcing Principal Findings. The author presents the main conclusions of his or her research. For example:

- *The results of the study suggest...*
- *When we examined X, we discovered...*

Step 3: Indicating the Structure of the Research Paper. The author previews the organization of the paper. For example:

- *This paper is structured as follows.*

Note: No paper has to rigidly follow this model and no comprehensive theory appears to exist. The author may prefer not to adopt a negative stance in the writing when placing it within the context of prior research. In such cases, an alternative approach is to utilize a neutral, contrastive statement that expresses a new perspective without giving the appearance of trying to diminish the validity of other people's research.

Examples of how this can be achieved include the following statements, with A representing the findings of prior research, B representing your research problem, and X representing one or more variables that have been investigated.

- *Prior research has focused on A, rather than on B.*
- *Prior research into A can be useful but to* ***counterbalance*** (抵消) *X, it is important to consider B.*
- *These studies have emphasized A, as opposed to B.*
- *While prior studies have examined A, it may be preferable to contemplate the impact of B...*
- *After consideration of A, it is important to also recognize B.*
- *The study of A has been exhaustive, but changing circumstances related to X support the need for examining [or revisiting] B.*
- *Although considerable research has been devoted to A, less attention has been paid to B.*
- *Earlier research offers insight into the need for A, though consideration of B is also helpful.*

[Swales, J. M. (2014). *Genre Analysis: English in Academic and Research Settings*. Cambridge: Cambridge University Press, 45–47, 52–60, in *John Benjamins Publishing Company eBooks* (pp. 306–316). https://doi.org/10.1075/z.184.513swa]

❶ Draw a diagram to describe the CARS model for the introductions of research papers. You can complete either of the given diagrams or draw one in your own style.

Diagram 1:

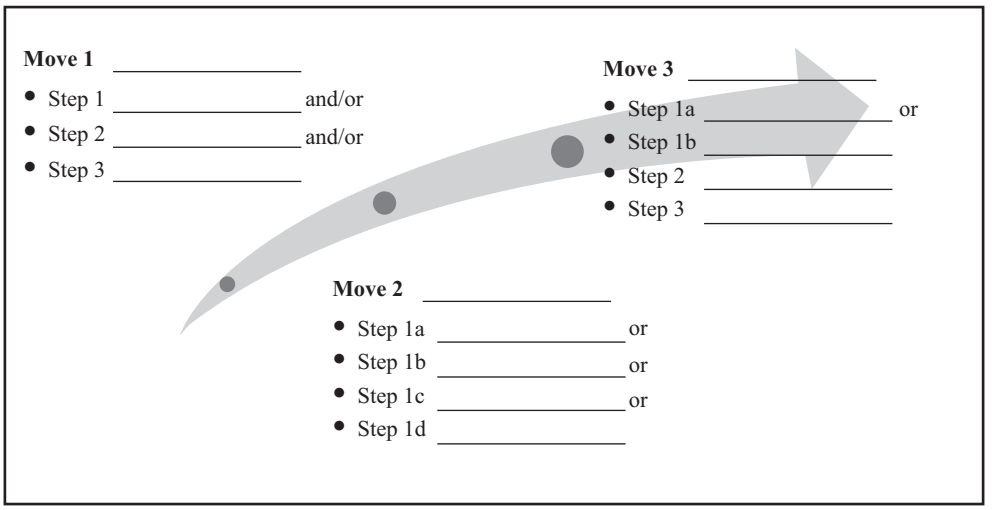


Diagram 2:

Move 1 _____	
Step 1 _____ and/or	
Step 2 _____ and/or	
Step 3 _____	**Declining rhetorical effort**
Move 2 _____	
Step 1a _____ or	
Step 1b _____ or	
Step 1c _____ or	
Step 1d _____	**Weakening knowledge claims**
Move 3 _____	
Step 1a _____ or	
Step 1b _____	
Step 2 _____	
Step 3 _____	**Increasing explicitness**

❷ **Read a research paper in your own field and check whether its introduction is written by following the CARS moves and steps.**

III Case Study

❯ Case 1

Container terminals (集装箱码头), where containers are transferred between different modes of transportation both on the sea side and land side, are crucial links in intercontinental supply chains. The rapid growth of container shipping and the increasing competitive pressure to lower rates result in demand for higher productivity of both sea and land operations. At a typical container terminal, sea-side operations include	**Move 1** **Situation** Step 1 Claiming centrality

assigning ships to **quay** (码头) **slots** (时段) or discharging and loading ships with quay **cranes** (起重机) while land-side operations mostly involve **routing** (为……规定路线) internal trucks or storing and delivering containers in the storage area. For both types of operations, the efficiency of container terminals can be clearly enhanced by investments in new terminal devices (Speer & Fischer, 2017). These investments can range from just improving current devices to buying new **state-of-the-art** (最先进的) cranes. Another direction for improvement is to develop new techniques to operate more efficiently existing devices, thus explaining the increasing research interest in optimizing operations in container terminals (Gharehgozli, Roy, & De Koster, 2016).	Step 2 Making topic generaliza-tions Step 3 Reviewing previous research
Due to limited space in the storage area, containers are stacked on top of each other. The resulting stacks create blocks of containers as shown in Figure 1. If a container that needs to be retrieved is not located at the top of its stack, that is, it is covered by other containers, the blocking containers must be relocated to another stack. As a result, during regular operations, one or more relocation moves are performed by the yard cranes. Such relocations (also called reshuffles), which cannot be charged to customers, create delays in operations, thus resulting in a substantial loss of revenue. Therefore, while this block structure represents a gain in space, it results in a loss in operational efficiency.	**Move 2 Problem**
As more thoroughly explained in Section 3, two problems have been studied separately in the literature. One, the Container Relocation Problem, is concerned with minimizing the number of relocations given a sequence of requests in a restricted setting, most of the time a single bay (Figure 1). The other, the Yard Crane Scheduling Problem, focuses on the routing of the crane and scheduling of storage and retrieval requests given space assignments for storage and relocations. This paper bridges the gap between these two problems in a unified framework. To the best of our knowledge, this paper is the first to consider jointly these problems and to show the important benefits of jointly considering these decisions. We model this new problem using a **binary** (二进制的) **integer** (整数) programming formulation and study some properties of the problem. In practice, this problem has to be solved in real time (a few minutes before the actual operations occur). Hence, we provide a **heuristic** (启发式的) procedure to generate promising solutions in a limited amount of time	Step 1b Indicating a gap **Move 3 Solution** Step 1a Outlining purposes Step 1b Announcing present research Step 2 Announcing

(1 minute), thereby showing the practical relevance and applicability of our approach. The rest of our paper is organized as follows: After describing the problem of interest in Section 2, Section 3 explains the contributions of this work in light of an extensive literature review of both the Yard Crane Scheduling Problem and the Container Relocation Problem. Subsequently, Section 4 formulates the problem as a binary integer program and states some properties about this mathematical formulation. Section 5 builds upon these results to introduce a practical heuristic procedure. Algorithms are tested through computational experiments in Section 6. Finally, concluding remarks and future directions are given in Section 7.	principal findings Step 3 Indicating the structure of the paper

[Galle, V., Barnhart, C., & Jaillet, P. (2018). Yard Crane Scheduling for container storage, retrieval, and relocation. *European Journal of Operational Research*, *271*(1), 288–316. https://doi.org/10.1016/j.ejor.2018.05.007]

❯ Case 2

High-speed railway (HSR), intercity railway, subway, light rail, and other rail traffic systems have brought much convenience for people's travel with less energy consumption and air pollution compared to cars and airplanes. Moreover, HSR moves very fast with high comfort and high punctuality. To ensure the safe and reliable operation of railways, the train operation control system acts as a nerve center. To make such a nerve center work well, a reliable bidirectional communication link between the train and the ground is of great importance. Global System for Mobile Communications for Railway (GSM-R) plays a key role in realizing such bidirectional communications. Train timetable information, the driving license, train speed, train location, and other train control signals can be transmitted through a GSM-R network. With the increasing demand for new railway services such as railway multimedia **dispatching** (调度) communication and railway emergency communication, Long Term Evolution for Railway (LTE-R) is now under discussion[1, 2]. Such a broadband communication system has the capability of 100 MHz data transmission rate in high mobility with 20 MHz **bandwidth** (带宽). However, just as those topics specified in the	**Move 1** Step 1 Claiming centrality Step 2 Making topic generalizations Step 3 Reviewing previous items of research **Move 2** Step 1b

European "Shift2Rail" project, intelligent rail infrastructure, intelligent mobility management, smart rail services, and a new generation of rail vehicles ultimately form the requirements of a **seamless** (无空隙的) high data rate wireless **connectivity** (连接) for future rail development. Thus, higher-frequency-band techniques such as millimeter-wave (mmWave), the fifth generation (5G), and the corresponding mobile communication network should be designed accordingly to provide high capacity and high data rate for future railway services. As far as the authors know, although plenty of literature has discussed GSM-R communication networks[3] and 5G techniques[4], no literature deals with the communications network regarding future railway services.	Indicating a gap **Move 3** Step 1b Announcing present research
The new services for railways may pose special requirements for the new mobile communications network architecture. Future railway services and typical communications scenarios are described. The heterogeneous mobile network architecture for future railway system, related promising key technologies, and technical challenges are discussed. Massive multiple-input multiple-output (MIMO)-based wireless coverage for railway stations, inside cars, and other railway hotspot areas is discussed in detail. Finally, conclusions are drawn.	Step 3 Indicating the structure of the paper

[Ai, B., Guan, K., Rupp, M., Kurner, T., Cheng, X., Yin, X., Wang, Q., Ma, G., Li, Y., Xiong, L., & Ding, J. (2015). Future railway services-oriented mobile communications network. *IEEE Communications Magazine*, *53*(10), 78–85. https://doi.org/10.1109/mcom.2015.7295467]

❶ **In both cases, the Introduction section has been separated into three moves and more detailed steps. Do you agree with the division? Why or why not?**

❷ **Analyze the moves and steps adopted in the following introductions.**

❯ Case 1

Globally, the construction sector employs an estimated 7% of the world's paid workforce[1], and accounts for about 13% of global gross domestic product (GDP)[2]. Excess mortality from suicide among construction workers has been consistently observed in countries such as the United Kingdom[3], the U.S.A.[4], Denmark[5], Italy[6], Australia[7] and Canada[8]. In England for example, the risk of suicide among low-skilled male construction workers is over three times higher than the male	