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POINTS: A THEORY OF STORY CONTENT

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Points:  
A Theory of Story Content

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Abstract

Attempts to produce computer story understanding systems have generated a number of interesting ideas, particular in the areas of knowledge representation and organization. However, many basic questions still remain largely unaddressed. In particular, the idea of what actually constitutes a story has never been clearly delineated.

A theory of story points has been developed that attempts to characterize those texts that describe situations that constitute stories. Unlike previous attempts at such a characterization, points are based not on the structure or form of a text, but on its content. Points describe those situations that generate reader interest and therefore give a text some poignancy.

The theory of stories proposed here is intimately connected with basic issues of language understanding, language generation, cognition and memory. In addition to characterizing stories, knowledge about poignancy is as necessary for the construction of intelligent story understanding programs as are theories of inference and knowledge representation. A story understanding system (PAM - Plan Applier Mechanism) has been given some of this knowledge about points, and as a result, its language processing capabilities have been extended to facilitate summarization and intelligent forgetting.

## 1.0 INTRODUCTION

Story comprehension has recently received a great deal of attention from cognitive psychologists and researchers in artificial intelligence (For example, see Bower (1976a), Kintsch and van Dijk (1975), Mandler and Johnson (1977), Rumelhart (1975), and Charniak, (1974), Schank and Abelson (1977), Cullingford (1978), and Wilensky (1978)). However, the complaint has been made repeatedly that most of the work on story understanding has little to do with stories. Rather, what is being studied both in AI and psychology are coherent texts. The difference is that not all coherent texts are stories, and that a theory of stories per se is still lacking.

One ostensible exception to this criticism is a formalism known as a story grammar. Using a grammar to try to capture the notion of "storyness" seems first to have occurred to Rumelhart (1975). Since then, the notion of story grammars has been expanded theoretically by a number of researchers, and even used as the basis for a number of empirical studies (e. g., Mandler and Johnson (1977), Stein and Glenn (1977), and Thorndyke (1977)).

Unfortunately, the story grammar concept is lacking in a number of ways that make it inadequate for its intended purpose. The chief problem is that story grammars purport to capture the idea of what a story is by trying to express the structure of a story text. My claim is that a theory of stories must be much more concerned with the content of a text than with its form. Moreover, when story grammars are examined closely, most of the story structure they aim to capture dissolves away, and they end up saying little more than that story is a

coherent set of sentences.

A detailed critique of story grammars is found in Black and Wilensky (1979), and will not be repeated here. This paper is concerned with a theory of stories I have been developing based on text content. I call it a theory of story points. The theory is by no means complete. Nevertheless, some parts of it are well-formed enough to be presented, perhaps even refuted. In any case, the piece of the theory described below should provide a picture of what I believe a theory of stories needs to look like.

One of the salient features of this theory is its complexity. In spite of its incompleteness, the theory presented here necessitates detail. While it may be edifying to think that a theory of story representation should be simple and elegant, perhaps denotable by a few dozen story grammar rules, it may turn out that this is not the case. One of the major goals of this paper is to demonstrate the inherent complexity of the problem.

The next section of this paper reviews some previous work in story understanding. Much of this material may already be familiar to the reader. The rest of this paper, which contains a critique of previous work as a theory of stories, and gives an exposition of the notion of story points, should be intelligible without a detailed knowledge of the material in the background section.

## 2.0 BACKGROUND

Most of the work that goes under the label of story understanding is really concerned with coherent text comprehension. Understanding such a text involves finding the implicit connections between story sentences, and thus much of the work in this area is concerned with the problem of inference generation. In particular, the problem of representing knowledge needed for understanding has dominated this work, and involves notions of scripts and plans (Schank and Abelson, 1977), schemata (Rumelhart, 1976) and frames (Minsky, 1974).

Most of this work on knowledge representation and organization is very basic. It has application not only to understanding narratives, but to other forms of cognitive processing, even non-linguistic ones. This is precisely its failure as a theory of stories. For example, consider the following "story," which is used by Schank (1977) to demonstrate his script idea:

- (1) John went to a restaurant. The hostess seated John. The hostess gave John a menu. John ordered a lobster. He was served quickly. He left a large tip. He left the restaurant.

The point of this example is to demonstrate that knowledge about what typically goes on at a restaurant is needed to infer implicit events, such as John's eating the lobster. The notion of a script is introduced as a way to organize such knowledge.

Schank is careful to point out, however, that such neatly delineated event sequences do not necessarily constitute stories. The problem is that they just too dull. No one will even be heard telling story (1) to anyone else because there is little reason to believe

anyone would have any reason to express it, nor is anyone likely to be amused upon hearing it.

The ability to understand utterances like (1) seems to underlie much of language processing. In the most general terms, such examples simply illustrate that people bring their experience to bear in understanding a new experience. However, the existence of such knowledge structures and their unquestionable utility in making a text coherent has little to do with the notion of a story. A story is not merely an arbitrary coherent sequence of events.

Thus it is extremely unlikely that anything conforming to the content of a mundane knowledge structure will constitute a story. Moreover, as was well understood at the time of their inception, rigid knowledge structures such as scripts are inadequate for much of the inference processing necessary to establish the coherence of a non-conforming text. Script-like knowledge structures reflect the repeated experience of mundane situations, and are directly useful for comprehending these situations. However, they are less clearly useful for processing situations that do not conform entirely to stereotypes.

## 2.1 Explanation-Driven Understanding

Understanding a situation that is not necessarily stereotypical requires a good deal more reasoning than script-based processing can provide. In particular, script-based understanding tends to be rather inflexible. If an event occurs that is not in the script being used to understand a text, it cannot be handled by a script-based mechanism.



For example, consider the following story:

- (2) John wanted to impress Mary. He asked Fred if he could borrow his Mercedes for the evening.

It is unlikely that most understanders process this example using a script. To claim as much would amount to saying that whenever a reader hears that someone wants to impress a date, the reader then expects to hear of the person asking a friend to loan him a fancy car. Such a script that includes all alternatives is an impossibility, since we can always dream up new variations not already packaged into it.

Even if it were possible to include an infinitude of variation within a script, doing so would defeat the whole purpose behind the script concept. Namely, scripts are supposed to limit the inference process by specifying events that are usually found in mundane sequences. Clearly, scripts would no longer be mundane or inference-constraining if they explicitly delineated all possible alternatives.

Thus while the utility of script processing is inherently limited to understanding those event sequences that conform to a rigid structure, human readers seem to have no trouble connecting up the events in texts like (2). Since people can easily understand texts with some novel variation in them, a more general theory of text coherence is needed to describe the processing of these situations.

I call the general process of finding the connection between events in a text explanation-driven understanding. That is, much of the processing that a reader needs to do to understand a text revolves around the task of finding explanations for the events of the text.

Since stories are generally about people, explanations usually take on an intentional flavor. The reader must find explanations for people's behavior, and these explanations must be stated in terms of a person's plans and goals.

For example, in story (2), John's asking Fred to loan him a car is explained by inferring that this action is part of a plan for a goal of getting possession of a vehicle. This goal is explained by inferring that it is instrumental to John's plan for impressing his date, which is to pick her up in an expensive car. This plan in turn is explained by John's desire to impress his date, which is explicitly stated in the story.

Thus a reader of (2) must compute a series of explanatory inferences in order to understand John's action. Each of these inferences explains some element of John's behavior - why he has a goal, why he chooses a plan, or why he performs an action. In each case, the type of explanation that can be found is a function of the type of element that is to be explained. An action is explained if it is found to be part of a plan its actor is pursuing. A plan is explained if it can be used to achieve some goal of its planner. A goal can be explained if it is instrumental to some plan, or if there is some known state that gives rise to the goal. These states, called themes by Schank and Abelson (1977) include drives like hungry or being tired, being in a social role, or having an attitude toward someone or something.

These types of explanations conform to a rather standard planning structure, starting from goal generators (themes) and moving on down to goals, plans for those goals, subgoals, and actual events. In addition, there are explanations that circumvent or short circuit this planning structure. That is, an understander does not necessarily trace an event all the way back to its origin in order to consider it explained. Two kinds of explanation of this form are normalcy and social stereotypes.

A social stereotype is a kind of prototype of personality. It is often used as an explanation for goals. For example, consider the sentences

John raped five women because he is a sex manic.

George lets people stay at his house because he's a very generous person.

The explanation in both cases is that the actor is a certain personality type who is predisposed to behave in the manner of the action to be explained.

That fact the some event or goal is very common often serves as an explanation in a similar way. For example, if a story understander read a sentence that began with "While John was waiting for a bus, he saw a man walking on his hands", the understander need not compute an explanation for John's waiting for the bus; John's inferred goal of going to some unspecified place is common enough so as not to require a more detailed explanation. However, the second part of this sentence seems peculiar precisely because the event is not normal, nor can an underlying plan structure be readily inferred.

The types of intentional explanations are summarized in Figure 1:

Figure 1  
Types of Intentional Explanations

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Item to Explain -----	Explanation -----
Event	Plan of which event is a part
Plan	Goal at which plan is directed
Goal	Theme that gave rise to the goal or Plan to which goal is instrumental or Social stereotype
any	Normalcy

---

Figure 1 describes the constituents of an explanation. But it does not describe how an explanation is constructed for a sentence in a text. Above I stated that a theory more general than script processing is needed because of the inability of that theory to cope with non-stereotypical texts. I offered explanation-driven understanding as this more general notion. The major consideration that this theory must take into account is how the context of a text can influence the explanation that is constructed without making the the inference process too rigid to accomodate reasonable variations.

For example, suppose a reader were given the following short texts:

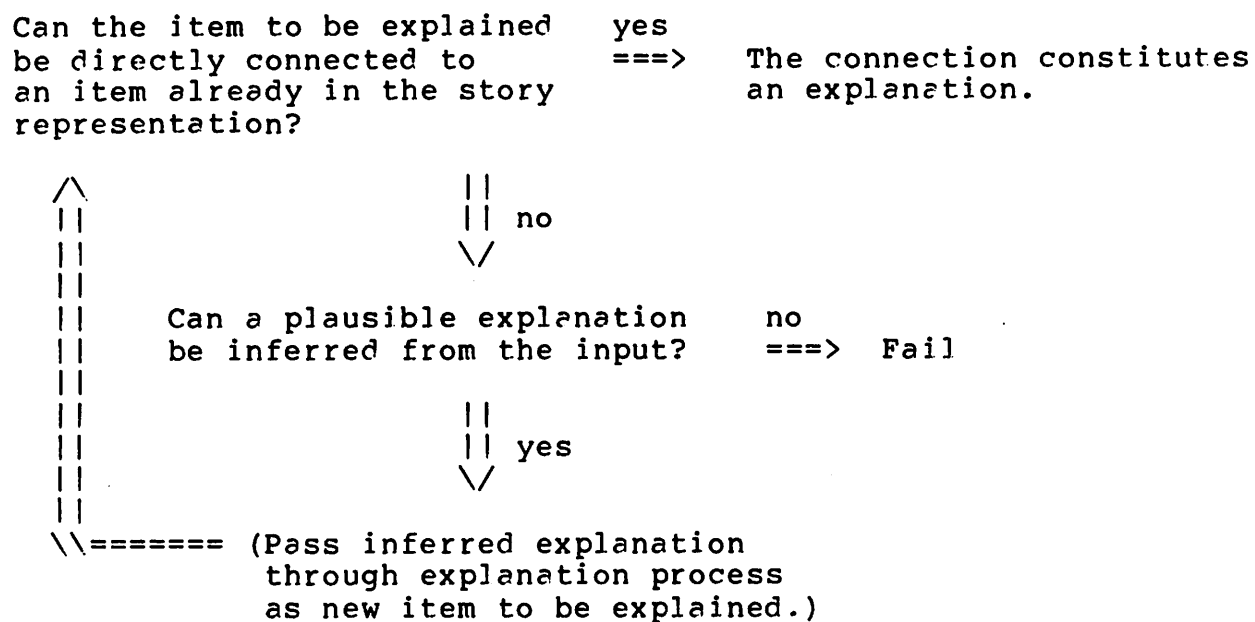
- (3) A bum on the street came over to John. He told John he wanted some money
- (4) A man came over to John and pulled out a gun. He told John wanted some money.
- (5) John's son came over to John. He told John he wanted some money.

In these cases, the second sentence of each text has a different interpretation, even though the sentences are the same. The interpretations are different because they are influenced by the context set up by the first sentence. However, the context does not totally determine the interpretation, as it would in a script-governed situation. For example, in (5), John's son coming over to him does not determine that his son would ask him for something, although it does bias the subsequent processing. The problem is how to allow the context to influence the interpretation while still allowing enough latitude to explain unexpected events.

The general scheme by which explanation-driven understanding accomplishes this is as follows. When an explanation is needed for some element in a text (i. e., an event, a plan, or a goal), the items already known to the reader are checked first to see if any of them constitute an explanation. If so, then an explanation has been found. If not, then the reader consults his general world knowledge to see if any usual explanation for this item is available. If so, the reader tentatively infers that explanation, and tries to find an explanation for that explanation. The process is iterated until either it fails or an explanation has been constructed that relates the input to previous parts of the story.

This process is summarized in Figure 2:

**Figure 2**  
**The Process of Finding an Explanation for an Event**



As an example, consider the processing of the following story taken from Schank and Abelson (1977):

(6) Willa was hungry. She picked up the Michelin guide.

Upon reading the first sentence, the reader learns that Willa has the goal of satisfying her hunger. It is unlikely that this sentence will invoke any script that the next sentence will conform to. Thus the reader must explain why Willa picked up the Michelin guide. Since no plan of Willa's is known to the reader, one must be inferred. Picking up something is usually a plan for having control of something, so Willa must have had the goal of possessing the Michelin guide. This goal must then be explained. Again, there is no ready explanation from the story. However, having possession of something that has a function is usually instrumental to performing that function. Thus the reader infers Willa was going to read the guide. Reading is often a plan for finding out some information, and since the Michelin guide is a source of information about the location of restaurants, the reader infers that Willa must have had the goal of knowing the location of a restaurant. Having this goal can be explained by the fact that knowing the location of a place is often instrumental to going there. Being at a restaurant is in turn instrumental to eating at the restaurant. Eating at a restaurant is a plan to satisfy hunger, which is known to be one of Willa's goals. Thus an explanation for Willa's action has been found, and the inference process can cease.

This notion of explanation and the explanation process just described are incomplete in a number of ways. These shall be discussed later on. For the time being, I will assume this to be an accurate model of a reader, and call the theory of explanation underlying it

naïve explanation.

## 2.2 PAM

The naïve explanation model has been used as the basis of a computer program called PAM (Plan Applier Mechanism) that can understand a number of short texts. PAM has knowledge about the kinds of plans and goals people have, and uses this knowledge in accordance with the algorithm above to find explanations for the events described in a text. PAM can then paraphrase the text from the points of view of the different characters in the text, as well as answer questions about the text.

For example PAM can read the Michelin guide story given above, answer a number of questions about the story and produce a paraphrase from Willa's point of view:

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INPUT TEXT:

Willa was hungry.  
She picked up the Michelin Guide  
and got into her car.

INPUT: Why did Willa pick up the Michelin Guide?

OUTPUT: Because Willa wanted to know where a restaurant was.

INPUT: Why did Willa get into her car?

OUTPUT: Because Willa wanted to get to a restaurant.

INPUT: What were the consequences of Willa picking up  
the Michelin Guide?

OUTPUT: This enabled Willa to read the Michelin Guide.



## OUTPUT:

## THE STORY FROM WILLA'S POINT OF VIEW.

I wanted to get something to eat, but I didn't know where a restaurant was. So I picked up the Michelin Guide, and I got into my car.

\*\*\*\*\*

The question-answering and paraphrasing demonstrate some of the inferences that PAM made as it was reading the story. For example, PAM had to infer that Willa was going to eat at a restaurant, that she picked up the guide in order to read it, that she read the guide to find out where a restaurant was, and that she wanted to know where one was so she could get there. PAM makes these inferences in the course of finding an explanation for Willa's action of picking up the Michelin.

PAM can understand a number of texts that are considerably more complicated than this one. In fact, some of the texts that PAM can process go beyond the model of naive explanation given above. These capabilities of the program will be examined later on. For the present, references to PAM will essentially be references to the part of PAM that implements the naive explanation algorithm. I will sometimes refer to this program (and the associated algorithm) as "naive PAM".

## 3.0 POINTS

PAM is a somewhat more flexible text understander than previous systems since it does not require that a text conform to a rigid structure. However, many of the same criticisms applicable to previous systems insofar as stories are concerned are just as applicable to naive PAM. PAM's "stories" may be less stereotyped than the texts other

systems can process, but they are hardly any more reasonable. A relatively large number of inferences have to be generated to understand the Michelin guide example, but it is no more of a story than texts that conform to scripts. Once again, it is hard to imagine someone not in the field of natural language processing bothering to tell this story to someone else.

While goals and plans are important elements of real stories, the pursuit of a goal does not in and of itself make for good reading. For example, contrast the following two paragraphs:

(7) John loved Mary. He asked her to marry him. She agreed, and soon after they were wed. They were very happy.

(8) John loved Mary. He asked her to marry him. She agreed, and soon after they were wed. Then one day John met Sue, a new employee in his office, and fell in love with her.

Paragraph (7) is typical of the simple goal-based stories that can be understood by naïve PAM. A character has a goal (wanting to marry Mary) generated by a theme (being in love with her) and pursues a plan (asking her) that results in the goal being fulfilled. While (7) is cogent enough, it is not a good story. Most readers would be surprised, for example, if they were promised a story and were given paragraph (7). In spite of its coherent intentional structure, paragraph (7) seems much more like the setting of a story than a story itself.

In contrast, paragraph (8) seems much more promising. Although paragraph (8) does not appear to be a complete story either, it seems to get further along than paragraph (7) before it terminates. Here the reader probably expects the story to be continued with an elaboration of John's situation. In the case of story (7), it is much harder to guess

what the story will be about.

What makes paragraph (8) more of a story than paragraph (7) is that paragraph (8) has a point to it. By a point I mean some element that invokes the interest of a reader. The point of a story is what the story seems to be about. For example, paragraph (7) seems not to be about anything, while paragraph (8) is about a married person who falls in love with someone else.

Stories are structured around what they are about. That is the whole idea of a story is to convey some points to the reader. This content has its own structure, and it largely determines the structure of the story text. The main goal of the story reader is to determine infer the points of a story, and to structure what has been read in terms of these points.

### 3.1 Points Structure Memory

The conceptual representation of a story in memory is structured according to its point content. At one level, a story is conceptualized as a point or set of points that comprise the important content of the text. Beneath this level is a description of the actual events that comprise these points. Beneath this is a level of events that connect up with the major events of the story but do not in themselves constitute points. Finally, there is a level consisting of the actual words of the sentences used to express these ideas.

These levels of representation are hierarchically based on how a story appears to be structured in memory. Suppose someone were asked to read a real story of substantial length, and were then asked to re-tell it. Most likely, not all details of the story will be equally easy to retrieve. The exact words and form of sentences in the text become hard to recall very quickly after reading. Likewise, events and even whole episodes may be forgotten even though the reader still has an excellent idea of what the story is about. One way to account for this behavior is to assume that the story is structured in the reader's memory so that the first thing accessible to the reader is the story's point structure. The reader must then look through this structure to access specific events, and so on. At the very bottom are the literal words, which accounts for the relative difficulty in retrieving them.

For example, a reasonable summary of paragraph (8) might be that John and Mary were happily married, and then John fell in love with another woman. This summary constitutes the point of this story segment, and thereby, the highest level in the memory representation. Note that this summary neglects to mention that John asked Mary to marry him, or that they got married soon after she agreed. These facts are not pertinent to the point of the story, and therefore exist on a lower level of representation. They can be omitted without seriously damaging the overall structure of the story, but John's involvement with another woman cannot be.

It may be possible that the structure of a particular story deviates from this form in some way. For example, if a specific word or sentence formulation happened to be particularly poignant in a given

story, then this poignancy would be reflected by a reference to this item at a high level in the representation. However, such cases appear to be the exception to the description of the levels given above.

### 3.2 Points Affect Processing

Since readers are presumably looking for a point as a text is being read, points often give rise to expectations, or predictions, about what will happen next in the text. For example, a reader of paragraph (7) does not find any point; if the story ends here the reader's expectations are not met and the reader is surprised by the stories pointlessness.

A reader of story (8), on the other hand, interprets the text as the beginning of a poignant episode. The reader of this story will also be surprised if the story terminates here. However, this time, the surprise is due to a point being introduced but not completed. That is, the reader would be equally confused if the story were to continue and introduce other points without continuing to expand on the point already introduced. Without some predefined notion of point, a reader could not judge that one of these stories is better formed than the other.

Thus a reader must possess some notion of what constitutes a point in order to recognize one's occurrence in a story. This knowledge about story points also plays a predictive role as well, since once a point has been referred to by a text, a reader must determine how the subsequent episodes in the story relate to that point.

While text comprehension is normally influenced by points, it is possible that points play a greater role in special kinds of processing. For example, skimming is a text comprehension technique in which the desire to process poignant information dominates the reader's concerns. We shall not be concerned with this sort of processing here, but with the role points play in ordinary comprehension. For a model of skimming as a goal-directed understanding process, see DeJong (1979).

### 3.3 Kinds Of Points

By definition, some points are liable to be idiosyncratic. However, enough points seem to be sufficiently pervasive to allow people to agree that the same point structure exists in the same texts. My goal here is to isolate these common points.

Since points are those things that motivate the telling of a story in the first place, two kinds of points can be distinguished. An external point is some goal a story teller might have in telling a story. An internal or content point is some part of the story itself that generates interest.

External points are what is usually meant when someone refers to "the point of a story." External points include goals like convincing a listener of something (e.g., morals, propaganda), impressing someone, achieving an emotional reaction, or being informative. The external point of a text will certainly have some impact on the content and structure of the text. However, we will not pursue the nature of these kinds of points further. Instead, we will concentrate on those points

that legitimize a text from within. The term point will generally be used to refer to content points when we can do so unambiguously.

Many of the content points in stories have to do with human dramatic situation. A human dramatic situation is a sequence of goal-related events that contains some problem for a character. For example, in story (8), the problem is that John loves someone, but is already married to somebody else. Dramatic situations usually also involve solution components that describe how a problem is resolved.

The notion that problems form the basis of many stories was noted by a number of people, in particular, by Rumelhart (1976). Rumelhart uses the notion of a problem in his theory to refer to any situation involving a goal. The concept of a problem introduced here differs from Rumelhart's in that it requires a character to have trouble fulfilling his goal. For example, Rumelhart's theory does not make the distinction between story (7) and (8) above, although one story clearly appears to be more interesting than the other.

The following text contains an actual story that illustrates some of the problem and solution components of a point that one is likely to encounter in a simple story:

Figure 3  
The Xenon Story

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When John graduated college, he went job hunting and found a job with the Xenon corporation. John was well liked, and was soon promoted to an important position.

One day at work, John got into an argument with his boss. John's boss fired John and gave his job to John's assistant.

John had difficulty finding another job. Eventually, he could no longer keep up the payments on his car, and was forced to give it up. He also had to sell his house, and move into a small apartment.

Then one day, John saw a man lying in the street. Apparently, the man had been hit by a car and abandoned. John called a doctor and the man's life was saved. When he was well, the man called John and told him he was in fact an extremely wealthy man, and wanted to reward John by giving him a million dollars.

John was overjoyed. He bought himself a huge mansion and an expensive car, and lived out the rest of his life in the lap of luxury.

---

A reasonable summary of the Xenon story is the following:

John lost his job and came upon hard times. Then one day John helped a rich person in need, and was rewarded with enough money to last him a lifetime.



This summary conforms to a description of the story's point. In this case, the problem component is the situation that exists after John loses his job and is unable to maintain his lifestyle. The solution component of this point is the fortuitous circumstance that enabled John to once again attain his desired goals.

In order to read this story and produce the summary above, a reader must recognize this problem and solution as the poignant part of the text. To do so, a reader must be capable of realizing that a character is experiencing some difficulty. Unfortunately, stories in which goals are problematic are generally more complicated than the stories naive PAM is capable of handling. For example, the problem in the Xenon story involves John running into a number of difficulties based his inability to find work. This situation does not conform to any of the simple plan-goal type sequences that we use above to explain a character's behavior. That is, none of the planning structures mentioned as far can adequately describe the relationship between not having a job and having to move into a smaller apartment, or why getting a large sum of money should alleviate this problem. In general, the problem is that to understand how a reader is capable of understanding the interesting dramatic situations that occur in real stories, or to build a computer system that is can simulate this process a more powerful theoretical apparatus is needed.

In particular, the problematic dramatic situations that initiate story points usually involve some complex interactions between goals that can create difficulties for a character. For example, in the Xenon story, John's problem involves a relationship between his recurring

goals of living in a certain style, and the state of having a job. In addition to situations involving recurring goals, frequently occurring dramatic situations include those in which there are a number of characters with opposing goals and in which an individual has goals that are in conflict with one another.

### 3.3.1 Summary Of Goal Relationships

The following is a short description of the goal relationships that play a significant role in creating poignant situations. As I have pointed out previously (Wilensky 1978a and 1978b), these relationships are themselves quite complex, and a great deal of knowledge about them is needed by story understanders in order to understand the situations in which they appear. The following section is meant only to illustrate these relationships.

#### 1. Goal Conflict

A goal conflict is a situation in which one character has several goals such that the fulfillment of one goal will preclude the fulfillment of the others. For example, consider the following story:

(9) John wanted to watch the football game but he had a paper due the next day. John decided to watch the football game. John failed Civics.

Story (9) is an instance of a goal conflict because John's goal of watching the football game may interfere with his other goal of writing his paper.

## 2. Goal Competition

Goal competition refers to those situations in which several characters' goals may interfere with one another. For example, the following story contains an instance of goal competition:

(10) John told Bill he would break his arm if Bill didn't give John his bicycle. Bill got on the bicycle and rode away.

John's goal of possessing Bill's bicycle cannot be fulfilled along with Bill's goal of preserving possession of the bicycle. If Bill succeeded in preserving possession of the bicycle, then John would have failed to fulfill his goal.

## 3. Goal Subsumption

Goal subsumption refers to a situation in which a character's plan is to achieve a state that will make it easier for a character to fulfill a recurring goal. For example, the following story contains an instance of goal subsumption:

(11) John was tired of frequenting the local singles' bars. He decided to get married.

In this story, John decides to get married in order to make it easier to achieve the goals he had been achieving previously by going to a singles' bar.

These particular goal relationships are important here because the situations to which they give rise account for a large class of story problems. That is, dramatic situations involve a difficulty in fulfilling a goal, and these difficulties often arise due to goal

interrelations. In particular, goal relationships can give rise to these problems and associated solutions:

1. Goal Conflict - If a character is unable to resolve a goal conflict, then one of that character's goals may fail. Thus goal failure due to goal conflict, and attempts to resolve goal conflict both provide interesting story situations. In addition to attempts at resolution, a goal conflict may resolve itself spontaneously under a set of fortuitous circumstances.

2. Goal Competition - As with goal conflict, the existence of competitive goals implies that some character may have trouble fulfilling his goal. Interesting stories therefore exist involving goal failure due to goal competition, struggles against the plans of other characters (which we call anti-planning), attempts at easing the competition, and spontaneous resolution of the problem.

3. Goal Subsumption - Goal subsumption gives rise to dramatic situations when a subsumption state is terminated. For example, if John is happily married to Mary, and then Mary leaves him, all the goals subsumed by their relationship may now be problematic - John may become lonely, and miss his social interactions with Mary, for instance. Closely related to problems based on goal subsumption are those caused by the elimination of normal physical states. For example becoming very depressed or losing a bodily function can give rise to the inability to fulfill recurring goals, and can therefore generate some interesting problems.

The resolution of goal subsumption termination involves establishing a new subsumption state to re-subsume the recurring goals.

#### 4.0 GOAL RELATIONSHIP POINTS

Goal subsumption termination is a problem point component because previously subsumed goals become problematic. Goal conflict and goal competition endanger the fulfillment of some of a character's goals, and therefore generate dramatic impact. On the solution side, we have goal conflict resolution, goal abandonment, antiplanning, re-subsuming subsumption states, and spontaneous conflict and competition removal.

However the dramatic nature of goal relationships is not independent of how these relationships are presented in a text. For example, consider the following misuse of a potentially poignant goal relationship:

(12) John lost his job. Then he found another one.

This is not a particularly dramatic situation. It contains an instance of goal subsumption termination (John losing his job) and a solution to the problem this creates (John getting a new job). Nevertheless, (12) hardly qualifies as an interesting story.

The problem with (12) is that it contains the cause of the problem, the termination of a subsumption state, but no description of the problem itself. Contrast (12) with the Xenon story given at the beginning of this paper. John also lost his job in that story but the situation contains considerably more dramatic impact. In the Xenon

story we are given a description of John's problem state. He could no longer afford all the things he had become used to. Since the problem is spelled out in this story, its dramatic effect is more fully realized.

Thus the mere appearance of a problematic goal relationship does not guarantee its poignancy. The problem must appear in a form that spells out its implications. I call these forms point prototypes. A point prototype is a kind of distillation of the dramatic element of which the goal relationship is a part. The Xenon story above will serve to illustrate such a prototype.

The problem for John in the Xenon story is caused by a goal subsumption state terminating. To make this poignant, the story uses the problem point prototype in Figure 4 to fill out the circumstances of the problem.

Figure 4  
Goal Subsumption Termination Prototype

- 
1. Subsumption state
  2. Cause of termination event
  3. Problem state description
    1. Unfilled precondition
    2. Problematic goals
    3. New goal (optional)
    4. Emotional reactions (optional)
-

That is, to use subsumption state termination as a problem point, first state the subsumption state, followed by the cause of termination event. Then describe the problem state itself by listing the goals that are no longer subsumed; the goal of re-establishing a subsumption state may be stated also, along with any emotional reactions to the termination.

In the Xenon story, this prototype is instantiated as is shown in Figure 5.

Figure 5  
Instantiated Goal Subsumption Termination Prototype

- 
1. Subsumption state - John has job.
  2. Cause of termination event - Boss fires John.
  3. Problem state description
    1. Unfilled precondition - John doesn't have enough money.
    2. Problematic goals - Maintaining car and house.
    3. New goal - John wants to resubsume these goals.
    4. Emotional reactions - not explicitly stated.
- 

This problem is resolved in the story through a very common solution point called Fortuitous Circumstances. Spontaneous goal conflict resolution and external goal competition removal are also instances of this solution point component, which is shown in Figure 6.

Figure 6  
Fortuitous Circumstance Solution Prototype

---

1. Undesired state
  2. Fortuitous event
    1. Incidental action
    2. Fortuitous outcome
    3. New state
  3. State consequence description
- 

This solution prototype is instantiated in the Xenon story as Figure 7 shows.

Figure 7  
Instantiated Fortuitous Circumstance Solution Prototype

---

1. Undesired state - John doesn't have enough money.
  2. Fortuitous event
    1. Incidental action - John saves rich man.
    2. Fortuitous outcome - Rich man gives John money.
    3. New state - John is rich.
  3. State consequence description - John is happy and gets lots of possessions.
-



#### 4.0.1 Some More Solution Point Components

Solution point components and their associated prototypes have not yet been analyzed in as much detail as the problem components have been. However, in addition to the fortuitous circumstances solution given above, several other solution point components seem to be common.

One such solution is called "More Desperate Measures". In this point, a problem is attacked by some plan that is normally not considered because of its high risk. Because of this risk, More Desperate Measures solutions tend to generate goal conflicts their user, thus creating another problem point component for the story. For example, in the Xenon story, after John loses his job, he might decide to rob a bank to get some money. Robbery entails a number of risks, so the use of this plan would create a goal conflict for John between his desire to have money and to preserve his well-being. This point would then be developed further in the story.

Overcoming a Limitation is another solution point seen with some frequency. This case can occur when a problem is based in part on a character's inability or lack of courage. Here the character attempts to overcome his personal limitation or see the error of his ways in order to resolve a problematic situation. For example, a typical fairy tale type plot might involve a character who is a subject of ridicule by his peers because he is a coward, and then overcomes his cowardess in some heroic deed.

## 5.0 CURRENT STATE OF PAM

As was mentioned previously, the naïve explanation algorithm fails to find proper explanations for events in stories involving goal relationships. However, a more sophisticated version of PAM has been implemented that possesses knowledge about the goal relationships described above. PAM can use this knowledge to infer explanations for events in many complex goal relationship situations.

The following simple examples illustrate some of the situations involving goal relationships that PAM can understand:

\*\*\*\*\*

Goal Subsumption:

Input text:

JOHN AND MARY WERE MARRIED.  
THEN ONE DAY JOHN WAS KILLED IN A CAR ACCIDENT.  
MARY HAD TO GET A JOB.

Input: WHY DID MARY NEED EMPLOYMENT?

Output: JOHN DIED AND SO SHE NEEDED A SOURCE OF MONEY.

\*\*\*\*\*

Pam infers that John's death terminates a subsumption state for Mary, and that she may seek to replace it. PAM uses this inference to infer that the explanation behind Mary's goal of getting a job.

\*\*\*\*\*

Goal Conflict:

Input texts:

WILMA WANTED TO HAVE AN ABORTION.  
WILMA WAS CATHOLIC.  
WILMA CONVERTED FROM CATHOLICISM TO EPISCOPALIANISM.

WILMA WANTED TO HAVE AN ABORTION.  
WILMA WAS CATHOLIC.  
WILMA WENT TO A ADOPTION AGENCY.

FRED WANTED TO TAKE HIS GUN HUNTING.  
FRED WANTED WILMA TO HAVE A GUN AT HOME.  
FRED ONLY HAD ONE GUN.  
FRED BOUGHT ANOTHER GUN.

\*\*\*\*\*

In the first two stories, PAM detects a conflict between Wilma's goal of having an abortion and her inferred goal of not having an abortion because she is Catholic. In the first story, PAM infers that Wilma resolved the conflict by changing the circumstance that gives rise to one of her goals, and fulfilled the other (i. e., she decided to have the abortion). In the next case, PAM infers that Wilma abandoned her goal of having an abortion because it meant less to her than violating her religious beliefs.

The third story is a goal conflict based on a resource shortage. Here PAM infers that Fred bought another gun so he could take one with him and leave one at home.

\*\*\*\*\*

Goal Competition:

Input text:

JOHN WANTED TO WIN THE STOCKCAR RACE.  
BILL ALSO WANTED TO WIN THE STOCKCAR RACE.  
BEFORE THE RACE, JOHN CUT BILL'S IGNITION WIRE.

Input: WHY DID JOHN BREAK AN IGNITION WIRE?

Output: BECAUSE HE WAS TRYING TO PREVENT BILL FROM RACING.

\*\*\*\*\*

This story contains an instance of a goal competition situation involving anti-planning. PAM explains John's action as part of a plan to undermine Bill's efforts by undoing a precondition for Bill's plan.

PAM also have been given some knowledge about poignancy. In particular, PAM knows about goal subsumption termination problem components, and fortuitous circumstance solution points. With this knowledge, pam can now understand the following version of the Xenon story:

\*\*\*\*\*

JOHN GRADUATED COLLEGE. JOHN LOOKED FOR A JOB. THE XENON CORPORATION GAVE JOHN A JOB. JOHN WAS WELL LIKED BY THE XENON CORPORATION. JOHN WAS PROMOTED TO AN IMPORTANT POSITION BY THE XENON CORPORATION.

JOHN GOT INTO AN ARGUMENT WITH JOHN'S BOSS. JOHN'S BOSS GAVE JOHN'S JOB TO JOHN'S ASSISTANT. JOHN COULDN'T FIND A JOB. JOHN COULDN'T MAKE A PAYMENT ON HIS CAR AND HAD TO GIVE UP HIS CAR. JOHN ALSO COULDN'T MAKE A PAYMENT ON HIS HOUSE, AND HAD TO SELL HIS HOUSE, AND MOVE TO A SMALL APARTMENT.

JOHN SAW A HIT AND RUN ACCIDENT. THE MAN WAS HURT. JOHN DIALED 911 THE MAN'S LIFE WAS SAVED. THE MAN WAS EXTREMELY WEALTHY, AND REWARDED JOHN WITH A MILLION DOLLARS. JOHN WAS OVERJOYED. JOHN BOUGHT A HUGE MANSION AND AN EXPENSIVE CAR, AND LIVED HAPPY EVER AFTER.

\*\*\*\*\*

In addition to the many inference that are made to understand this story, PAM also recognizes that John's losing his job is an instance of a Goal Subsumption Termination problem, and that the hit and run victim rewarding John is an instance of a Fortuitous Circumstance solution to this problem. This representation can be used by a summarization program to produce a summary that included only the events of John losing his job, the problems this caused, John's saving the rich man, and the rich man rewarding him. Alternatively, only these events can be remembered, and the unimportant events intelligently forgotten. (These programs produce conceptual summaries that contain these events, although they cannot yet be generated in English).

## 6.0 SOME PSYCHOLOGICAL IMPLICATIONS OF POINTS

The notion of a story point suggested here gives rise to some testable predictions about the process of story comprehension. The following are some instances, none of which have yet been subjected to empirical scrutiny:

1. Subjects should be able to classify texts into stories or non-stories as a function of their point content. That is, stories that contain related problem and solution prototypes should be judged as being better formed stories than those that do not conform to any point prototype, or those that contain only incomplete or unrelated point components.

2. Story recall should measurably reflected a story's point structure. Since story memory is presumably structured by the points present in the story, those events most germane to story points should be the easiest to recall. This should be manifest in several ways. First subjects asked to paraphrase the story should remember most of poignant events but may forget some events tangential to the point structure. Second, subjects asked to summarize the story should essentially produce an outline of the story's point structure. Third, recall of poignant events should be faster than that for the rest of the events in the text.

3. The predictive function of story points should be ascertainable by giving subjects story fragments and asking them to complete the stories, or to judge which of several alternative completions is more satisfactory. Presumably, subjects will prefer to introduce a point if none has yet been encountered; they will continue to fill out an incomplete point prototype; they will follow a problem component with a solution; and they will either terminate a story that contains an entire point or continue it by introducing a new point.

Most of these effects should be greater as the time after understanding lengthens. Thus the hierarchical structure imposed by points controls the forgetting process as well as recall: The higher up an item is in the point structure, the less likely it will be forgotten.

## 7.0 OTHER POINTS

The analysis of story points presented here is far from complete. However, I believe it is developed enough to suggest that the notion of storyness is not so much one of form but one of content. The discussion above is prototypical of a direction for research that I feel will be a profitable to study stories and story comprehension.

The notion of a story point goes beyond the idea of the simple dramatic situations outlined above. Points are those things that generate interest, and therefore should also involve constructs such as enigma, novelty, tragedy and humor. For example, a common technique to maintain interest in a novel is to create a mystery, or a situation for which no explanation is readily inferrable by the reader. The content of all these constructs is in need of analysis.

In addition, the notion of poignancy is not limited to the domain of stories. Other forms of communication have their points as well. For example, conversations seem to have a point structure within them. Consider the following sentences as conversational utterances:

- (13) Just before I came in to your office I was outside and I noticed a meter maid about to write a parking car ticket and put it under the windshield of a car.
- (14) Just before I came in to your office I was outside and I noticed a meter maid about to write a parking car ticket and put it under the windshield of your car.

After utterance (13), most people would still be waiting to hear what the speaker was getting around to saying. However, utterance (14) fits into a predefined conversational point and the speakers remark immediately becomes salient. I expect that the point structure of

interpersonal communication is at least as complicated as that of stories, and possibly more basic. However, neither have been analyzed sufficiently at this time to allow adequate comparison.

## 8.0 SUMMARY

Stories constitute a subset of coherent natural language texts. To establish text coherence, a great deal of knowledge is needed about people's goals and plans. This process by which this knowledge can be applied is termed explanation-driven understanding. It uses what has been heard previously to help disambiguate subsequent events, but does not constrain the understanding process to "canned" event sequences.

For texts to be stories, they must be poignant in addition to being coherent. This point structure of a story serves to organize the representation of a story in memory so that more important episodes are more likely to be remembered than trivial events. Points also serve to generate expectations about what will happen next in a story, since a story reader is looking for the point of a story as the text is being read.

An important class of story points deals with human dramatic situations, and these most often contain a set of interacting goals that create difficulties for a character. A taxonomy of these goal relationships and the situations they give rise to is useful for detecting a point of a story, as well as for establishing its coherence as a text. When a goal relationship situation occurs as a problem point component, it will occur as part of a point prototype. These prototypes



specify those aspects of the situations that should be mentioned in order to produce a dramatic effect.

The notion of a story point competes with the idea of story grammars as a way to characterize story texts. The story grammar approach attempts to define a story as a text having a certain form, while the story point idea defines a story as a text having a certain content. The form of a story is viewed here as being a function of the content of the story, not a reasonably independent object. Understanding stories, then, is not so much a question of understanding the structure of a text, but of understanding the point of what the text is about.

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