What's the Point?*

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We present a theory of conversation comprehension in which a line of the conversation is "understood" by relating it to one of seven possible "points". We define these points, and present examples where it seems plausible that the failure to "get the point" would indeed constitute a failure to understand the conversation. We argue that the recognition of such points must proceed in both a top down and bottom up fashion, and thus is likely to be quite complicated. Finally, we see the processing of information in the conversation to be dependent upon which point classification the user decides upon.

INTRODUCTION

Part of understanding involves assessing why a speaker says what he says. Understanding what someone has said involves understanding what the speaker intended the hearer to do with what he said.

It is quite possible for someone to understand exactly what a speaker said, but not understand why it was said, or why it was said to him in particular. Alternatively, an understander may think he knows why something was said to him, but he may be incorrect. In such cases, we usually say he has "missed the point," and the speaker may find a response he receives to be incoherent.

A very important part of what we do when we understand is attempt to figure out the point of what we are being told. This search for the point guides processing, and thus directs the inferencing process. We make choices early on in processing that cause us to go one way or another in what aspects of an input we dwell on and which we ignore. Clearly this initial assessment of what is important is a key element in the understanding process and in the subsequent memory organization that results from the way we have processed an input.

Recent research in natural language has focused on the examination of the types of mental knowledge structures necessary to build a conceptual

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representation of a discourse. Scripts, plans, and goals have been proposed (Schank & Abelson, 1977) and both embodied in programs, (Carbonell, 1979; Cullingford, 1978; Wilensky, 1978) and tested in psychological experiments (see Abelson 1981 for a review). However, an understanding system utilizing inferences driven by these types of knowledge structures faces the problem of controlling those inferences. There must be some guidance in the application of these knowledge-based rules.

One way we can know where to begin in processing is by attempting to assess the point of what we have heard. To make this clear, consider some examples of what we mean by points.

Suppose you are told that the Zambians are going to invade your country tomorrow. What would be the point of your being told that? Clearly there is no one correct answer to such a question. A person could have any number of points in mind that a particular utterance expresses. For this sentence, some possible points are:

1. Your're going to be in trouble very soon.
2. Boy, this is really the last straw. Things couldn't get any worse for me.
3. Get your guns right now so we can get ready to repel the invaders.
4. That explains why the their ambassador decided to leave yesterday.
5. Head for the hills immediately if you want to save your life.
6. My assertion that invasions only happen on Tuesdays is again shown to be correct.
7. Who would have thought that they would really invade?

It may seem here that almost anything can be a point. In one sense this is true. Nearly any proposition can realize a point that someone is trying to express. But, the notion of a point is one that does not depend upon the content of a proposition directly. Rather whether something is a point depends upon its significance to the particular speaker and listener in the the context in which it is said. Saying that a given proposition has a given point is a statement about what you as an understander are supposed to do with that proposition. Viewed from a processing perspective, when a speaker makes a point, he is trying to direct the understanding process of the listener. In this sense, points provide a much needed focussing mechanism during understanding.

The seven examples above suggest a set of point categories which could be applied in the processing of any input. The seven are not necessarily exhaustive, but we believe they will serve for the argument we want to make in this paper, which is that the knowledge of a set of point categories is often essential in the processing of a speaker's input in a realistic context (i.e.,-where his point cannot be assumed a priori).
The point here, if we may use the word, is that when someone has a point, that is, when some statement is intended to express a point, the listener may represent that point as an instance of one of this small set of point categories. When we are confused by something someone says and ask, “What’s the point?” we mean to convey that we are having trouble deriving the relationship of the input to any known point category.

In this paper we will address the issues of how we derive what a speaker’s point is, and what effect that has on subsequent processing. First, however, we will define the seven point categories suggested by our examples.

**KINDS OF POINTS**

**Affective Points**

People usually have a set of plans and goals that are presently active in their minds. Some of these goals may be long-term, such as the goal of becoming President, or some may be very short-term, such as the goal of finding a pencil. Often, the point of a speaker’s statement is to address one or more of the understander’s plans and goals, or to call to the understander’s attention that some piece of information has some positive or negative affect on one of the understander’s plans or goals. These points are called affective points.

An example of an affective point was given in the Zambian example in the previous section. In the case in which the speaker meant, “Head for the hills immediately if you want to save your life,” he was obviously addressing one of the understander’s goals. After understanding that this was what was meant, the understander would not ask, “What’s the point?”

A point can also be affective if it addresses the plans and goals of someone which the understander has some emotional feelings toward. Thus, if your sister lived in Peoria and someone told you, “The Zambians are invading Peoria!,” his point would be affective. Again, you would not ask, “What’s the point?” These emotional feelings need not be positive, however. If your worst enemy lived in Peoria and someone told you “The Zambians are invading Peoria!” you still could very well derive an affective point.

**Empathetic Points**

Conversations between good friends often deal indirectly with the feelings of the conversants. What is the point in such conversations? The speaker may not be conveying anything which will directly affect the listener’s life, although the expression of an emotional or problem situation is certainly of
interest to a friend. Indeed, part of the meaning of a friend is that things that concern one's friends are of interest to oneself. Yet the expression of merely interesting items does not seem to capture the importance of such dialogs.

If one friend worriedly says to another, "Oh, have my wife and I been fighting a lot lately!", he would probably not respond, "So, what's the point?" Clearly, the speaker has in mind a particular concept that he wants to communicate, and a very particular way in which he wants his friend to process that concept. At the lowest level, he wants the listener to understand that he is having some sort of marital problems. In this case, however, the speaker not only wants his friend to understand the specific content of the experience he is describing, but to understand how he is feeling about them. There may be no request for help, or implication of any personal effect on the listener. Instead, what the speaker desires is for the listener to process the input almost as if he might be the focus of the situation, so as to understand the speaker's point of view. When the speaker's point in communicating is getting someone else to understand how he is feeling about a particular situation, we call this an empathetic point. He is saying, in essence, "Here is something that is affecting me, and I just want you to understand how I feel."

**Need Points**

Someone else's problem may not be your problem but it most certainly can be his point. This was illustrated by the example above in which the worried friend describes his frustration in having an unhappy marriage. However, in many cases when a person describes his problems, he is seeking much more than an empathetic understanding from the listener. He is often expressing his needs with the hope of getting help.

When someone tells you that his car has run out of gasoline, he is probably not making an empathetic point. He may well be asking for help. Asking for help is his point. Here again, it is bizarre to say, "What's your point?" When we are asked for help, either directly or indirectly, the point being made is simply that you should attempt to provide that help. As another illustration, consider the case in which one student tells another about his difficulty in understanding algebra. He is probably seeking some tutoring, particularly if the other student is known to do well in mathematics courses.

One question that comes to mind here is, if he wanted tutoring or guidance, then why didn't he simply ask for it? This speaks to the heart of the issue of points. Points are frequently expressed indirectly. One reason for this is that social rules often prohibit direct expression of ideas and desires. If we ask for something indirectly, we are not so devastated when
we are refused. In this example, by not asking for help directly, the student has left his prospective tutor with the option to politely avoid the issue of providing assistance.

**Explanatory Points**

As understanders of the world we seek to know why things happen the way they do. Thus, we are often in the situation of not understanding something and wishing we did. Speakers often help us by making explanatory points, which fill the gaps in our understanding. For example, in the exchange

A: Why are the banks closed today?
B: Lincoln's birthday.

B is making an explanatory point. He provides a cause for a fact which A finds unexplained and anomalous. Teaching consists, in great measure, of presenting explanatory points.

An important class of explanatory points are those which explain or defend the speaker's behavior (or, by extension, the behavior of someone with whom he identifies himself). For example, if a teacher asks, "Why are you late for class?" a student may answer "I had to go to the dentist." The notable point about such examples is that very likely the teacher does not care why the student is late, as long as there is some acceptable reason. It is a social rule that, if one is obliged to behave in an unusual or offensive manner, one will provide an explanation.

**Prescriptive Points**

Our world is full of rules. Some of these rules can be broken down into explanatory points. "Don't play with matches," and rules of that nature can be viewed as pithy expressions of explanatory points connecting possible cause and effect relationships concerning the possible dangers of fire for you. However, not all rules are thus decomposable. In particular, religious and moral rules can often be broken down no further—ultimately we believe they should be obeyed either because some higher authority has prescribed it or because they just seem to be right, depending on our particular religion/philosophy.

Furthermore, rules which could in theory be broken down are often not, particularly with children who may be incapable of understanding the actual causal points involved. Children are in reality far more likely to be told not to play with matches because it's "bad" than they are to be given a real explanation.

Many rules are not broken down because whatever causal notions underlie them are too poorly understood to be specified. We often pass on
information like, "Hitting the TV on the side with your shoe seems to improve the picture". This, too, is prescriptive. This information does not pretend to be an explanation of anything, it is merely advice on how to succeed in some of your goals.

Because of this, a lot of the input a person gets is in the form of prescription (or proscription) alone. In fact, in comparison to those explanatory points which have the same ultimate goal of improving the performance of the individual, the number of prescriptive points is probably far greater. Whole disciplines in which explanations have become extremely complex and convoluted often turn more and more to these types of points, which exhibit themselves as superstitious behavior. In computer science, for example, programming and in particular debugging are more often done by ritual than by invoking a clear understanding of the situation.

It is clear that the process of internalizing a prescription is different from any of the other types of processing we have examined. Rather than being linked into memory in a causal manner, as explanations are, prescriptions are simply connected to whatever goals and plans they are intended to govern, serving as constraints on later instances of the planning process.

Argument Points

When we get into an argument, it is often our fervent desire to show our opponent that he is wrong and we are right. In such situations the point of our remarks may well be just that: that our position is right, or our opponent's is wrong. Any statement which is meant to supply evidence for some proposition has implicitly as its point "therefore (that proposition)". Thus, while attempting to prove that the Arabs are the aggressors in the Middle East, an Israeli's point is that that is true.

Of course, this situation will be complicated somewhat by the fact that arguments often proceed by spawning subpropositions which provide evidence reflecting on the top level proposition being argued. Thus when an embedded point of evidence occurs in an argument, it is somewhat ambiguous whether the point is that the nearest subproposition is correct, or that the top level proposition is correct (or incorrect), or both. Clearly the situation can become complex, given several levels of propositions being debated. An argument has a life of its own, and often functions in a manner quite unrelated to normal conversation. Therefore, the concept of points may not be the most natural way to view the situation in an argument (Flowers, McGuire, & Birnbaum, 1981).

However, argument points are not necessarily limited to arguments. It is not at all uncommon to make a statement in conversation with the point of supplying evidence for a previous statement. For example, one might say, "The younger generation is totally degenerate. Judy and Richard are
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Living together!” The second statement has the point of providing evidence for the first. Note that this accounts for the fact that a reaction based on affect or interestingness of the second statement would “miss the point” slightly, and if the speaker cared to pursue it he would have to redirect the listeners attention to his opinion of the younger generation.

Interestingly, it is quite possible that someone would say “Judy and Richard are living together” with the same meaning as the statement in the above example. In other words, it could be implicit that the speaker means to point out that the younger generation is degenerate. In this instance, we face something of a dilemma, since the statement is still an argument point, in that it provides evidence for another proposition, but it also serves to introduce that proposition which presumably is intended as an affective point. It seems clear that the main point is whatever the point of the implicit proposition is, and that the argument point is secondary.

Interest Points

Much of what one hears is told merely for the interest value. If someone tells you that the Yankees are trying to sign Dave Winfield, he is (in most cases) stating a fact that is valuable to you to know merely out of idiosyncratic interests, rather than out of any actual relevance to yourself or himself. The ideal response, from the speaker’s point of view, is an expression of interest or excitement on your part: “Really?,” or “That’s wonderful,” or “How do you know?” This can go wrong in several ways. You may, in fact, be interested in baseball, but have a very low opinion of Dave Winfield; in which case you may respond “So what? It won’t do them any good.” You may have no interest in baseball, in which case you will generally tell the speaker so: “I’m sorry, I don’t like baseball.” Or the speaker may be right as to your interest, but mistake your knowledge state, leading to the responses “Who is Dave Winfield?,” or “Who are the Yankees?"

The example with Dave Winfield is based on an interest idiosyncratic to the individual hearer. Other statements, like “Someone shot the President” may be assumed to be interesting to most hearers. Criteria for interestingness are sketched in (Schank, 1978).

Comparison to Other Work

Morgan (1978) arrives at conclusions which are very similar to ours. He states:

From [the content of the speech arts] H [the hearer] must infer what modifications he is intended to make in his model of the world...For each speech act H must infer a purpose that is consistent with the pur-
poses he inferred for earlier speech acts; or he must revise earlier hypotheses about purposes accordingly. Questions H must infer answers to are: "Why did the speaker perform this particular speech act at this particular point in the text?" and "Why does he want me to have this particular fact just now?"... From speech acts and their purposes taken jointly, he must construct a hypothesis of the speaker's goal in the text, and of the plan that the speaker is following in advancing toward that goal...

Our overall model is in close agreement with Morgan's. There are, however, many important aspects of the problem which are not discussed in his brief paper. In particular, we will deal with the categorization of speaker's points; the use of non-linguistic context to aid in determining the speaker's point; and the interactions between determining the speaker's point, and determining the propositional content of speech acts.

Our theory, and Morgan's, clearly lies within the philosophy of "language as use," of which the chief proponents are Grice (1975), Austin (1962), and Searle (1969). Grice presents four rules which govern conversational speech, and he gives a number of examples where the point of an utterance may be found by assuming that the speaker follows these rules. Grice suggests that these rules can probably be derived from an analysis of the goals of communication, but gives no indication of how this may be done. Our analysis begins at the opposite end. We consider the general problem of describing and determining a speaker's goals, and we see, in many cases, how a Gricean analysis may be performed.

Austin (1962) and Searle (1969) are likewise related. The object of their research, however, is quite different. Austin and Searle are interested in speech acts as acts which do something like "asserting truths about the world" or "commit the speaker to a future action" or "attempt to get the hearer to do something," etc. Our primary interest is in communication, viewing communication as an attempt by the speaker to have the hearer perform more or less specific mental operations, like "form a causal chain" or "connect a fact to his personal goals."

The difference between our categorization and Searle's reflects our different interest. Austin and Searle are much interested the category of promises, for example, because promises have remarkable ethical effect; they put the speaker under an obligation. We class promises with other affective points, because generally the hearer will process promises in terms of his personal goals. Conversely, we treat "explanatory points" as a separate category because the information allows the hearer to reform his knowledge state in more reasonable terms. Austin and Searle consider these to be assertions, because they state truths about the world.

Allen and Perrault (1980) and Perrault, Allen, and Cohen (1978) have made a very sophisticated analysis of indirect requests in terms of planning and cooperation. However, they have so far restricted their analysis to what
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We have called need points and affective points; and, indeed, to conversations which open with the expression of a need point. It is not clear that their work can be extended to all the cases where it is important to analyze intention in utterances. In particular, a goal based analysis of empathetic or argument points, if possible, would involve rather subtle goals relating to the relationship between the speakers, or to the structure of the conversation, rather than the rather mundane goals (catch a train, open a door) considered by Allen, Perrault, and Cohen.

Wilensky (1980) distinguishes between external points, the goals of the story teller, and content points, interesting features of the plot structure. His research focusses on the latter, whereas we have examined the former.

Lehnert (1978) discusses the question of determining the meaning of questions, and gives examples where scriptal knowledge and general inference rules associated with semantic primitives are needed to find the meaning of a question. We propose that this kind of information is not applied directly, but rather it is used to build up a model of the speaker; and that very similar processes are needed for all text understanding.

A Detailed Example

We have been talking about points and point categories thus far as though they are very clear-cut. Now let us look at a few examples which show that this is not always the case.

Sometimes it is difficult to say what the point of a statement is. Consider the following exchange:

1: I think Reagan is doing a good job on inflation.
2: I don’t. Did you hear the price of gasoline is supposed to go up to $1.50 a gallon by next month?

One could say that Person 2's statement was an argument point, namely that inflation is getting worse. But assuming Person 1 drove a car and didn’t know about the predicted gasoline price increase, the statement would be a good candidate for an affective point, also. The fact that either of these could be the point of the statement is evident in the way in which the conversation could proceed. It would not be surprising if Person 1 responded, "Really? I’m going to have to start taking the train to work from now on," reacting to Person 2's statement as an affect point, or if he responded, "Yeah, but interest rates are going down," reacting to it as an argument point.

Either one of these two points would be reasonable for the understander to derive. There is no "correct" analysis. We are maintaining that deriving a point is a part of processing, specifically related to the choice of an "inference path". Understanders choose to process idiosyncratically. When an understander's choices do not correspond to the ones the speakers
would have had him make, the speaker will feel that the understander has “missed the point”. But that is a relative judgment, not an absolute one. Sometimes, it is hard to say just how much the point contains. Consider the following example:

Person 1: The Yankees are going to do well this year. They just signed Dave Winfield.

Person 2: Good. The team needed a good leader.

Person 1: I was thinking more about his hitting power.

Here, Person 2 realizes that Person 1 mentioned the fact that the Yankees signed Winfield because it supports the assertion that they will do well this year. In this sense, he got the point. But Person 2 has found a different reason for the support than the one that Person 1 had in mind. Because of this, it still seems that he has missed at least part of Person 1's point.

So we see that points are more complicated than simply finding some assertion which falls into one of the several point categories. Which category does the point really belong to? What does the point include? Sometimes it is difficult to answer these questions. We will not discuss these questions in detail. Rather, we will focus on the utility of the various categories. The "point" of points, and point categories, is to capture some generalizations about intentional communication. As we will see, these generalizations say things about what how the understander processes a point given its category, how to find a point of a given category, and also how to find the category of a given point. These generalizations are knowledge which we feel the understander must possess and use in order to process natural language.

Misunderstandings

Communication between speaker and hearer is not always perfect. Some cases of communication failure are trivial; for example if the hearer cannot hear what the speaker said. Other failures shed considerable light on our theory of points. It is worth noting that there is a special category of responses, such as "So what?" or "What's your point" which a hearer can use if he has parsed the input, but is unable to derive any point. In other cases, the hearer may mistake the point, and indicate this by an inappropriate response. The speaker will then presumably give him some more indications of how to process the statement. Some examples:

Example 1

A: The cat is scratching at the door.
B: Yes.
A: Why don't you let her in?

A intends his remark about the cat as a need point. B categorizes the remark incorrectly as a point of information. This error might be made due
to inattentiveness or simple rudeness; it might be made if B is ignorant of the ways of cats (he thinks it's simply sharpening its claws); it might be made if A's request is for some reason inappropriate (e.g., A is closer to the door). A makes his point clearer by rephrasing his remark as a question about the desired action.

**Example 2**

Holmes: Watson, do you remember seeing any cow-tracks today?
Watson: Yes, several...
Holmes: Well now, Watson, how many cows did you see on the moor?
Watson: I don't remember seeing any...
Holmes: Do you remember that the tracks were sometimes like that... and sometimes like this...and occasionally like this?
Watson: No, I cannot...What is your conclusion?
Holmes: Only that it is a remarkable cow which walks, canters, and gallops.

(The Adventure of the Priory School, Sir Arthur Conan Doyle)

Watson is unable to make the necessary connection between the facts about the cow tracks and any important feature of the case. From his knowledge of Holmes, he knows that Holmes' observations have an argument point, but he is unable to find the evidential connection. Hence he is baffled. His failure to make the necessary inferences is due to denseness, and perhaps also to ignorance of the tracks made by various gaits. Holmes clarifies himself by supplying the forward inference from the nature of the tracks to the nature of the gait, and leaves it to Watson to make the further inferences that the "cow" tracks were made by a horse.

**Example 3**

X: The young generation is incredibly degenerate. Did you know that Judy and Richard just had a child?
Y: Oh well, I've not sure that marriage is really all that important for happy family life.
Y: But Judy is Richard's sister!

This is similar to the previous case, but somewhat more subtle (from a technical point of view.) Again, Y successfully categorizes X's statement as an argument point, and X (unlike Holmes) has made his overall point clear. Y is able to find a connection between X's evidence and his assertion, but owing to ignorance of the situation, he finds the wrong connection, thus missing the point. X clarifies the point by supplying him with the missing situation.

**Example 4**

Mrs. Brown: Suzy Jones is pregnant.
Mr. Brown: What do I care?
Mrs. Brown: Well, they use the same contraceptive method we do.
Note that it is entirely possible that Mr. Brown already knew about the Joneses' birth control method. He may merely have overlooked that source of relevance. This failure, either a failure of knowledge, or a failure to retrieve all the relevant information, led him to be unable to categorize the point of the utterance at all.

Example 5

P: I got a B in my computer course.
Q: Oh, congratulations!
P: No, no, I was expecting an A.

Q correctly realizes that he is being called upon to sympathize with P's emotional state, but he errs in judging what that state is. This is, again, due to a failure of knowledge. It is worth emphasizing the subtlety of the interpersonal knowledge which may be needed to extract the point here.

Example 6

M: The Khmer Rouge have murdered two million Cambodians.
N: So what?
M: How can you be so callous?

This is an example of a speaker failure. M has made a mistake as to N's probable interests. His only approach is to try to awaken N's dead moral conscience.

There are sometimes ways of conveying the point which are essentially immune to misinterpretation. "Pass the salt," is one such. "The Khmer Rouge have murdered 2 million Cambodians," is another. If the hearer responds "So what?" there is nothing more to be said. However, people are rarely this direct; rather, they generally phrase what they say in ways that require their hearer to make some inferences. The most common reason is brevity. In example (3) above, Mrs. Brown could have said, "Suzy Jones uses the same kind of contraception that we do, and is pregnant. This shows that the method is fallible, and that maybe we should do something else."

This would have eliminated any chance of misunderstanding, but it would have also taken twice as long to say. In (1), the indirectness is motivated by etiquette; in our society, it is more polite to word requests indirectly. In (2) Holmes is merely teasing Watson.

POINTS & LISTENER'S PROCESSING

Now let us consider in some detail the role points play in the listener's processing of an input. One important thing to note is that for the listener to get the point is not the same thing as for him to process the input in the manner the speaker intended. That is, the speaker may not succeed in producing the desired effect upon the listener, but this fact does not imply that the listener does not realize what that desired effect was.
We have already looked at an example where this fact was implicit. We noted that a reasonable response to "The Yankees just signed Dave Winfield" might be "I don't like baseball." To generate such a response, the listener would have to be aware that the speaker intended the statement to be processed in terms of interest, despite the fact that he did not find it interesting. This implies that the listener must be processing the input not only by determining what processing category is appropriate for dealing with it, but also in terms of what processing category the speaker intended the listener to choose.

In the Winfield example the understander failed to derive a processing category for the input, but was nonetheless able to deduce the intended processing category. Alternatively, it is possible to find a way to process the input without knowing what the intended processing category was. For example, if someone inadvertently gives you some information concerning something which, unknown to them, is very important to you, you are very likely to process the input in terms of its effect on you. However, the fact that you are affected by this input does not imply that the speaker's point was necessarily to affect you. The intended processing category may be unrelated, or unclear. The speaker may have had no idea that you might be affected by the particular information involved. Furthermore, this fact may be entirely clear to you, since it is quite possible that you could know that the speaker wouldn't have the knowledge to infer that you would be affected.

A simple example of how this could happen might be in a situation where the speaker is using facts to support an argument point. Say he is making a point about the shocking number of children born out of wedlock these days, and he mentions as an example that Mary Jones is pregnant. If you have been secretly dating Mary, this fact may well be of tremendous import to you, and you are likely to process the statement in exactly the same way you would had it been straightforwardly intended as an affect point by someone who was aware of your relationship with Mary. However, this in no way implies that the speaker's point had anything to do with that. Furthermore, the fact that this was not the speaker's point should be perfectly obvious to you.

These examples make it clear that two separate but related processes are occurring in the listener when an input is being processed. The listener is both deciding on how to process the input and trying to determine how the speaker intended him to do so. In order to make use of the notion of points in a process model of an understander, we will have to make clear how these two processes interrelate.

The relationship between the process of tracking points and the process of deciding what to do with input is not a simple one, since either process can potentially be helpful for the other one. Deciding that an input is interesting, or inferring from it that the person you are talking to needs help, is not equivalent to determining that that was the person's point, but it cer-
tainly good evidence to that effect. Likewise, knowing that a person has an explanatory point does not ensure that you will grasp it, but it can at least help to guide you in the right direction for processing.

In general, whenever we decide that an input belongs in a certain processing category, we check to see if that might have been the speaker's point, and whenever we decide on the speaker's point, we see if we can process the input in the manner he intended. These two situations may be seen as roughly constituting a distinction between "bottom-up" and "top-down" derivation of the point. That is, if we use some cues taken from our knowledge of the speaker or the situation to decide what sort of point the speaker probably has, and use that information to direct future processing, we have analyzed the input top-down by making heavy use of our expectations. On the other hand, if we can't figure out from the situation what type of point of the person has, we may have to first decide that the input fits one of our processing categories by attempting to apply each of them (Is this interesting? Does this affect me? etc.). Having found a processing category which is appropriate, we may then ask ourselves. "Was that his point?" In this case we have done our processing bottom-up, being guided by our analysis of the input rather than our expectations.

Let us look at an example which makes this distinction clear. Consider the following case: an official says to you, "You are standing on the grass." Accordingly, you move off the grass. Now, you may have known perfectly well that you were standing on the grass, and you may even have known that the official knew it. Therefore, your action was not prompted by any new information, as such. Why, then, did you decide to move?

The answer is that the official's point was not an informative point, it was a need point (in a broad sense). The official was requesting that you move off the grass. There are at least two ways in which you could determine the category of his point. You might notice that you already knew the content of his statement, and therefore the statement presumably served some other function. It is a general rule that need points are often presented as statements of the problem (compare "I'm hungry," "It's cold in here," etc.). Therefore, your being on the grass constitutes a problem for the official, which can be remedied by appropriate action on your part.

Alternatively, you may use your knowledge about officials. Usually, when an official addresses you, it is with the purpose of giving you an order. Frequently, the owners of grass prefer that you stay off it, and they employ an official to enforce this preference. The understander may, by a judicious application of these rules, arrive at an interpretation of the officials remarks.

Actually, both methods must be available to the understander. The former must be used if someone who does not look like an official tells you, "You are standing on the grass." The latter must be used if an official shouts "Hey you!" at you, and you wish to respond before he gets angrier.
There are, in fact, a number of studies in the psychological literature of the processing of indirect requests, such as the one above. The results of Gibbs, (1979) suggest that, when it is available, contextual information is heavily used in determining that a statement is a request. Specifically, he showed that people normally do not need to first assess the "literal meaning" of an utterance, and then realize that the indirect meaning is the intended meaning. Instead, subjects seem to be able to correctly uncover the intended indirect request, without having to first understand a "literal meaning". Gibbs found that in a story context, indirect requests are understood faster than the same sentences used as literal questions.

The meaning of such results can be made clear in the context of our theory. When we use our knowledge of officials to understand the official's point in the above example, this is a case of almost pure top-down processing on our part. We do not have to derive the literal meaning of the sentence because the situation, and perhaps some meta-linguistic cues such as the official's tone of voice, allow us to realize the type of point he has without reference to the content of the input.

On the other hand, the alternative method of processing is almost purely bottom-up. Here we derive the content of the input, recognize that the input seems to provide information, and ask ourselves, "Could that have been his point?" Because of the obviousness of the information, we are forced to answer "no" to this question, and it is the subsequent search for what the person's point might have been which produces the realization that the point is a need point.

We will now consider how to use the two processes of finding the speaker's point and finding a processing category to build a model of a conversational listener. To begin with, we can recognize the following principles by which the model should operate:

1. For each input, at least one speaker's point must be derived. If this is not the case, understanding has failed.
2. For each speaker's point derived, the listener must consider whether the input can be processed in the intended way.
3. For each input, any number of processing categories may be applied (depending on the importance to the understander).
4. For each processing category applied, the understander must consider whether the speaker may have intended the application of that category.
5. The input content must be understood at least sufficiently to decide what the speaker's point is and to determine if the listener can process the input in the intended way. If one of these cannot be accomplished, and the input has not been sufficiently understood to make it reasonable certain that it will not be accomplished, the
process must continue. If a processing category is chosen, processing must continue in the direction indicated by that choice.

Based on these principles we can construct the following algorithm: Is there enough a priori and situational knowledge available to guess the category of the speaker’s point?

If yes,

- assume that the speaker’s point is in that category
- see if the input can be processed in that way
- if so, do and STOP
- otherwise, continue

Try to find a processing category available to the input (i.e.,—ask “does this interest me?” “Does this affect me?” etc.)

Was a category found?

- If no, ask “What’s your point?” and STOP
- Process the input according to the category
- Could this have been the speaker’s point?
- If yes, assume this is the speaker’s point and STOP

Return to beginning (now considering the fact that we derived a category which couldn’t have been the speaker’s point as part of the situational information)

We have oversimplified somewhat here in that we have neglected to say anything about how this processess relates to other processes involved in understanding. In particular, we may think of the type of understanding processes upon which previous research in natural language processing has typically focused: representing text and forming causal and knowledge structure based (e.g.,—scripts, MOPs) relationships between the input and other knowledge. The relationship between understanding and point derivation is a more complex sort of process than the one we have been looking at.

For one thing, we can understand an input, at least to some extent, without having the slightest grasp of the speaker’s point in saying it, and without any applicable processing category for it. That is, someone could come up to you and make almost any sort of simple, declarative statement—say, “John and Mary just got married”—and you can process the content of the input, in this case by instantiating the knowledge structure associated with “wedding”. However, this input (assuming you don’t know John and Mary) will not fall into any of your processing categories, and the point of the speaker will be completely opaque to you. In fact, just because you could process such a sentence, it doesn’t necessarily follow that you would, given a lack of understanding of the point of the processing.
On the other hand, there are times when the search for the point of a statement results in true understanding. This is the case in the "standing on the grass" example above. Only by considering the intent of the speaker in affecting you can you actually derive the meaning of the official's statement.

Furthermore, as was the case with that example, one can at times anticipate the point before the content of the communication is actually present. However, there are also times when the point is grasped only after lengthy consideration of the content.

So we can see that the search for the point may fail, though understanding proceeds; that understanding may, on the contrary, depend on the search for the point; that the search for the point may precede the processing of the content, but may also follow it.

The point here is that it just does not seem possible to specify any sort of serial relationship between the search for a point and general understanding of the input. It seems most reasonable to think of the point processor as a routine that acts in some sense as a watchdog over the understanding process, serving to monitor whether that process is producing reasonable representations of the input, to guide the attention of the understanding process away from input which seems to lack a point, and to direct further processing of an input for which a point has been found.

Specifying this relationship algorithmically is certainly a complex task, and it lies beyond our scope here. However, we can give some principles for the interaction of the process of deriving the point and the rest of understanding. In particular, we can assert the following:

1. If there is some anticipation of the content of the input, this will not occur before the application of some top-down knowledge of the speaker's likely point. That is, it is hard to imagine processes which give us a reason to guess at the content of the input without doing so by way of a consideration of the speaker's intent. This restriction is not inviolable, but at least it is not likely to be profitable for the understander to try to guess the content before considering the intent of the speaker, and thus the likely point category for the input.

2. The process of determining the applicability of processing categories cannot begin until at least some understanding of the content has occurred. Whether the process is triggered by the derivation of a possible point, or simply begins of its own accord, it has nothing to operate on without some understanding of the content of the input. However, this understanding must by no means by complete, as the example above where application of a processing category begins before the input is even received demonstrates.

3. The effect of choosing a processing category will be to direct further processing of the input content (with respect to the structures in
memory). Therefore, once the process for choosing a processing category has chosen, the processing of the content must continue along the direction specified by that choice.

A DETAILED EXAMPLE

We will now examine an example in some detail which will show that deriving points is necessary for proper understanding. Consider the following conversation between a husband and wife:

Wife: I went to the doctor's office today.
Husband: Are you sick?
Wife: No, I'm fine.
Husband: Then why did you go to the doctor's?
Wife: Do you know that extra room we were thinking of adding on?
Husband: What about it?
Wife: Well, the doctor says we're going to need it.

The point of the wife's sequence of statements is clearly, "I'm pregnant." Let us examine how the husband derives this point.

The wife's first statement strongly suggests to the husband a category for her point, as well as fairly specific limitations on its content. A visit to the doctor usually implies illness, and this means that the wife's goal of preserving her health is being threatened. This implies an affective point, since affective points are transitive across relationships, as we said earlier. Therefore, the husband guesses that his wife's point is that she is sick. Since there is some doubt, however, about what exactly her point is, his reply of, "Are you sick?" is a way of asking for verification that he has derived the correct point.

There is a problem here. Although the wife's first statement does suggest the point that she is sick, it does not explicitly state it. There are other possibilities (as the husband eventually discovers). Why, then, does the husband make the inference that her point is that she is ill?

The reason is that the connection between going to the doctor's and illness is very strong. Therefore, the possible affective point here forces the husband to leap to a conclusion in attempting to find the point. In a less clear or less affective situation, the husband might very well have reacted differently to his wife's statement. For instance, drug stores are also associated with illness, but if the wife had said, "I went to the drug store today," this would not have created as strong an expectation for an affect point. In this case, the husband would have been more likely to respond with, "So what?" or something else meaning, "What's your point?"

Continuing with the present example, after the husband asks for verification that he has derived the correct point, she responds by saying, "No,
I'm fine” or, in other words, “No, you don’t have the correct point.” At this point, he does not know what his wife’s point is. Now he is justified in saying something which means, “What’s your point?” (It is important to realize that his statement, “Then why did you go to the doctor’s?,” is an encoding of “What’s your point?”). To express our processing goals, such as finding the point, we often encode them using the context of the conversation. Just because we mean “What’s your point?” we don’t constantly say it.

At this point, although the husband does not know the category or the content of his wife’s point, he does still have some expectations about what the point will be. He knows that the point eventually has to relate back to a trip to the doctor’s. In other words, he is still assuming that she did have a point to her first statement.

There is a problem here which is analogous to the problem discussed earlier. Why does the husband still assume that his wife’s first statement had a point? In many similar cases, it would be correct to conclude that there is no point to be found. Let us illustrate this with another example. In this example, the husband has been cheating on his wife with his wife’s best friend, Ellen. Ellen is mad at the husband, and the husband fears that Ellen will tell his wife about them.

Wife: I got a call from Ellen today.
Husband: What did you talk about?
Wife: Nothing very interesting.
Husband: What else did you do today?

This example is very similar to the first example, in that the wife’s first line sets up an expectation for an affective point, namely that Ellen told her about their affair. He asks a question, trying to confirm this expectation. Again, the wife does not confirm these expectations (“Nothing very interesting”), and apparently the husband’s expectations for an affective point have been violated. As in the first example, the husband is now left with almost no expectations about what her point is. Instead, he changes the subject, glad that she does not have a point.

So how can we explain why the husband assumes that there is still a point in the doctor example? The reason is that the husband cannot assign a motive to his wife’s trip to the doctor. In the affair example, he can understand why Ellen had called his wife: Ellen and his wife are friends, and friends call each other on the phone just to talk. But people do not go to doctor’s offices just to talk. Because of this, the husband is not satisfied with finding an interest point; he wants an affective point.

Let us continue with the example. We have established that the husband is still expecting a point about the doctor’s office. When the wife says that the doctor thinks that they will need an extra room, the husband tries to find a point which involves a doctor, does not involve illness, and which has
something to do with an additional room. He is supposed to conclude that his wife is going to have a baby. Exactly how his does this is not really relevant to points. What is relevant, though, is that is his searching for a point which leads him to look for a connection between these things, thus enabling him to infer that his wife is pregnant.

Searching for points is vital to inference-making. To demonstrate this further, let us suppose that the doctor is a good friend of the wife's. In this case, when the husband asked, "What's wrong with you?" and his wife told him that nothing was wrong, he could have inferred another motive to her visit to the doctor's: she was paying him a social visit. Then, if she had gone on to say that the doctor thought they needed an addition, he might have missed the point, since he was no longer looking for one. He could have come up with another explanation as to why the doctor would say that they needed an addition, such as maybe their house would be worth a lot more if they built an addition, so it would be a good investment, and the doctor was giving them advice as a friend.

Notice also that the husband's search for the point not only explains how he was able to understand such an obscure reference to pregnancy, it also explains why he said what he did during the course of the conversation. His expectations for finding a point guided his questioning. So we see that this example illustrates two uses for points—explaining how obscure inferences can be made in some situations, and explaining, at least in part, why a conversation proceeds in the manner in which it does.

CONCLUSION

Our examination of points has led us to the following conclusions:

1. Typically, a speaker will have in mind the way in which he wishes his listener to process an utterance.
2. Besides processing an utterance for content, a listener will also try to determine how the speaker intended him to process it. This information may aid him in understanding the utterance and in framing an appropriate reply. The processes used to determine the speaker's point involve a mixture of top-down and bottom-up reasoning.
3. Deriving the point is an important criterion for understanding. Therefore, processing must continue until the understander has satisfied himself, either that he has found the point, or that finding the point is not worth the effort.
4. Varieties of points may be profitably categorized, as above, by the type of processing which the speaker desires in the listener.
5. Restricting inferences to those which help find the point protects the inference process from combinatorial explosion. Points guide inferencing and also guide conversation.
What does this mean for AI programs? In the past, natural language programs have generally interpreted input and produced output as if in a vacuum, with no model (or at best a fixed, invariant model) of why the input came, and what the reason had to say about subsequent processing. Knowing what a speaker may have in mind, or knowing that you don’t know what he is getting at, is critical to understanding.

We are talking about making programs purposive. Just finding new inferences isn’t good enough. A program must know if what it has found is satisfactory. Our definition of satisfaction must employ a concept of a point such that we could know when we have found it and also know to keep on trying.

REFERENCES