

Inference Tree Use to Design Arguments in Expository Reports

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INTRODUCTION

When they write essays, many students merely attempt ‘to fill pages with material gathered from sources’ (Erion, 2000). Consequently, they produce inane arguments of the form:

Adams said this, Brown said that, Cohen said the other, etc.

Conclusion: much has been written about this topic.

This is unacceptable both in academic ICT courses and subsequently in the ICT profession. In academe, a written argument should ‘make a leap from the raw materials of the library to an informed opinion’ (Fasel, 1963). In the profession, a written argument should similarly make a leap from a present state of affairs to a desired future state. So in both situations, writers should be able to devise a report that contains an argument from available facts towards an intelligent conclusion. This kind of report is called an ‘expository report’ (Trimble, 1975), or an ‘argumentative report’ (Dykeman, 1974).

In order to write such reports successfully, ICT writers can get a great deal of useful advice from textbooks of Writing for ICT (e.g., Warner, 1996; Zobel, 1997), as well as textbooks of technical writing (e.g., Andrews & Blickle, 1982; Pauley & Riordan, 1993), business writing (e.g., Ruch & Crawford, 1988), nonfiction (e.g., Fryxell, 1996; Zinsser, 1990), and even prose style (e.g., Strunk & White, 1979; Trimble, 1975). There they will find a variety of methods, such as structuring sentences and paragraphs, introducing a report and ending it, outlining a report and editing it, and so forth, which are useful for writing reports of any kind: narrative, descriptive, imperative, or expository/argumentative. However, they will find little or no advice on devising the argument in an expository/argumentative type of report.

Yet, ICT writers need not despair. Specific argumentation aids are actually available right under their noses in ICT textbooks of artificial intelligence (e.g., Giarratano & Riley, 1989; Turban, 1992). There they will find a tool called the *inference tree*, and two associated techniques called *forward chaining* (FC) and *backward chaining* (BC). Although these three aids were originally intended for the purpose of devising expert systems and related computer applications, writers can easily adapt them for the purpose of devising expository/argumentative reports. The *inference tree* can be used to outline the argumentation product; the *chaining* techniques can be used to facilitate the argumentation process.

BACKGROUND

In such reports, the argument is situated in the paragraphs beyond the introduction. Each of those paragraphs consists of a single *core idea* supported by several *peripheral ideas* (Andrews & Blickle, 1982). For example, the following paragraph has a single core idea (in italics), which is supported by four peripheral ideas.

This system has no validation. We examined the system specification, looking for all programs that capture data from human sources. Then, we examined the if-then commands in each program, but found that none of the if’s detect data errors, and none of the then’s produce error messages.

The argument involves *inferences* between core ideas. Each inference inputs the core ideas of one or more previous paragraphs, and outputs the core idea of a subsequent paragraph. Example:

This system has no validation

If it has no validation, then it captures bad data
So it captures bad data.

Table 1. An argument

This system has no validation. If no validation, then it captures bad data. So it has bad data. If bad data, then it produces bad information. So it has bad information. If bad information, then users make bad decisions. So users make bad decisions. If bad decisions, then we are blamed. Therefore we are blamed.
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The argument usually contains *many* inferences (Fisher, 1988; Hamblin, 1970; Mende, 2005a, 2005b; Parsons, 1996). For example, Table 1 outlines the argument in a simple report about validation (omitting all peripherals, and indicating the inferences with the keywords **so** and **therefore**).

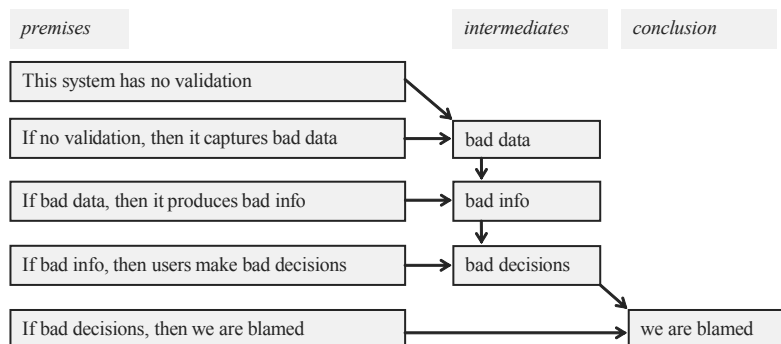
An inference tree is a diagrammatic outline of an argument (Mende, 2005a; Turban, 1992). For example, Figure 1 is the inference tree of the argument outline in Table 1.

An inference tree omits all the peripheral details that appear in the written report. Boxes represent core ideas only, and arrows represent inferential connections between those core ideas. The boxes are arranged in three columns.

Premises: core ideas that are not inferred from other core ideas.

Intermediates: inferred from other cores, and other cores are inferred from them.

Figure 1. Inference tree of Table 1



Conclusion: inferred from other cores, but no other cores are inferred from it.

This kind of diagram has been mentioned by several authors on formal logic (Carney & Scheer, 1980; Copi & Cohen, 1994; Hurley, 2000; Kelley, 1990) and on informal logic (Copi & Burgess-Jackson, 1996; Freeman, 1993; Grennan, 1997; Kneupper, 1978; Little, Groarke, & Tindale, 1989; Reed & Rowe, 2005; Scriven, 1976; Toulmin, 1969; Twardy, 2004).

USING INFERENCE TREES

Yet the previous authors have neglected three important questions: (1) How should writers proceed to draw an inference tree? (2) How should they use the tree after drawing it? (3) How should they deal with the tree of a large argument? These questions need to be answered before the inference tree can be used as a practical aid in devising an argument.

Drawing an Inference Tree

Writers can draw an inference tree by emulating the forward and backward chaining algorithms of an expert system. These algorithms easily enable a computer to draw Figure 1. Suppose the computer's knowledge base contains five premises: one is the fact 'no validation,' and the others are simple if-then rules:

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