A NARRATIVE APPROACH TO TECHNICAL DOCUMENT CONSTRUCTION

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Key words to describe this work: Rhetorical Structure Theory (RST), Narrative Structures for Technical Documents, XML

Key Results: A software tool that uses RST to allow an author to create and instantiate document narratives and to explore alternative narratives for a technical document.

How does the work advance the state-of-the-art?: Technical documents with more coherent narratives can be produced easily.

Motivation (Problems addressed): Every document must have a coherent narrative and narrative theories had not previously been applied to improve the narratives of technical documents.

Introduction

Effective written communication forms an integral part in many fields of work and study.

A fundamental aspect of a document is the 'story' it conveys to the reader. This is referred to as a document's narrative. A coherent, well-structured narrative conveys the information better and is more convincing to the reader. Even though software tools for the writing process have been manifold, support for document narratives is almost non-existent.

There are many theories for the structure of a narrative. We have studied Rhetorical Structure Theory (RST) [Mann & Thompson, 1988] and used it to build a tool (CANS) which helps authors construct documents with better narratives. This tool is described further in the sections below.

Rhetorical Structure Theory

In this theory, a text is divided into segments and relations between these segments are used to explicate the text coherence.

A text segment assumes one of two roles in a relationship: the nucleus (N) or satellite (S). Nuclei express what is more essential to the understanding of the narrative than the satellites. The size of a text segment is arbitrary but each should have independent functional integrity.

Relations hold between non-overlapping text segments and are of two kinds: *hypotactic* and *paratactic*. Hypotactic relations connect one nucleus and one satellite. Paratactic relations hold between text segments of equal importance; that is, multiple nuclei. There are 23 relations defined in Mann & Thompson's original paper. Two of them are illustrated below. In these diagrams, the arrow points towards the nucleus in a hypotactic relationship.
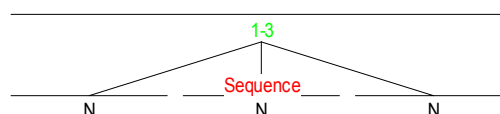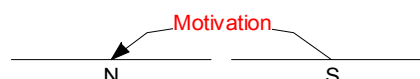

Figure 1: A paratactic relationship

Figure 2: A hypotactic relationship

Text coherence arises due to an overall effect associated with each relation. For instance, in a MOTIVATION relation, the satellite presents some information that increases the reader's desire to perform the action presented in the nucleus.

URML (Underspecified Rhetorical Markup Language) [Reitter & Stede, 2003] is an XML-based data format used to define RST relations between text spans and is used in this tool.

CANS (Computer-Aided Narrative Support)

CANS has been implemented using JSP, XSLT and an XML database. A narrative for a short story will be used to demonstrate the features of RST and of this tool.

The writing process begins with the construction of the document narrative which can then be divided into segments, as shown below.

> *[There is an initial condition.]* [1]
> *[Then a problem arises]* [2] *[that disrupts this condition.]* [3]
> *[A solution is sought.*
> *One of the solutions fixes the problem]* [4]
> *[and restores the initial condition.]* [5]

These segments can then be linked using RST relations that best describe their dependence on one another. By joining sub-trees, a complete RST tree can be constructed in a bottom-up manner.

One possible RST tree for the narrative above is illustrated in Figure 3; drawn using RSTTool3.0 [O'Donnell, 2000].

Then the content for the document can be added by answering a series of questions generated by CANS. Each question is preceded by a history of its relations to other segments. An example is given below.

[Background to the problem] What is the initial condition?

An example of an instance of the narrative above is:

Fido is a happy dog.
Last week Fido got fleas and started scratching. This made Fido unhappy.
Noticing this, Fido's owner took him to the vet. The vet recommended a flea treatment which got rid of the fleas. Fido stopped scratching and was happy again!

The most important feature of the tool is the ability to study alternative narratives for a document. The tool can traverse the RST tree in different ways; each traversal producing a different narrative. The need for varying narratives can be explained further by considering a Research Proposal. A proposal pitched to an audience of investors needs an explanation of how the technical plan achieves something that others cannot so that they are convinced their investments are utilised wisely. In contrast, a proposal read by other researchers in the field, should enhance the understanding of the unsolved problem and the chosen method of solution.

It is clear even from this simple example that every version of the narrative requires a change in the sentences to remain coherent. We are studying ways of doing this transformation in ways less pedantic than Natural Language Processing.

At all times, the current RST structure and the document narrative can be viewed on the right hand panel.

The tool also contains a list of predefined narrative structures for popular types of documents. The narrative below for a Research Proposal (divided into segments) is one of them.

[We want you to fund us][1] [because we will achieve these objectives/results.][2] [We believe these results are important to you][3] [because of benefits-to-beneficiaries][4] [and to the whole world][5] [because there exists an unsolved-problem.][6] [We know this is unsolved][7] [because we have studied the background.][8] [We will solve this problem][9] [by this method.][10] [We know this is the best method][11] [because we have studied alternative-methods.][12] [To achieve this, we will need total-time][13] [and these resources][14] [because justification-of-resources.][15] [The research will be carried out by these researchers][16] [and they are the most qualified to do this because justification-of-researchers.][17] [The research will be conducted at these locations][18] [because justification-of-locations.][19]

Future work and conclusions

This is a single-user application but research is being carried out into collaborative authoring of a technical document using RST.

Different ways of generating questions from the narrative and improvements to the user interface need to be explored.

Apache Xindice (2000) will soon be used to manage the XML documents.

Having studied several other tools that provide support for document creation, I have found CANS to be an original approach.

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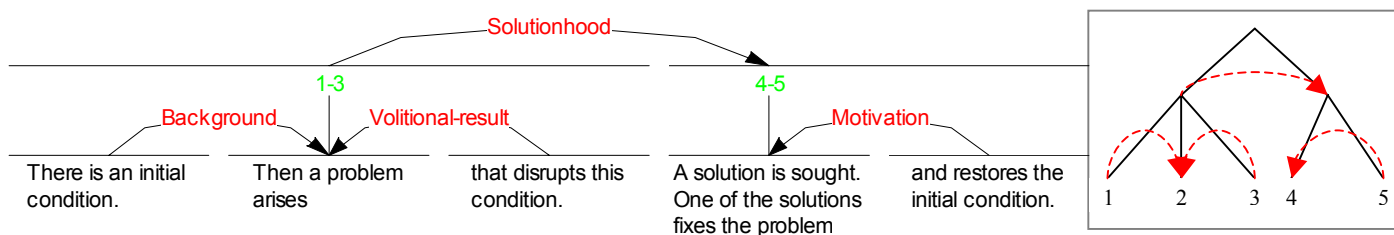
Figure 3: A possible RST tree for the narrative and a more traditional tree diagram for it (right)