GENERATING NATURAL LANGUAGE UNDER PRAGMATIC CONSTRAINTS

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Though much work in natural language generation remains to be done with regard to syntax, the main stumbling block that prevents existing generators from easily producing coherent paragraphs is our lack of understanding of text planning. To remedy this, we should view generations preeminently as a planning task; that is, we should study the goals that underlie text production, the plans that help achieve these goals, and the ways the plans can interact with grammar. A clue to the nature of these goals is the fact that people say the same thing in various ways. They can vary the content and form of their text when they want to convey more information than is contained in the literal meanings of their words. This information expresses the speaker's interpersonal goals toward the hearer and, in general, his perception of the pragmatic aspects of the conversation. This paper identifies goals that arise from pragmatic aspects of the conversation, plans and strategies to achieve them, and how they constrain the decisions a generator has to make during the realization process. To illustrate some of these ideas, a computer program is described which produces stylistically appropriate texts from a single representation under various settings that model pragmatic circumstances.

1. The problem

It is straightforward to write a language generation program that produces impressive text by associating a sentence template (or some equivalent general grammatical form) with each representational item and then using a grammar to realize the template into surface form. Such a program, however, is not sensitive to anything but the input items, and therefore produces the same output to all hearers in all circumstances.

When we produce language, we tailor our text to the hearer and to the situation. This enables us to include more information than is contained in the literal meanings of our words; indeed, the additional information often has a

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stronger effect on the hearer than the literal content has. This information is carried by both the content and the form of the text. As speakers and hearers, we attach various interpretations of the speaker, his goals, the hearer, and the conversational circumstances, to the various ways of expressing a single underlying conceptualization. These interpretations are governed by rules. Speakers use the rules to determine how to say what they want to say. Generator programs with any flexibility of expression require such rules too.

What is the additional information that speakers can convey? Compare the following four descriptions of an event that occurred at Yale in April 1986, and consider the differences in point of view the speaker communicates in each:

(1) “On April 4, concerned Yale students constructed a shantytown on Boesak Plaza as a reminder to those in Woodbridge Hall (and all over campus and the community) that Yale is complicit [sic] with the system of apartheid that creates shantytowns where thousands of blacks are forced to live in squalor and fear. The shantytown, Winnie Mandela City, served as a focal point of education concerning South Africa and Yale’s investments there. At 5:30 am on April 14 the Yale Administration had the shantytown torn down and had 76 students and community members who were defending the shanties arrested. After a huge outcry, the Administration allowed the shanties to be rebuilt. We will not be silenced; we will continue to challenge the University on their moral failure.” (From: protester literature; the protesters renamed the plaza after the South African churchman Allan Boesak.)

(2) “On April 4, a small group of students took over Beineke Plaza and built some shanties; they wanted to force Yale to sell its stocks in companies with branches located in South Africa. The university asked the students to move the shanties to another location, but the students refused. The university then granted them permission to occupy the plaza until the end of the week, so that they could be there to be seen by the university’s trustees, the Yale Corporation, at their meeting. But even after the meeting, the students refused to leave the plaza, and police had to clear the shanties. Later, the university relented, and gave them permission to rebuild the shanties. It also announced that it would send a fact-finding mission to South Africa.” (Speaker: anti-divestment student.)

(3) “On April 4, students at Yale built a symbolic shantytown to protest their school’s investments in companies doing business in South Africa. The college ordered the shanties destroyed. The police arrested 76 protesters when the shantytown was torn down. Local politicians and more than 100 faculty members criticized the action. A week after it had ordered the removal of the shantytown – named Winnie Mandela City, after the South African foe of apartheid – the shantytown was reconstructed and the
administration agreed to allow it to remain standing. Concurrently, Yale announced that its trustees, the Yale Corporation, would soon send a fact-finding mission to South Africa to investigate the actions of corporations in which it owns between $350 million and $400 million of stock.” (From New York Times, Sunday, 27 April, 1986, Connecticut section.)

(4) “Some students erected a shantytown to protest Yale’s investments in companies that have operations in South Africa. The University tore it down and arrested several of them. The students continued to demonstrate and finally the university said they could put up the shantytown again. The university said it would investigate its investments in South Africa.” (Speaker: neutral student.)

Clearly, the first two speakers incorporate strongly their opinions about the shantytown issue; the second two speakers seem more neutral but differ in level of formality. In order for generator programs to produce similarly varied, information-bearing text, such programs must have some means of representing relevant characteristics of the hearer, the conversation setting, and their interpersonal goals. These are the pragmatic concerns. In addition, they must contain choice points in the grammar that enable topics to be said in various ways. These are the syntactic concerns. Finally, they require criteria by which to make the decisions so that the choices accurately reflect the pragmatic aspects and convey appropriate additional information. These are called here the rhetorical concerns.

In Artificial Intelligence research, some work has been done on various aspects of the computer generation of pragmatically appropriate language. The effect of the hearer’s knowledge on the selection of speech acts was studied by Cohen (1978); on planning the inclusion and organization of topics by Appelt (1981), and on user instruction by Woolf and McDonald (1984); the explanation generator of Swartout (1981) had a switch distinguishing between programming and medical expert users; Jameson (1986) modeled generation in evaluative contexts such as job interviews; Bienkowski (1986) describes automatic elaboration of basic text. Much related work on the structure of discourse uses some pragmatic information, for example, Grosz and Sidner (1985), Grosz (1986), and McCoy (1986).

This paper describes how the program PAULINE (Planning And Uttering Language In Natural Environments) produces stylistically appropriate texts from a single story representation under various settings that model pragmatic circumstances. First, the paper describes the program’s pragmatic settings and syntactic choices; this is followed by a description of the way these can be linked using a set of intermediate-level goals. Next, the architecture of PAULINE is described. Finally, two such goals and strategies for achieving them are discussed, including a description of the generation of example texts.
2. Incorporating pragmatics in a generator

2.1. Typical pragmatic features

Though there has been much discussion about what pragmatics as a field of inquiry is all about (see, say, Carnap (1938), Morris (1938), Katz (1977), Grice (1957), Gazdar (1979), Searle (1979), and Levinson (1983)), no generally accepted scheme has emerged yet. Gazdar (1980) lists pragmatic constraints on sentences; Bühler (1934) names some pragmatic aspects of conversation; Jakobson (1960) extends this list. In the tradition of systemic grammar (see, say, Halliday (1976)), interesting recent work on pragmatics can be found in Fawcett (1980) and Gregory (1982).

If, however, we want to study the relationship between pragmatic considerations and computer language generation, we have to start with something concrete enough to program. Therefore, as a pragmatic characterization of its conversation, PAULINE was simply given a list of features that are similar to many of those commonly discussed. Much work must be done before we understand any of the features well enough to make any strong claims about them. But we must begin somewhere. The (pragmatic!) justification of these features is that they are the kinds of features necessary to make a generator of this type work.

In the representation of pragmatics used here, each feature was given a fixed number of possible values, usually lying on a scale. In a few cases, features were conflated and the result merely given a set of distinct values; this should eventually be refined. PAULINE uses the following characterization of the conversation setting to modulate its text:

*Conversational atmosphere (setting):*
- time – much, some, little
- tone – formal, informal, festive
- conditions – good, noisy

*Speaker:*
- knowledge of the topic – expert, student, novice
- interest in the topic – high, low
- opinions of the topic – good, neutral, bad
- emotional state – happy, angry, calm

*Hearer:*
- knowledge of the topic – expert, student, novice
- interest in the topic – high, low
- opinions of the topic – good, neutral, bad
- language ability – high, low
- emotional state – happy, angry, calm
Speaker-Hearer Relationship:
depth of acquaintance – friends, acquaintances, strangers
relative social status – dominant, equal, subordinate
emotion – like, neutral, dislike

In addition, PAULINE can have the following interpersonal goals:

Hearer:
- affect hearer’s knowledge – teach, neutral, confuse
- affect hearer’s opinions of topic – switch, none, reinforce
- involve hearer in the conversation – involve, neutral, repel
- affect hearer’s emotional state – anger, neutral, calm
- affect hearer’s goals – activate, neutral, deactivate

Speaker-Hearer Relationship:
- affect hearer’s emotion toward speaker – respect, like, dislike
- affect relative status – dominant, equal, subordinate
- affect interpersonal distance – intimate, close, distant

Assuming that generation is influenced by pragmatic aspects of this kind, the question is: how? To answer this, we must consider what the generation process itself involves.

Any system that produces a sentence must perform a large number of tasks, each with characteristic decisions. These decisions range from having relatively wide-range syntactic effect, such as the selection of topics and their organization into phrases and sentences, to having relatively localized effect such as word choice. PAULINE makes the following types of decisions:

topic collection: collect aspects of the topic and related items as candidate sentence topics,
topic organization: find appropriate groupings and interpretations of the candidate topics; find appropriate ways to juxtapose them in multi-predicate phrases; find ways of expressing relationships among them,
sentence organization: for each topic, select an appropriate subject, pre-sentence clauses, vcrb, predicate clauses, etc., and order them,
clause content and organization: determine and order the contents of clauses and noun groups, and
word choice: select appropriate words and phrases.

Whatever the nature of the generator and the implementation of the grammar, all generators have to perform these tasks. The simplest programs, of course, perform them by having only one available option. However, as soon as a generator is given the ability to realize an item of representation in more than one way, it has to be able to make its choice in a principled manner. Since
different realizations carry different pragmatic effects, the pragmatic aspects of conversations must help determine the speaker's text by influencing the generator's decisions.

This argument seems plausible but runs into problems. Inevitably, attempts to write down rules that relate pragmatic aspects to generator production decisions become bogged down in minutiae and produce rules with very little credibility. For example, what is the effect on sentence length if the speaker is socially dominant over the hearer? Should speakers who want to be friendly make active or passive sentences? Most pragmatic aspects do not influence the decisions directly, since they are simply too general to be attuned to the requirements of language production.

2.2. Rhetorical Goals

The solution proposed here is that speakers use a number of goals and associated strategies that act as intermediaries between, on the one hand, their interpersonal goals and perception of other pragmatic aspects of the conversation, and, on the other, the syntactic decisions their realization components have to make. These goals will be called rhetorical goals. Two groups of strategies they control are presented here: the strategies of opinion and the strategies of style.

Rhetorical goals of opinion achieve their results by a number of techniques, such as judicious topic collection, the appropriate juxtaposition of topics into phrases, the inclusion of stress words, adjectives, and adverbs, and the use of slanted words. These goals are described later.

Rhetorical goals of style achieve their results by causing characteristic stylistic effects in the text. Through style, the speaker can communicate additional information that the hearer can interpret and respond to. Classifying all the possible styles of text is an impossible task: One can imagine text characteristics that fit almost any adjective! But certain features of text, such as formality and force, are generally accepted as stylistic. A study of some of the major handbooks of good writing (Weathers and Winchester (1978), Birk and Birk (1965), Payne (1969), Hill (1892), Loomis, Hull and Robinson (1936), Baker (1966), Cowan and McPherson (1977), Strunk and White (1959), Willis (1969)) indicates that the authorities agree on a few common broad-based features in their discussions of style. These aspects they usually describe in terms of the characteristics of finished paragraphs of text. However, such a descriptive approach is of very little use in a theory of language production, since it never makes clear why and how each style is formed out of words; nor does it indicate any systematicity behind the classification of styles.

In contrast to such descriptions, a functional approach is to describe styles in terms of the abovementioned five types of decisions a generator has to make. Thus the techniques to achieve rhetorical goals are defined as criteria for generator decisions (examples are given below). These criteria, then, form
the link between the syntactic concerns of the generator and the rhetorical goals.

The relations between the rhetorical goals and the pragmatic aspects of the conversation are, however, not so clear-cut. Pragmatic-based generation would be simple if a one-to-one correspondence existed between rhetorical and pragmatic goals. In this case, each rhetorical goal would simply be the repository for the generator-specific knowledge required to express its pragmatic partner: For example, the goal to cheer up the hearer would result in happy text, regardless of what other pragmatic conditions held for the conversation. Then there would be no reason for the separate existence of rhetorical goals. However, the pragmatic aspects of conversations are not independent. This fact necessitates the existence of rhetorical goals as entities distinct from pragmatic features. To illustrate, note that a single rhetorical goal can express opposite pragmatic aspects under different conditions. For example, if the speaker has the goal to make the hearer feel close to her, she may activate the rhetorical goal to the humorous. Usually this will work well, but it will backfire if the hearer has just heard of his mother's death. In this case, an appropriate rhetorical goal is the goal to be serious and slightly formal – which, under normal circumstances, would tend to alienate him. Hence, combinations of rhetorical goals act in concert to produce pragmatic effects. For another example, note that low formality, high force, and high partiality together have an effect on the text that is distinctly pragmatic and clearly distinguishable from the text produced when these values are inverted: the former could be characterized as no-nonsense, the latter as blather. Thus, though rhetorical goals are activated by configurations of pragmatic aspects, they must exist separately from them in a generator.

Rhetorical goals, then, are the ways speakers' pragmatic goals can index to (and can determine the application of) their stylistic and opinion-manipulative techniques, which control the decisions of the realization process. The advantages of defining and using rhetorical goals are that they enable one to make explicit, collect, and organize many generator strategies and design characteristics that most generators have left implicit or have avoided altogether.

2.3. PAULINE's rhetorical goals of style

PAULINE uses the following stylistic rhetorical goals, with values as indicated:

*formality* (highfalutin, normal, colloquial): highfalutin language is used for speeches and toasts,

*simplicity* (simple, normal, complex): simple text has short sentences and easy words,

*timidity* (timid, reckless): willingness to spend time to consider including opinions,
partiality (impartial, implicit, explicit): how explicitly you state your opinions, 
detail (details only, interpretations, both): too many details can be boring to nonexperts,
haste (pressured, unplanned, somewhat planned, planned): when there’s little 
time, you speak fast . . . 
force (forceful, normal, quiet): forceful text is energetic and driving, 
floridity (dry, neutral, flowery): flowery text contains unusual words, 
color (facts only, with color): colorful text includes examples and idioms, 
personal reference (two ranges, for speaker and bearer): amount of direct 
reference to the interlocutors, 
openmindedness (narrow-minded, openminded): willingness to consider new 
topics, and 
respect (arrogant, respectful, neutral, cajoling): tone of respect.

Of course, it is impossible to list all possible styles. Every speaker has an 
idiosyncratic set of techniques, often tailored to particular hearers, for using 
language to achieve his or her interpersonal goals. Thus, this work should not 
be interpreted as claiming to describe exhaustively language users’ stylistic 
knowledge. Rather, it is intended as a description of the general function of 
style in a generator – the expression of rhetorical goals, which in turn serve 
the speaker’s interpersonal goals in the text; and of a useful method of definition 
of style – as certain types of constraints on the decisions the generator has to 
make.

3. The Program

PAULINE generates texts in three distinct domains: It produces different ver-
sions of the output of JUDGE, a program that models the sentencing behavior 
of a judge (see Hovy (1986b), Bain (1985, 1986)); it generates various descrip-
tions of a hypothetical primary election outcome between Carter and Kennedy 
(see Hovy (1986a)); and it generates over 100 variations of the shantytown 
story described above. The program consists of over 12,000 lines of T, a 
Scheme-like dialect of LISP developed at Yale.

The shantytown episode will be used for illustration in this paper. A represen-
tation of the episode was built up using representation elements based on 
Conceptual Dependency (the semantic representation scheme described in 
Schank (1972, 1975, 1982) and Schank and Abelson (1977)), and defined in a 
property-inheritance network such as described in Charniak, Riesbeck and 
McDermott (1980). The episode representation consists of about 75 elements 
denoting the events, actors, locations and props, and of about 50 elements 
denoting the relationships (temporal, intergoal, causal, etc.) that hold among 
them.
3.1. Program architecture

The structure of PAULINE is illustrated in figure 1. Briefly stated, the program works in the following way: It is given one or more input topics, opinions, and values for the pragmatic features of its 'conversation', including the hearer's sympathies and relationship to the speaker. It uses these values to activate the appropriate rhetorical goals. Then, starting with the given input topics, it proceeds to collect additional sentence topics and to organize them, associating with each topic an increasing amount of information, and gradually building up goals to make sentences. These tasks are the traditional generation planning tasks. Each goal then causes the realization component to convert the representation of its sentence topic into a grammatical sentence.

In PAULINE, rhetorical planning and realization are interleaved processes, where the interleaving takes place at the decision points mentioned above. PAULINE's approach differs from the traditional planning paradigm, in which one (or more) initial goal(s) is transformed, after a hierarchical goal-plan expansion cycle, into a series of steps that are executed by some agent. In the generation process, this approach takes the form of building up and associating...
generator instructions with increasingly detailed parts of the input topics until, eventually, enough instructions have been assembled to realize each part of the input as one or more words (see Appelt (1981)).

Of course, planning all the way down to the actual details of word choice requires that the planner have access to as much syntactic knowledge as the realization component itself. This obviates the need for a realization component. This model is unrealistic, however: We don’t start speaking only when we have planned out the full utterance. When we start speaking, we have usually made some decisions and have postponed others; that is, we have some vague notion about what topics we want to cover, and maybe even of the desired slant and a particular phrase we want to use; we have the details – especially the syntactic details – for later, real-time, consideration. This suggests that the planner assemble only a partial set of generator instructions – enough for the realization component to start working on – and then continue planning when the realization component requires further guidance. Thus, as argued in Hovy (1985), the solution is to interleave planning and realization.

When a number of rhetorical goals are activated, certain of their strategies are likely to make conflicting suggestions at decision points. This conflict can be dealt with in various ways. One way is simply to ‘average out’ conflicting suggestions (say, two suggestions for ‘long sentences’ cancel out two for ‘short sentences’). Another is to use the values to make decisions in proportion to the number of activated strategies, for example by making every third sentence short. This is the reason to monitor the satisfaction of rhetorical goals. Another way is to order the goals in importance and use strategies accordingly. This is the solution used in the construction of PAULINE.

3.2. PAULINE’s grammar

In PAULINE, syntax goals are achieved by functions called syntax specialists. Each specialist accepts a piece of input representation, inspect it, and produces an ordered list of words and/or other syntax goals that each associate another specialist with a piece of the input. The specialists correspond to the clause templates of Danlos (1985), or to the realization classes of McDonald’s generator MUMBLE (for example, McDonald and Pustejovsky (1985)); they can be seen as implementations of the systems in the systemic grammar of Halliday (1976) (for a clear exposition, see Patten and Ritchie (1986)), and so resemble the systems in Nigel, the systemic grammar implemented by Mann (1983a, 1983b).

Syntax specialists are the repositories of information about the linguistic options that exist for achieving their goals. The criteria by which these decisions are made can be grouped into three classes: syntactic, semantic, and pragmatic. Syntactic criteria are binding; if they are ignored, ungrammatical sentences result. (For example, when saying a verb, choices concern singular or plural
endings, appropriate tenses, and aspect.) Semantic criteria depend on the nature of the input and its relations to other concepts and the constraints on use of words. (For example, for the representation elements INGEST, the verb must match features of the OBJECT: a liquid gives 'drink', a solid 'eat', and a gas 'breathe'. This idea was first described in Goldman (1973).) Pragmatic criteria relate to the affective values of words and their interactions with the speaker's goals, and are determined by strategies such as those described below.

The specialists are part of the lexicon in exactly the same way the definitions of individual words are. Specifically, at the level of verbs, no clear distinction exists between specialists and words, since verbs contain so much sentence-building information. In this case, the predicate-builder specialist performs the same function as the idiosyncratic predicate patterns associated with verbs such as 'search for' (vs. 'seek'); 'tell X that Y' (vs. say to X that Y); 'kick the bucket' (vs. 'die'). PAULINE's phrasal grammar is described in Hovy (1987).

4. Formality

This section and the following one describe the communication in text of pragmatic information relating to formality and partiality.

The level of formality of the text expresses the perceived distance between the interlocutors as well as the tone, or level of formality, of the conversation. The level of formality is most apparent when it is inappropriate or is suddenly changed. When speakers become less formal they signal a perceived or desired decrease in the interpersonal distance, since this permits the selection of more intimate topics and the use of more personal phrases and words. However, being too informal for the occasion seems cheeky or irreverent. Conversely, if the speakers become more formal, they indicate the opposite, perhaps after taking offence or disliking the topic. Being too formal seems cold.

This section describes how a generator can be made to produce text of various levels of formality, given certain pragmatic goals. With appropriate settings and three input topics - the construction of the shantytown, its removal, and the subsequent permission to rebuild - PAULINE produces, for example, the following informal description of the event:

Example 1

STUDENTS PUT A SHANTYTOWN, WINNIE MANDELA CITY, UP ON BEINECKE PLAZA IN EARLY APRIL. THE STUDENTS WANTED YALE UNIVERSITY TO PULL THEIR MONEY OUT OF COMPANIES DOING BUSINESS IN SOUTH AFRICA. OFFICIALS TORE IT DOWN AT 5:30 AM ON APRIL 14, AND THE POLICE ARRESTED 76 STUDENTS. SEVERAL LOCAL POLITICIANS AND FACULTY MEMBERS CRITICIZED THE ACTION. LATER, YALE ALLOWED THE STUDENTS TO PUT IT UP THERE AGAIN. THE UNIVERSITY SAID
THAT A COMMISSION WOULD GO TO SOUTH AFRICA IN JULY TO STUDY THE SYSTEM OF APARTHEID.

This is the kind of description one may hear from a passer-by who knows about the issue. Compare this with the following version, in which PAULINE, now being a journalist, is set to be more formal:

Example 2

IN EARLY APRIL, A SHANTYTOWN – NAMED WINNIE MANDELA CITY – WAS ERECTED BY SEVERAL STUDENTS ON BEINECKE PLAZA, SO THAT YALE UNIVERSITY WOULD DIVEST FROM COMPANIES DOING BUSINESS IN SOUTH AFRICA. LATER, AT 5:30 AM ON APRIL 14, THE SHANTYTOWN WAS DESTROYED BY OFFICIALS; ALSO, AT THAT TIME, THE POLICE ARRESTED 76 STUDENTS. SEVERAL LOCAL POLITICIANS AND FACULTY MEMBERS EXPRESSED CRITICISM OF YALE’S ACTION. FINALLY, YALE GAVE THE STUDENTS PERMISSION TO REASSEMBLE THE SHANTYTOWN THERE AND, CONCURRENTLY, THE UNIVERSITY ANNOUNCED THAT A COMMISSION WOULD GO TO SOUTH AFRICA IN JULY TO INVESTIGATE THE SYSTEM OF APARTHEID.

4.1. Determining formality

Before beginning generation, in order to obtain a value for its rhetorical goal $RG$\textsubscript{formality}. PAULINE uses the following rules:

(1) set $RG$\textsubscript{formality} to:
   - ‘colloquial’ when the depth of acquaintance is marked ‘friends,’ or when the relative social status is marked ‘equals’ in an atmosphere (tone) marked ‘informal’,
   - ‘normal’ when the depth of acquaintance is marked ‘acquaintances’,
   - ‘highfalutin’ when the depth of acquaintance is marked ‘strangers’,

(2) then, reset $RG$\textsubscript{formality} one step toward ‘colloquial’ if: desired effect on interpersonal distance is marked ‘close’, that is, if the speaker wants the hearer to feel closer to him; or if tone is marked ‘informal’, that is, if the conversation occurs in a relaxed, friendly atmosphere,

(3) or reset $RG$\textsubscript{formality} one step toward ‘highfalutin’ if: desired effect on interpersonal distance is marked ‘distant’, that is, if the speaker wants to increase the emotional distance between himself and the hearer; or if tone is marked ‘formal’, that is, if the speaker wants to establish a serious tone for the conversation, say when making a speech at a formal occasion,

(4) and invert the value of $RG$\textsubscript{formality} if: desired effect on hearer’s emotion toward speaker is marked ‘dislike’, since inappropriate formality is often taken as an insult; or if desired effect on hearer’s emotional state is marked ‘angry’. (The contrapositive of these two rules is the default rule: to make the hearer like you, select an appropriate level of formality.)
The value of the goal \textit{Rhythm and Normality} determines which strategies are used as decision criteria at decision points during the generation process. For example, when the rhetorical goal is 'highfalutin', the strategies are:

(1) \textit{topic organization}: select options that use conjunctions and relation words to relate sentences to each other and embed sentences within each other,
(2) \textit{sentence inclusion}: include adverbial clauses to lengthen sentences,
(3) \textit{sentence organization}:
\begin{itemize}
  \item place clauses at the beginnings of sentences to add weightiness to the text,
  \item make passive sentences when possible,
  \item avoid ellipsis, even though it may be grammatical (for example, in sentences such as 'Joe got more than Pete did' and 'When I was 20 years old, I married for the first time'),
\end{itemize}
(4) \textit{phrase/word choice}:
\begin{itemize}
  \item select formal phrases and words,
  \item do not pronominalize a concept where grammatically allowed, unless nothing new can be said about it ('Joe Smith, a 40-year-old farmer, is... Mr Smith, who has lived in Ohio all his life, says... A vegetarian, Joe Smith grows...' instead of 'Joe Smith, a 40-year-old farmer, is... He says... He grows...'),
  \item avoid popular idioms, slang, and contractions (for example, avoid slang by saying 'man' rather than 'guy' and contractions with 'cannot' rather than 'can't'); do not use idiomatic but incorrect grammar ('if you have less than 10 people, come here'), and
\end{itemize}
(5) \textit{word choice}: select nominal forms of verbs (such as 'Max and Martha's disagreement scared Pete' instead of 'Max and Martha had a fight and scared Pete').

In contrast, the generator can make its text more 'Colloquial':

(1) \textit{topic inclusion and organization}: make short, simple sentences; do not conjoin related topics,
(2) \textit{topic organization}:
\begin{itemize}
  \item select at most one adverbial clause per sentence and place it toward the end of the predicate,
  \item leave out words and clauses where this may grammatically be done,
  \item do not make passive sentences,
\end{itemize}
(3) \textit{phrase/word choice}:
\begin{itemize}
  \item select informal phrases and words,
  \item pronominalize a concept if possible,
  \item where possible, select popular idioms, slang, and use contractions, and
\end{itemize}
(4) \textit{word choice}: select verbs rather than nominal forms for actions.
4.2. Realizing formal and informal text

**Topic collection.** As input topics, PAULINE is given a list of three representation elements: the students building the shantytown, the tearing down of the shanties, and the university giving its permission for the shanties to be rebuilt. Rather than saying just these topics in this order, PAULINE collects additional topics to help flesh out the story. In order to do this, it uses a set of suggestions that indicate where in relation to the input topics it may find useful additional sentence topics. These suggestions are contained in topic collection plans that are analogous to McKeown's schemas (McKeown (1982), Paris and McKeown (1986)) (they are called plans here because they do not prescribe the order of topics). The program has three collection plans: RELATE, DESCRIBE (similar to McKeown's four schemas for describing objects), and CONVINCE (described later). In this case, since the program has not been given opinions about the issue, it selects the RELATE plan, which causes the additional collection of the following representation elements: the students' goal to have Yale divest, the arrest of the 76 students, support for the students expressed by the local community, and Yale's announcement of its study commission. (Since formality does not play a role in the collection process, a more detailed description is left for later.)

**Topic organization.** Before actually starting to produce text, PAULINE performs a number of reorganization tasks on the candidate topics, such as reordering, interpretation, and casting into multi-predicate sentences. This is the first stage of the process in which RG:formality plays a role. Of these tasks, this goal helps determine conjunctions of topics, since the length and complexity of sentences contributes toward the stylistic formality of the text. When being 'highfalutin', PAULINE must find conjunctions with which to relate candidate topics. These are found using the relations that hold among them. For example, since the construction of the shanties serves the students' intention of having Yale divest, and the lexicon contains phrases for expressing the SUBGOAL-TO relationship, the program can say the relationship explicitly. Thus it attaches the syntax goal to say their intention to the goal to say the construction, and adds an appropriate conjunction (such as, say, 'so that' or 'in order to'). Similarly, the next two candidates, the deconstruction and the arrest, are related by the fact that they occurred simultaneously (a REL-DURING relation). This can be expressed using words such as 'while' and 'concurrently'; using the same strategy, PAULINE joins these two topics when being formal. The same occurs for the final two topics: the permission and the announcement of the study commission.

**Sentence organization.** Next, PAULINE begins to generate sentences. For each sentence topic, it has to select pre-subject adverbial clauses and the sentence subject first. For its first sentence (with topic the construction and
attached topic the protesters' intention), PAULINE finds two candidate adver-
biacl clauses – time (early April) and location (Beinecke Plaza). When it is being
'highbaitin', as listed above, PAULINE’s strategies call for including adverbial
clauses (to lengthen sentences); placing some of them at the beginnings of
sentences (to add weightiness to the text); and making passive sentences when
possible. It spawns the following syntax goals:

\[
\begin{align*}
\text{[SAY-TIME #TIME-l]} & \quad \text{(In early April.)} \\
\text{[SAY-SUBJECT #SHANTYTOWN-l]} & \quad \text{(a shantytown)} \\
\text{[SAY-PREDICATE #CONSTRUCT-1]} & \quad \text{(was built by students)} \\
\text{[SAY-LOCATION #PLAZA-l]} & \quad \text{(on Beinecke Plaza)} \\
\text{[SAY-CONJUNCTION #SUBGOAL-TO]} & \quad \text{(so that)} \\
\text{[SAY-SENTENCE #GOAL-l (attached)]} & \quad \text{(. . .)} \\
\end{align*}
\]

In contrast, when it is being 'colloquial', both adverbial clauses are said at the
end of the sentence, which is not passivized. In addition, the attached sentence
is not conjoined:

\[
\begin{align*}
\text{[SAY-SUBJECT #STUDENTS-l]} & \quad \text{(Students)} \\
\text{[SAY-PREDICATE #CONSTRUCT-1]} & \quad \text{(built a shantytown)} \\
\text{[SAY-LOCATION #PLAZA-l]} & \quad \text{(on Beinecke Plaza)} \\
\text{[SAY-TIME #TIME-l]} & \quad \text{(in early April.)} \\
\text{[SAY-SENTENCE #GOAL-l]} & \quad \text{(They . . .)} \\
\end{align*}
\]

Subsequent sentences are generated similarly.

Clause organization. With respect to formality, clause-level decisions involve
the form of verbs (nominal or normal), pronominalization, and the use of
ellipsis, as listed above. For example, when generating the noun group for the
shantytown, PAULINE has to say its name; when it is being 'colloquial' it can
elide 'named' from the post-nominal modifying phrase 'named Winnie Man-
dela City'. The protesters' intention can be generated using a nominal form
('protest Yale's investment') or a normal sentence ('want Yale to divest').

Word choice. Of course, the use of appropriate words is crucial. PAULINE’s
lexicon contains, attached to many representation elements, a number of
words organized in discrimination nets. Naturally, some of the discrimination
decisions relate to the level of formality. For example, CONSTRUCT indexes
to, amongst others, the verbs ‘put up’, ‘build’, ‘construct’, ‘erect’, and ‘assemble’;
SUPPORT indexes to, amongst others, ‘express criticism’ and ‘criticize’;
MTRANS indexes to a great many verbs and phrases, among which are ‘give
permission’, ‘allow’, ‘announce’, and ‘say’.
4.3. More detailed analysis

In summary, table 1 illustrates the effect of formality in more detail.

Table 1
The effect of formality.

<table>
<thead>
<tr>
<th>Highfalutin</th>
<th>Colloquial</th>
<th>Decision type</th>
</tr>
</thead>
<tbody>
<tr>
<td>[IN EARLY APRIL]</td>
<td>[]</td>
<td>Clause position</td>
</tr>
<tr>
<td>A SHANTYTOWN - NAMED WINNIE</td>
<td>STUDENTS [PUT] A SHANTYTOWN, [] WINNIE MANDELA CITY.</td>
<td>Verb formality</td>
</tr>
<tr>
<td>MANDELA CITY - [WAS [ERECTED] BY] [SEVERAL] STUDENTS ON BEINECKE PLAZA.</td>
<td>ON BEINECKE PLAZA [IN EARLY APRIL].</td>
<td>Ellipsis</td>
</tr>
<tr>
<td>[SO THAT]</td>
<td>THE STUDENTS WANTED YALE UNIVERSITY TO [PULL THEIR MONEY OUT OF] COMPANIES DOING BUSINESS IN SOUTH AFRICA.</td>
<td>Mode, verb formality</td>
</tr>
<tr>
<td>YALE UNIVERSITY WOULD [DIVEST FROM] COMPANIES DOING BUSINESS IN SOUTH AFRICA.</td>
<td>[LATER, AT 5:30 AM ON APRIL 14], THE SHANTYTOWN [WAS DESTROYED] BY OFFICIALS; [AND, AT THAT TIME,] THE POLICE ARRESTED 76 STUDENTS.</td>
<td>Clause position</td>
</tr>
<tr>
<td>[LATER, AT 5:30 AM ON APRIL 14], THE SHANTYTOWN [WAS DESTROYED] BY OFFICIALS, [ALSO, AT THAT TIME,] THE POLICE ARRESTED 76 STUDENTS.</td>
<td>OFFICIALS [TORE [IT] DOWN] AT 5:30 AM ON APRIL 14, [AND] THE POLICE ARRESTED 76 STUDENTS.</td>
<td>Mode, verb formality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adjective inclusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Word formality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verb formality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verb formality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Verb formality</td>
</tr>
</tbody>
</table>
5. Partiality

Examples 1 and 2 are fine ways to introduce someone to the topic. They are the kind of thing we would say if we were unbiased informers, such as passersby and reporters. But what if we were protesters and were trying to convince someone of our opinion? When PAULINE is set up to produce literature for the protesters’ cause, i.e. when it is given the goal to slant its description of the episode toward the protesters, it produces:

Example 3

AS A REMINDER TO YALE UNIVERSITY TO DIVEST FROM COMPANIES DOING BUSINESS IN SOUTH AFRICA, A LARGE NUMBER OF CONCERNED STUDENTS ERECTED A SHANTYTOWN – NAMED WINNIE MANDELA CITY – ON BEINECKE PLAZA IN EARLY APRIL. THE LOCAL COMMUNITY EXPRESSED SUPPORT FOR THE STUDENTS’ ACTION. THE UNIVERSITY TOLD THE STUDENTS TO ERECT THE SHANTYTOWN ELSEWHERE. LATER, AT 5:30 AM ON APRIL 14, YALE HAD OFFICIALS DESTROY THE SHANTYTOWN; ALSO, AT THAT TIME, THE POLICE ARRESTED 76 STUDENTS. AFTER THE LOCAL COMMUNITY’S HUGE OUTCRY, YALE PERMITTED THE STUDENTS TO RECONSTRUCT THE SHANTYTOWN.

In contrast, when PAULINE has to produce an official Yale version, it says:

Example 4

IN EARLY APRIL, A SMALL NUMBER OF STUDENTS TOOK OVER BEINECKE PLAZA AND BUILT A SHANTYTOWN NAMED WINNIE MANDELA CITY IN ORDER TO FORCE YALE UNIVERSITY TO DIVEST FROM COMPANIES DOING BUSINESS IN SOUTH AFRICA. YALE REQUESTED THAT THE STUDENTS ERECT IT ELSEWHERE, BUT THEY REFUSED TO LEAVE. THE UNIVERSITY GAVE IT PERMISSION TO EXIST UNTIL THE MEETING OF THE YALE CORPORATION BUT EVEN AFTER THAT THE STUDENTS STILL REFUSED TO MOVE. OFFICIALS HAD TO DISASSEMBLE THE SHANTYTOWN. FINALLY, YALE, BEING CONCILIATORY TOWARD THE STUDENTS, NOT ONLY PERMITTED THEM TO RECONSTRUCT IT, BUT ALSO ANNOUNCED THAT A COMMISSION WOULD GO TO SOUTH AFRICA IN JULY TO EXAMINE THE SYSTEM OF APARTHEID.

5.1. Affect

Many speaker goals depend on the communication of the speaker’s opinions. In general, since these sympathies and antipathies reflect so accurately the speaker’s disposition toward the world, any opinion with which the hearer disagrees implies distance between them – perhaps even censure on the part of the speaker. Thus, if the speaker’s opinion agrees with the hearer’s, expressing it will tend to make them closer; when it disagrees, expressing it may cause fights.
(See, for instance, Goody (1978) and Lakoff (1977) on politeness.) The rhetorical goal $RG_{\text{partiality}}$ controls how strongly PAULINE injects its opinions into the text. (Much of the following is discussed in more detail in Hovy (1986b).)

In order for the speaker to slant the text to fit the hearer's opinions, she must be able to determine what the hearer is likely to find sympathetic, what he is likely to dislike, and what he is likely not to care about much. PAULINE uses three values of affect: GOOD, BAD, and NEUTRAL. (Of course, 'affect' here simply denotes something akin to 'like'. But even with this limited denotation, three values are sufficient to give the program interesting behavior. In this regard it is similar to the work on narrative summarization in Lehnert (1982).)

PAULINE gets its affects from two sources: from the user and from the intrinsic affects defined for the representation elements. To give PAULINE opinions, the user must list one or more representation elements as 'sympathies' or as 'antipathies'. (In PAULINE, this is simply implemented by having a sympathy and an antipathy list. Elements on these lists will be characterized as GOOD and BAD respectively.)

The second source of affect is tied to the generic representation elements. Each representation type that carries some intrinsic affect in the example domain has this affect defined. For example, in neutral context in the example, the concept 'arrest' is BAD, the university's goal to be reasonable and fair is GOOD, and all other concepts, such as 'students' and 'construction', are NEUTRAL.

In order to determine its opinion about any arbitrary piece of input representation, PAULINE must have the ability to combine its affects with the concepts' intrinsic affects and to propagate affect along the relations between concepts. Though their exact form obviously depends on the design of the representation, the basic rules are:

1. Affect is preserved when combined with NEUTRAL,
2. Like affects combine to GOOD,
3. Unlike affects combine to BAD, and
4. For certain relations between affect-bearing concepts (e.g., the patient of a BAD act), the combined affect inverts. Special rules of affect propagation must be defined for each such relation.

5.2. Determining partiality

Partiality for a topic can be expressed explicitly, in a sentence stating the speaker's opinion, or implicitly, using techniques such as phrasal juxtaposition and stress words. The rules PAULINE uses to activate the rhetorical goal $RG_{\text{partiality}}$ based on its pragmatic goals are:
(1) set $RG:\text{partiality}$ to ‘explicit’ if the speaker’s and hearer’s affects for the topic agree and desired effect on hearer’s emotion toward speaker is marked ‘like’; or desired effect on interpersonal distance is marked ‘close’; or tone is marked ‘informal’.

(2) set $RG:\text{partiality}$ to ‘implicit’ if the speaker’s and hearer’s affects for the topic agree and desired effect on interpersonal distance is marked ‘distant’, since being lukewarm about the agreement with the hearer separates them; or speaker-hearer relative social status is marked ‘dominant’, for the same reason; or desire to involve hearer is marked ‘repel’, that is, if the speaker does not want to have the hearer too involved in the conversation.

(3) otherwise, set $RG:\text{partiality}$ to ‘impartial’ if their affects agree, or if their affects disagree and desired effect on hearer’s opinion is marked ‘none’; or if hearer’s knowledge level is marked ‘expert’, speaker’s knowledge level is marked ‘student’ or ‘novice’, and desired effect on hearer’s emotion toward speaker is marked ‘respect or like’, since when speakers care about expert hearers’ opinions of them, they will not want to exhibit their partiality and lack of knowledge.

(4) set $RG:\text{partiality}$ to ‘explicit’ if the speaker’s and hearer’s affects for the topic disagree and desired effect on hearer’s opinion is marked ‘switch’; or desired effect on hearer’s emotional state is marked ‘anger’; or desired effect on hearer’s emotion toward speaker is marked ‘dislike’; or desired effect on interpersonal distance is marked ‘distant’, and

(5) otherwise, set $RG:\text{partiality}$ to ‘implicit’ if their affects disagree and desired effect on hearer’s opinion is marked ‘switch’; or desire to involve hearer is marked ‘involve’; or relative social status is marked ‘subordinate’ (that is, when the hearer is subordinate to the speaker).

Having determined a value for $RG:\text{partiality}$, PAULINE uses the following strategies of style that act as criteria at decision points to make text partial (both ‘explicit’ and ‘implicit’):

(1) topic inclusion: include explicit expressions of opinion (explicit).
(2) topic organization: make appropriate interpretations of topics (discussed below) (implicit),
(3) topic/phrase organization: juxtapose topics in affect-imputing phrases (explicit and implicit),
(4) sentence inclusion and organization: include appropriate descriptive clauses, adverbial and adjectival (explicit),
(5) clause inclusion: include appropriate affect-laden adjectives and adverbs; and include stress words (explicit and implicit), and
(6) word choice: select nouns and verbs that carry affect (explicit and implicit).
In contrast, in order to make its text as 'impartial' as possible, the program uses the following strategies:

1. **topic selection**: select, in turn, the topics and aspects of topics that support each affective interpretation,
2. **topic/phrase organization**: juxtapose topics with opposite affects in affect-mitigating phrases (discussed below),
3. **sentence and clause inclusion and organization**: do not include affect-laden descriptive clauses or words, adverbial or adjectival,
4. **clause inclusion**: do not include stress words, and
5. **word choice**: select nouns and verbs that carry no affect.

### 5.3. Rhetorical goals of opinion

These strategies are not sufficient to make text partial or impartial: they control when to use slanting techniques, but they do not indicate what makes interpretations, clauses, phrases, or words appropriate. For example, compare the first two sentences from the original (not PAULINE-generated) protester and university texts in table 2.

<table>
<thead>
<tr>
<th>Protester</th>
<th>University</th>
</tr>
</thead>
<tbody>
<tr>
<td>On April 4, concerned Yale students</td>
<td>On April 4, a small group of students took over</td>
</tr>
<tr>
<td>constructed a shantytown on Boesak Plaza</td>
<td>Beinecke Plaza and built some shanties; they wanted to force Yale</td>
</tr>
<tr>
<td>as a reminder to those in Woodbridge Hall that Yale is complicit...</td>
<td>to sell its stocks...</td>
</tr>
</tbody>
</table>

Clearly, the protester had a reason for saying 'concerned' where the university speaker said 'a small group of'; also, the latter wanted to imply something specific with 'took over'; and even the different names used for the location (Boesak Plaza and Beinecke Plaza, the official name) and for the university ('Yale' and 'those in Woodbridge Hall', which is the president’s office) have different connotations.

In certain types of cases, enabling a generator to select a form of expression with appropriate connotations is easy; in the same way that 'erect' was defined as a formal version of 'build', 'tear down' and 'remove' can be defined as slanted versions of 'disassemble'. However, most techniques require a lot more
information. For example, the phrases 'concerned students' and 'a small group of students' are not simply two different lexicalizations of an underlying concept. In order to find when they can be used and which phrases are appropriate the generator either requires a very powerful general inferential capability, or else it requires rules that suggest making specific slanting implications. Of course, these rules are simply special-purpose inferences in any case.

PAULINE has a limited inferential capability. It has a list of rules, encoded as goals, that prescribe how the generator should proceed to find forms of expression for input topics with certain characteristics, and that indicate what aspects of these topics can be used to create appropriate slant. These strategies are called here the 'rhetorical goals of opinion'. When the program is given sympathies that oppose the hearer's sympathies, and when the pragmatic value for the hearer's opinion of the topic is 'switch', PAULINE activates a number of goals that help it slant the text toward its side and away from the opponents. These goals can be classified as follows:

- **State outright** that our side is good and theirs is bad.
- Show how our side has **good goals**, by describing how (a) we help other people, (b) we want a solution to the conflict, and (c) our goals are good according to accepted standards.
- Explain how our side does **good actions** to achieve the goals: (a) the actions are not unreasonable or nasty, (b) they are good according to accepted standards, and (c) they are performed in the open.
- Specifically, describe our side's **response to the opponent**: (a) negotiations that have taken place, and (b) how we have moderated our demands.
- Finally, show how **other people** believe that we are good, by describing (a) their active support, and (b) their statements and recommendations to that effect.

A similar classification exists for the inverse goal, to show how bad the opponents' side is. Both classifications contain a large number of specific inferences and explicit suggestions for sentences. For example, the opponents are unreasonable because:

- they started the whole affair,
- they don't seem to want a solution,
- their demands/goals are beyond reasonable expectations,
- they are only in it for their own good,
- they are immoral, unfair,
- they use distasteful/ugly tactics, misuse their rights, or overstep the bounds of propriety. They act aggressively,
- they coerce others into doing things for them,
- they disseminate false or misleading information about the dispute,
- they have a hidden agenda,
they won't discuss/negotiate the issue,
- they won't moderate their stance, are unconciliatory, intransigent, and
- they claim to have more support than they have.

PAULINE currently uses fifteen inferences from this list and its inverse.

The inferences fire when the collected sentence topics have characteristics that match their activation conditions. The inferences' left-hand sides are patterns of representation element types and their right-hand sides cause the generator to select the appropriate forms of expression. A simple pattern-matcher tests the activated inferences' patterns against the collected topics. In more detail, some inferences are the following (the terms in capitals are elements of the representation language, based on Conceptual Dependency; see Schank (1972) and Schank and Abelson (1977). MTRANS denotes the act of transferring information, PTRANS the act of transferring physical objects, and ATRANS the act of transferring control over something. An element 'is an antipathy' when the program determines, as described above, that the element carries BAD affect):

**Coercion:** they force their will on others (corresponding to the university speaker's 'wanted to force'):

IF the current topic is an ACTION,  
AND it is an antipathy,  
AND the action serves one of the opponents' goals,  
AND the goal's desire is to have some other party do some act,  
AND the other party is a sympathy,
THEN imply that the opponents force their will on them (using verbs and phrases much as 'force', 'make them do')

**Limited support:** they claim to have more support than they have (causing the university speaker's adjective 'a small group'):

IF the current topic claims support (an MTRANS of a SUPPORT),  
AND the ACTOR is an antipathy,  
AND the SUPPORT contains a number of people,  
THEN minimize that number,  
by using minimizing adjectives such as 'a small number', 'a few'

**Appropriation:** they use distasteful/ugly tactics, misuse their rights, or overstep the bounds of propriety (which causes the university speaker to say 'force' and 'take over'):

IF the current topic is an ACTION,  
AND it is an antipathy,  
AND the ACTOR is an antipathy,
THEN imply that the action is ugly, by
IF an ATRANS or PTRANS of props for other actions:
    say that they take control of what they need by force (use appropriate verbs
    and phrases such as 'take over', 'grab', 'commandeer')
IF an MTRANS of demands: say that they try to coerce others (use verbs such
    as 'force', 'pressure').

Different inferences are applied at different times in the generation process. This
depends on the kinds of effect they have on the processing. Inferences that call
for the candidate topic(s) to be interpreted and completely replaced by other
topics (such as interpreting a request as a coercion) are run during the topic
organization phase; inferences that suggest appropriate adjectives ('a large
number', 'a small group') are run when noun groups are built; those that
prescribe specific verbs are run when predicates are constructed.

5.4. **Topic collection**

Part of the generator's task is to determine what to say. Unless it is given all the
sentence topics it will be expected to produce, the generator must be able to
search for additional sentence topics in order to flesh out its arguments, present
examples, etc. Opinions play a large role in this selection. For example, when
the speaker and hearer agree on the affect of the topic, there is no problem; such
topics can simply be said directly. But when they disagree, the speaker has to be
more careful. One strategy the speaker can try is 'evasion'; dealing with
unpleasant topics indirectly. Various evasive techniques exist. As described in
Hovy (1986b), PAULINE can use the technique of:

*The wishful suppression and mitigation plan:*

- say GOOD topics,
- juxtapose NEUTRAL topics with GOOD ones in enhancer phrases
  (explained below), and
- leave out BAD topics altogether, unless they can be mitigated using mitigator
  phrases and words, or unless they are central to the story.

Sometimes, however, the program is explicitly given the goal to discuss a topic
about which the hearer disagrees. In such cases PAULINE uses the strategy of
'selectivity'; saying only aspects of topics that support its opinion. The CON-
VINCE plan (described more fully in Hovy (1985)) is a set of rules that suggest
where in relation to a topic with a sensitive aspect (i.e., an aspect over which
speaker and hearer have opposite affects) the generator can search for addi-
tional topics that support its version. Briefly, it contains the following sugges-
tions:
The CONVINCE plan:
- consider worse examples of the topic with the sensitive aspect – from the concept(s) immediately superior to the topic in the memory network, compute the affects of other, similar instances, and collect those with BAD affect,
- consider good results of the topic with the sensitive aspect – examine all the results and outcomes of the topic; if it is (part of) a goal, a plan, or a script, examine the final outcomes too; collect those with GOOD affect,
- consider good relations of the topic with the sensitive aspect – compute the affects for the intergoal relations that the topic is part of (e.g., those goals the topic supports, opposes, is a side-effect of) and collect the GOOD ones,
- consider good side-effects of the topic with the sensitive aspect – examine all the side-effects of the topic (if it is a goal or a plan) as far as they are known and collect the GOOD ones,
- appeal to authority – if any of the immediate aspects of the topic refer to people or organizations who share in, have, or support the sensitive aspect, and if the hearer’s affect for these authorities is GOOD, collect them, and
- simply enhance or mitigate the topic with the sensitive aspect – just say it and allow subsequent realization decisions to give it the appropriate slant.

5.5. Topic organization

When a number of candidate topics have been collected, what happens next? How is affect injected into language? Read the following paragraph, and then complete Martha’s and Max’s responses:

"Martha and Max are little Pete’s parents. Max and Pete are baseball fanatics, but Martha hates baseball. One day, Pete falls off his bicycle and is slightly hurt. Martha forbids him to play his baseball game that afternoon or to go to the movies. Max, who wants his son to be tough, disagrees. Secretly, Pete sneaks out of the house and plays a splendid game, hitting five home runs, and then goes to see a movie. When he gets home, a fight breaks out between angry Martha and proud Max. The next day, Pete’s grandmother calls, and asks both Martha and Max the same question: ‘So what has Pete done lately?’ Max proudly says ‘He’s been great, not only did he play baseball, but...’ and Martha angrily says ‘He’s been bad; not only did he play baseball, but...’"

Two appropriate responses are:

(a) Not only did he play baseball, but he hit five home runs!
(b) Not only did he play baseball, but he went to the movies afterwards!

Max’s retort (a) implies that Pete’s playing baseball was good, courageous, and tough. Martha’s retort (b), in contrast, implies that it was bad and disobedient. Each parent imputes an affect to Pete’s playing by juxtaposing the sentence “he played baseball” with another sentence of suitable affect.
Clearly, the 'not only $X$ but $Y$' sentence form is used to imply that $X$ and $Y$ carry the same affective value, and in fact that the value is to be strengthened due to their juxtaposition. In contrast, the following sentences carry no such cumulative affective import:

(c) Pete played the game and he hit five home runs.
(d) When Pete played the game he hit five home runs.
(e) Pete played the game. He hit five home runs.

The 'not only $X$ but $Y$' form can be called an enhancer. Other enhancing phrases are:

(f) Pete played the game; also, he hit five home runs.
(g) Pete played the game; what's more, he hit five home runs.

When an enhancing phrase juxtaposes two affect-laden sentences, the affect is strengthened; when it juxtaposes an affect-laden sentence with a neutral one, the affect is imputed to the latter. Thus, in addition to stressing affective concepts, a speaker can strengthen his or her case by imputing affect to neutral concepts too! This is, for example, what PAULINE does to produce:

NOT ONLY DID YALE UNIVERSITY PERMIT THE STUDENTS TO REBUILD THE SHANTY-TOWN, BUT YALE ANNOUNCED THAT A COMMISSION WOULD GO TO SOUTH AFRICA TO STUDY THE SYSTEM OF APARTHEID.

when defending the university. For PAULINE, the commission topic is simply NEUTRAL, whereas permission to rebuild, because it serves the goal to be reasonable (which is intrinsically GOOD) is GOOD. When juxtaposed in this way, both sentences seem GOOD for Yale – exactly what PAULINE wants.

Similarly, phrases with weakening effect are mitigators. When a mitigating phrase juxtaposes two sentences carrying opposite affect, the resulting affect is that of the first sentence, weakened; when it juxtaposes an affect-laden sentence with a neutral one, the opposite affect is imputed to the latter. In the following sentences, if 'John whipped the dog' carries BAD affect, then, if we know nothing more, 'he remembered the cat' becomes GOOD:

(h) Although John remembered the cat, he whipped the dog.
(i) John remembered the cat. However, he whipped the dog.

The first part, taken by itself, is neutral; it could just as well have been made BAD by using an enhancer:

(j) Not only did John remember the cat, he whipped the dog.
In a two-predicate mitigator, the sentence with the desired affect usually appears last.

A number of other constraints must be met before two topics can be juxtaposed in an enhancer or mitigator phrase. These are described in Hovy (1986b).

5.6. Realizing biased text

Using the same representation described under $RG:formality$ above, PAULINE slants its text to the extent prescribed by $RG:partiality$. The following is a short description of how it does so.

Sentence topic collection. Once again, PAULINE is given the three input topics (the building of the shanties, their being taken down, and Yale’s permission for them to be rebuilt). However, in this case, the program has the goal to ‘switch’ the hearer’s opinions to correspond to its own; hence it activates the CONVINCE topic collection plan.

Each step of a topic collection plan tells the generator where in memory, relative to the current topic, to find other potentially useful sentence topics. Applying its steps to the input topics in turn, PAULINE gathers a number of additional topics, and, for each of them, activates and runs an appropriate collection plan in turn, thereby doing a depth-first topic search and collection. When PAULINE is speaking as a university supporter, the GOOD-RESULTS step (described above) of the CONVINCE plan causes it to collect as topics the university’s offer of an alternative site for the shanties and the protesters’ refusal to move, since these topics are (a) direct results of the building of the shanties and are (b) GOOD from the program’s point of view, for they serve the university’s goal to be lenient and show the protesters’ intransigence. Furthermore, the plan suggests the inclusion of the announcement of the study commission, for that is also a GOOD topic. Eventually, having performed the collection, PAULINE begins topic organization with its input topics, the abovementioned candidate topics, as well as the university’s temporary permission to leave the shanties for a week and the protesters’ continued refusal to move after the week. In contrast, when the program is speaking in support of the protesters, it collects as topics the arrest and the local community’s supportive demonstrations, since they are results of the university’s actions, and hence are GOOD for the current argument; of course, it considers as additional topics the university’s offer and the students’ refusal, but doesn’t include them due to their BAD affect. In this case, the program starts topic organization with its input and the abovementioned two topics.

Topic organization. After it has collected candidate topics and before it says them, given the time ($RG:haste$) and the inclination ($RG:simplicity$), PAULINE can perform a number of topic organization tasks, one of which (conjunction) was described under formality. Here we will describe how sentence topics are cast into enhancer and mitigator phrases to manipulate their affective value.
Starting from the top, the program first has the goal to introduce the topic. Its discourse coherence plan provides it with the topics, the construction and the protester's intention, which are related by a SUBGOAL-TO relation. As described before, it queries the active rhetorical strategies of style: Should the relation between the two topics be used to conjoin them into a compound sentence? The answer is 'yes', since the relevant topic organization strategy, activated for both 'explicit' and 'implicit' values of \( RG:partiality \), calls for the use of affect-imputing enhancer and mitigator phrases. What is an appropriate way to express a SUBGOAL-TO relation? Here the inferences of opinion come into play, making decisions about the appropriateness of various interpretations of the two topics and their relationship. When sympathetic toward the university, one inference that matches the construction and its goal, which has the desired state that Yale divest from the companies, is that of 'coercion', defined above. This strategy spawns the syntax goal to say a newly-formed interpretation, CAUSE-TO-DO, with the protesters' intent as attached topic, and the conjunction 'in order to force'. In contrast, when PAULINE is speaking as a protester, the strategy 'we are lenient, offer passive resistance' causes it to join the topics using the phrase 'as a reminder to'. (Of course, when the program has no opinions, it would simply use one of the phrases 'in order to' or 'so as to'.) All these phrases are in the lexicon, indexed in a discrimination net linked to the relation SUBGOAL-TO. Similarly, when supporting the university, PAULINE attaches the announcement of the study commission to the permission to rebuild the shanties, using the enhancer phrase 'not only...but...'. since both topics carry the affect GOOD and meet the additional requirements.

Sentence organization. When organizing the parts of a sentence, PAULINE must select the subject and select pre-sentential adverbial clauses. Inferences of opinion play a role in the example only once, and that is to recognize that since the time of the tearing down is abnormal, it should be placed in a position of prominence (i.e. before the subject) when speaking as a protester (where it is GOOD for the argument), and should be suppressed altogether when speaking as a university supporter (when it is BAD).

Clause organization. On this level, decisions pertain to the inclusion of appropriate adjectives, adverbs, and stress words. Once again, to determine appropriateness, the strategies of opinion are used. When PAULINE is inserting adjectives in the noun group for the protesters, and it is supporting the university, the rule 'limited support' (described above) fires, and causes the inclusion of 'a small number of'. The symmetrical rule is used twice when the program supports the protesters: once when describing the students as 'a large number of', and once when describing the local community's response, to give 'huge [outrage]'.'

Word choice. As described before, in many cases PAULINE's lexicon contains words organized in discrimination nets. Some representation elements with affect-bearing words are MTRANS (with 'order', 'tell', 'ask', 'request') and DECONSTRUCT (with 'tear down', 'disassemble', 'remove').
5.7. More detailed analysis

Table 3 illustrates the concerted effect of the strategies described in this section. Note the important effect of suitable topic selection.

Table 3
The effect of partiality.

<table>
<thead>
<tr>
<th>For protesters</th>
<th>For university</th>
<th>Goal</th>
</tr>
</thead>
<tbody>
<tr>
<td>[AS A REMINDER TO] YALE UNIVERSITY TO DIVEST FROM COMPANIES DOING BUSINESS IN SOUTH AFRICA, [A LARGE NUMBER OF] [CONCERNED] STUDENTS ERECTED A SHANTYTOWN NAMED WINNIE MANDELA CITY ON BEINECKE PLAZA IN APRIL.</td>
<td>IN EARLY APRIL, [A SMALL NUMBER OF] [STUDENTS TOOK OVER] BEINECKE PLAZA AND ERECTED A SHANTYTOWN NAMED WINNIE MANDELA CITY [IN ORDER TO FORCE] YALE UNIVERSITY TO DIVEST FROM COMPANIES DOING BUSINESS IN SOUTH AFRICA.</td>
<td>Interp: peaceful</td>
</tr>
</tbody>
</table>

Support, adjective
Interp: tactics
Topic: input
Interp: coercion
Verb: force
Interp: coercion
Topic: protesters
Support, stress
Interp: conciliation
Phrase: enhance
Topic: input
Phrase: enhance
Topic: university
6. Conclusion

The question 'why and how is it that we say the same thing in different ways to different people, or even to the same person in different circumstances?' is interesting from a number of perspectives. From a cognitive perspective, it helps shed light on speakers' goals and personal interrelationships in conversations; from a linguistic perspective, it raises interesting questions about the information content of language; and from an engineering-AI perspective, it helps provide principled reasons by which a program that can realize the same input in various ways can make its selections.

As described in this paper, the answer deals with the pragmatic nature of communication – a big and complex field of study. In order to begin to study how pragmatics is used in generation, a number of rather crass assumptions about plausible types of speaker goals and the relevant characteristics of hearers and of conversational settings must be made. The specific pragmatic features used by PAULINE are but a first step. They are the types of factors that play a role in conversation; no claims are made about their literal veracity. Similarly, the strategies PAULINE uses to link its pragmatic features to the actual generator decisions, being dependent on the definitions of the features, are equally primitive; again, no strong claims are made about their existence in people in exactly the form shown. However, in even such a simple theory as this, certain constraints emerge, and these constraints, I believe, hold true no matter how sophisticated the eventual theory is. The constraints pertain primarily to the organization of pragmatic information in a generator: the fact that pragmatic and interpersonal information is too general to be of immediate use; the resulting fact that intermediate strategies, here called rhetorical strategies, are required to run a generator; the fact that, in a model of generation that incorporates these goals, rhetorical planning and realization are interleaved processes, where the interleaving takes place at choice points (this view supports the standard top-down planning-to-realization approach, as well as a bottom-up approach, in which partially realized syntactic options present themselves as opportunities to the rhetorical criteria, at which point further planning can occur). This design can be called a limited-commitment planner that satisfies its pragmatic goals opportunistically.

References