

# UNDERSTANDING STORIES THROUGH MORALS AND REMINDINGS

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## ABSTRACT

This paper examines the role of both episodic memory and abstract planning knowledge in narrative comprehension. Many narratives are memorable for the abstract planning advice they contain, usually in the form of failures which narrative characters experienced during either planning, or plan execution. The planning advice, or moral, contained within such stories is often expressed in terms of sayings, or cultural adages, which then effectively characterize these stories. These same planning failures also provide indexing structures for both the storage and subsequent retrieval from long-term episodic memory of narrative episodes involving similar errors in planning. Consequently, when people encounter similar episodes (either in real life situations, or vicariously in narratives) they experience spontaneous reminders (Schank 1982) of related stories which illustrate the same moral. A theory for extracting the moral of a story, along with reminders of related episodes, is currently being designed and developed in order to extend the theoretical and practical scope of the BORIS (Dyer 1983) story understanding program.

## A. Background

Previous story understanding systems developed at Yale displayed their comprehension by performing tasks of translation, summarization (e.g. FRUMP (DeJong 1979)) or question-answering (e.g. QUALM (Lehnert 1978)). However, after reading a story and performing its respective task, these programs threw away the results of their work. Consequently, previous stories were never involved in subsequent comprehension processes. IPP (Lebowitz 1980) was one exception, since it retained a summary of each story, which it then used in forming generalizations. For example, if IPP read three stories of bombings in Ireland, and in each case carried out by the IRA, then IPP formed a generalization that bombings in Ireland are done by the IRA. The next time IPP read about bombings in Ireland, it used this generalization to predict IRA responsibility.

While IPP represented an important advance over other story understanders which failed to remember what they had read, IPP was limited in both the depth of its understanding and the way it indexed stories read. As a skimmer, IPP mainly filled roles in frame-like structures (Minsky 1975). As a result, IPP could only index stories by means of similarities and differences in role bindings.

In contrast to IPP and FRUMP (which as skimmers read many stories but built relatively sparse conceptual representations for them), BORIS (Lehnert, Dyer et al. 1983) was designed to read a few stories in great depth, extracting a detailed conceptual representation involving scripts, plans, goals (Schank and Abelson 1977), settings, affects (Dyer 1983b) interpersonal relationships, and planning failures organized in terms of abstract thematic structures, called TAUs (Dyer 1981).

This paper discusses extensions to BORIS which involve remembering previous episodes in memory during the comprehension of novel stories. These theoretical extensions are under design and development in a program called MORRIS (Moral and Reminding Inference System). MORRIS is intended to read a story in depth, and perform a careful analysis of the appropriateness of character actions. As a result of this analysis, MORRIS will extract the moral of the story, in terms of abstract planning advice, and use this moral as an indexing structure for storage of the story in long-term episodic memory. Whenever a later story is read, which can be analyzed in terms of the same abstract planning advice, MORRIS will be reminded of the prior story. Furthermore, MORRIS should be able to express its advice in terms of an appropriate cultural saying, or adage. Unlike IPP, reminders which occur in MORRIS will be based upon recognizing inappropriate planning situations at an abstract level. Thus, reminders in MORRIS need not be based simply on indexing by roles and frames.

## B. indexing stories in Episodic Memory

Often, when people read a story, they are spontaneously reminded of previous stories (or personal experiences). Why is this the case? What makes a story memorable and worth telling over and over again (as in certain parables and fables), or worth recalling in the right context?

In this paper I argue that one class of reminders occur as the result of a complex analysis of the appropriateness of character plans, actions, or reactions to various goal situations, interpersonal relationships, and other conceptual structures of significance within the story. When a character responds inappropriately or ineffectively, the error is recognized by the reader, and the consequences of that character's actions are predicted. As a result, the story carries with it a moral, or

implicit advice in planning, which the reader may be able to employ in real-life for future planning in related situations. The most generally applicable types of advice become solidified in the adages, or sayings of our culture. Such adages, for instance, give us abstract advice concerning:

- timing of plans ("A stitch in time saves nine.")
- plans for satisfying recurring goals ("Kill the goose which lays golden eggs.")
- assessing risks in planning ("The cure is worse than the disease.")
- coordinating planning with others ("Too many cooks spoil the broth.")
- counterplanning and vulnerability ("Throwing stones when you live in a glass house." "Cutting off your nose to spite your face").
- affect reactions during plan/goal failure ("Crying before the milk is even spilt.")

In BORIS, such planning advice is organized by TALIS (Thematic Abstraction Units) which represent situations in which planning errors brought about goal failures. See (Dyer, 1983).

### C. Reminders during Comprehension

By way of illustration, consider the following episode (which actually happened to the author):

GARAGE TRIP: I was taking a friend to a garage to pick up his car. He started talking about how they had promised to have it ready, but he hadn't called them to make sure. He became convinced that the car wouldn't be ready, and how annoying that would be, and he became more and more upset. When we arrived, his car was all fixed.

At the point that my friend began getting really upset, I told him to quit bleeding before he'd even been cut. I was also spontaneously reminded of a humorous story I had not thought of in years (and whose author or source I can not recall). Of course I now told him the story as we drove to the garage. I have tried to recapture below the flavor of this story as it was first told to me:

OUT OF GAS: A man was driving along a lonely road late at night when his car ran out of gas. He remembered seeing a farm house a mile back, and so started walking toward it. As he walked along he thought: "It's pretty late. If someone were to awaken me at this hour, I might be pretty annoyed." He kept on thinking along these lines: "The farmer will have to get dressed and siphon gas out of his tractor for me. He may find that very inconvenient..." As he approached the farmhouse he became more and more annoyed.

The farmer was awakened by loud knocking at his door. When he went down to answer it, there stood a man who Larked: "Who needs

your stupid gas anyway!" and then stomped off into the night.

Clearly, both the actual GARAGE TRIP episode and the OUT OF GAS humorous story involve car troubles. However, there are numerous other instances of car breakdowns that I could have recalled, and yet they did not come to mind at that time. The key to my reminding was the moral, or planning advice in OUT OF GAS. This advice was appropriate to GARAGE TRIP and is expressed in our culture by such adages as "Crying before the milk is even spilt" or "Bleeding before one's been cut". But what was the mechanism which allowed me to extract both a moral and a reminding from the GARAGE TRIP episode?

At the level of abstract planning, in both cases some individual X became emotionally upset at a situation S which involved anticipating a goal failure before X knew for sure that S had occurred. Thus, the moral of each story might be expressed in planning terms as follows:

TAU-EMOT-ANTICIPATE: When anticipating a negative situation, don't act as if the failure has occurred, since this wastes energy that could be better used in planning ways of recovering from the failure, if indeed one has occurred. Furthermore, getting upset may make things worse, by interfering with planning about what to do next.

In OUT OF GAS, the driver was so upset that he rejected help before even requesting it.

This planning advice is rather sophisticated, involving interaction between plan failures, the appropriateness of anticipating failure in planning, and the effect of emotional reactions in the face of planning failures.

Upon realizing that my friend was wasting energy and suffering emotionally in anticipation of an unproven failure, I had indexed the situation in terms of the appropriate abstract planning theme. At this point, both the adage and narrative episode which shared the most content features (i.e. a story illustrating TAU-EMOT-ANTICIPATE which also involved a broken car) came to mind. So, not only was I able to advise my friend of the inappropriateness of his behavior in terms of its overall effectiveness, but I could also illustrate my advice with a vicarious episode from my own experience.

### D. In-Depth thru Plan Analysis

This level of story understanding is one of the deepest possible (for other thematic levels, see (Lehnert 1982), (Schank 1982) (Wilensky 1981)). Summarization, translation and question answering tasks are not guaranteed to reveal this level of comprehension. For instance we could ask the following questions regarding OUT OF GAS:

- Q: What was wrong with the driver's car?  
A: It was out of gas.

Q: Why did the driver go to the farmer's house?

A: To get help.

Q: What woke up the farmer?

A: The driver knocked on his door.

and still miss the point of the story. The best way to reveal this level of understanding is through spontaneous reminders of episodes with similar themes, along with the generation of advice in the form of a moral, saying, or adage. This deep level of analysis requires sophisticated knowledge of plans, including:

- the goals they normally serve
- a history of successes and failures for each planning situation
- their enablement conditions, along with timing, effort, etc.

Consider how MORRIS will work for the following, much simpler story, which involves a planning error in terms of cost:

FACE LIFT: Bill was a poor student. One day he discovered that he had a single acne pimple on his chin. He decided to go see a plastic surgeon and have his face lifted.

Here Bill chose an overly costly plan to achieve a goal which could be achieved by equally effective, yet simpler and less troublesome measures. One adage characterizing this situation is: "Killing a fly with an elephant gun."

The moral: Don't chose an expensive plan (in time, money, physical suffering, etc.) when a cheaper, equally effective plan is available.

In this case, plastic surgery is used to eliminate serious facial conditions and involves great discomfort. Since the goal is minor, this plan is inappropriate. As MORRIS notices that an expected, more reasonable, plan was not chosen, various planning metrics (Dyer 1983a) are analyzed, including the cost of the plan, the goal it normally serves, etc. Associated with various planning errors are larger thematic structures (TAUs), which generate more expectations concerning plan outcomes, and carry planning advice. Once a TAD associated with this plan error is recognized, MORRIS will express the TAU in terms of the "elephant gun" adage, and be reminded of any other story which involves the same kind of planning "overkill".

MORRIS is currently under design at UCLA, using the insights gained from experience with BORIS at Yale. Many representation and process issues remain which are best resolved through experimentation with initial implementations. MORRIS will be given an episodic memory of different stories, each indexed in terms of distinct TAUs, along with various planning metrics. Whenever a plan, goal, affect, or interpersonal expectation is violated, associated TAUs will be activated, and these structures will determine how the story is to be indexed. Research is also underway for building a generator to produce appropriate adages, and thus

act as an advice giver in various planning situations.

## E. Summary

One important type of story is memorable for the abstract planning advice it contains. This abstract planning advice serves as a major indexing structure for both storing and retrieving stories from long-term episodic memory. The most general forms of abstract planning advice are often expressed in terms of common sayings, or adages, which refer to the moral, or point, of the story. When similar planning errors occur, the same planning analysis leads to both recall of associated adages, and to spontaneous reminders of stories which are related at the same abstract thematic level. Thus planning information becomes available for both advice-giving, and the anticipation, avoidance, or recovery of future planning errors.

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