# When Given Information is Accented: Repetition, Paraphrase and Inference in Dialogue

Marilyn A. Walker

Computer and Information Science University of Pennsylvania 200 S. 33rd St. Philadelphia, Pa. 19104

#### ABSTRACT

A classic function of intonation is to indicate the distribution of given and new information in an utterance. This paper defines given in two ways: known and salient. It then examines 63 utterances from a radio talk show corpus to determine whether either definition of given is predictive of the intonational contours found in the corpus. Given as salient is found to reliably predict one class of contour: the sustained tones.

#### 1. Introduction

A classic function of intonation is to indicate the distribution of given and new information in an utterance[5, 7]. The pitch accent on new information indicates the information focus, the discourse entity about which a predication is being made, whereas given information typically occurs without a pitch accent. The traditional view consists of three basic claims: (1) Each phrase contains an item marked by the main pitch accent as the information focus; (2) The remainder of the phrase is given information, the ground; (3) There are a limited number of special cases in which given information may be accented.

Pitch accents may function to draw attention to or to increase the amount of processing devoted to the information focus[4]. A complementary viewpoint is that deaccenting plays a functional role as well; it indicates to the hearer that the deaccented item is currently salient in the discourse[20, 17]. The combination of these two factors allows the distribution of pitch accents to guide the hearer's processing.

Other researchers have claimed that given information may be accented in special cases such as when it is thematic, contrastive, or exclamative, as well as when the speaker echoes part of a previous utterance with surprise or incredulity or denies a presupposition in the previous utterance[3, 13, 18].

A less traditional view is that given information can occur with a pitch accent, but the type of pitch accent is qualitatively different than that on new information[15]. P&H claim that the complex bitonal accent  $L^*+H$  marks information that is known but not currently salient, whereas the bitonal H+L accents mark the propositional content of an utterance as being inferable. The H+L\* accent indicates that 'the desired instantiation of a salient open proposition is already among the mutual beliefs' of the conversants. The H\*+L differs from H\* in conveying that the hearer 'should locate an inference path supporting the predication'([15], sect 5.4).

In order to investigate some of these claims, this work develops independent logical criteria for classifying utterances as consisting of given or new information, and then examines whether in fact the intonational realization of given information corresponds with the predicted intonational patterns. This paper examines utterances that consist wholly of given information, e.g. repetitions of previous utterances. A definition of this class of utterances will be provided in section 2. I will call these INFORMATIONALLY REDUNDANT utterances, IRU's[22, 21].<sup>1</sup> Since the classical view is that each utterance has at least one item of new information, and since IRU's provide no new information, they potentially have an anomalous intonational realization.

The data consist of 63 IRU's from a corpus of naturally occurring dialogues, from a radio talk show for financial advice.<sup>2</sup> IRU's constitute about 12% of the utterances in this corpus. The instances of IRU's that have been analyzed intonationally demonstrate cases of pitch accents on given information that do not seem to fit the special cases described in previous work.

Section 2 describes the independent criteria used to classify utterances as consisting of given information, the types of prosodic realization found in the corpus, and a number of distributional parameters used to classify the

<sup>&</sup>lt;sup>1</sup>These utterances are not however communicatively redundant, and yet they provide no new information.

<sup>&</sup>lt;sup>2</sup>This corpus was initially transcribed by Hirschberg and Pollack from tapes of a live radio broadcast of a talk show called *Speaking of Your Money* on WCAU in Philadelphia[16]. I am grateful to Julia Hirschberg for generously providing me with the tapes of the original broadcast. Digitizing, pitch tracking, and transcription of the original broadcast was done with WAVES and additional programs generously supplied by Mark Liberman. There are some problems with this corpus, mainly being that there is some overlapping speech and the dialogues are taped in single track.

utterances in the corpus. The following sections examine particular subsets of the corpus defined by certain distributional properties, and finally section 7 proposes some issues for future research.

#### 2. Informational Redundancy

The term INFORMATIONALLY REDUNDANT utterances (IRU's) describes utterances that consist wholly of given information. In what follows, it will be useful to have a term to refer to the utterance(s) that originally added the propositional content of the IRU to the discourse situation. This the IRU'S ANTECEDENT.<sup>3</sup>

A definition of when an utterance counts as informationally redundant is given below[6]:<sup>4</sup>

Definition of Informational Redundancy An utterance  $u_i$  is INFORMATIONALLY REDUN-DANT in a discourse situation S

- 1. if  $u_i$  has already been said in S
- 2. if  $u_i$  expresses a proposition  $p_i$ , and another utterance  $u_j$  that entails  $p_i$  has already been said in S
- 3. if  $u_i$  expresses a proposition  $p_i$ , and another utterance  $u_j$  that presupposes or implicates  $p_i$  has already been said in S either non-adjacent to  $u_i$  or by another speaker

Condition (1) of the definition means that saying an utterance in a discourse situation adds the propositional content of that utterance to the discourse situation. Condition (2) depends on identifying what is entailed from what is said; it relies on concepts such as paraphrase and logical inference.<sup>5</sup> For conditions (1) and (2), a diagnostic of whether the propositional content of an IRU is defeasible can be used to test whether the information is already available in the discourse situation[19]. This diagnostic cannot be used for cases defined by condition (3) since some of these inferences are defeasible.

Thus there are 4 logical types of IRU's defined by their relation to their antecedent. An IRU may be a: (1) repetition, (2) paraphrase, (3) entailment, or (4) non-logical

inference from its antecedent(s). This defines given information based on purely semantic properties.

I will also examine the interaction of salience with the semantic definition of given as informationally redundant that is provided above. The term given has been used to mean both semantically given as well as 'in the hearer's consciousness' or salient[2, 17]. In fact, Brown argues that only when 'given' means 'salient' does it have relevance for intonational realization[1].

In the remainder of this section I will first describe the way that the IRU's in the corpus can be prosodically characterized, and then define a number of distributional parameters to use to determine whether it is possible to predict the different intonational realizations.

#### 2.1. Intonational Description

I will use the system for intonational description proposed by Pierrehumbert[14], with two modifications. First, I will use the diacritic [ds] to indicate downstep[8], replacing the abstract L in the  $H^*+L$  contour that was the trigger for downstep in Pierrehumbert's original system. Second, I will adopt the parameter of ':' for sustained tones, from McLemore[12]. This parameter indicates that a tone is sustained until the next tone.<sup>6</sup>.

Most of the IRU's examined here, (48 of them), are roughly categorized into three intonational patterns, all of which end in falls; the difference between them is in the relationship between the two or more high pitch accents (H\*) that each pattern contains. I will call these (1) sustained tones, e.g. H\*: H\* L L%, (2) downstepped H, e.g. H\* H\*[ds] LL%[8], and (3) upstepped H, e.g. H\* H\* L L%[11, 9]. Figure 1 shows a sustained tone. Figure 2 gives an example of downstep and Figure 3 gives an example of upstep.<sup>7</sup> I have limited the cases I examine here to IRU's that are realized with final falls or levels. Some have a downstepped phrase accent, or final Mid[9, 10].

For utterances that fit in these three main classes, there is often very little juncture between pitch accents in their realization. This means that the whole utterance seems to be treated as a unit since no single sub-part of the utterance is selected as focal. This is interesting due to the potential anomaly referred to earlier; theories that say that given information is de-accented predict that

<sup>&</sup>lt;sup>3</sup>Actually I use the term antecedent to refer to both the prior utterance and the proposition realized by that prior utterance, but this should not cause any confusion.

<sup>&</sup>lt;sup>4</sup>An utterance is defined as a clause, or a phrase in cases when there is no finite verb in an utterance.

<sup>&</sup>lt;sup>5</sup>Other information is commonly included in the discourse situation such as that which is evoked by the physical situation or by common-sense or plausible inference[17]. However, I will only look at a subset of the 'available' information.

<sup>&</sup>lt;sup>6</sup>Neither the system presented in Pierrehumbert's dissertation nor the recently proposed 'standard' transcription system seems adequate to transcribe this contour.

<sup>&</sup>lt;sup>7</sup>The terms downstep and upstep are used to refer to precisely defined phenomena in African tone languages; here, I am using them simply as descriptive terms to refer to a relationship between adjacent H\* tones.



Figure 1: Mary 46. Salient paraphrase, Sustained Tone

the whole utterance would be de-accented, and yet this is in conflict with the assumption that at least one item in an utterance is always accented. Realizing the utterance with a sustained  $H^*$  or with broad focus makes sense if every item has the same information status. In this case, the whole utterance consists of given information.

There are 7 IRU's in the corpus that are ambiguous between the three patterns described above because there is only one pitch accent in the utterance. Clearly one cannot distinguish sustaining a tone, downstepping from a tone, or stepping up to a tone when only one tone is realized. These will be called one-tone and will be discussed in more detail in section 4. Additionally, there are 15 tokens that do not fit into these three patterns and which I will briefly discuss in section 6. I should also note that there are cases in which it is difficult to distinguish a downstepped tone from a sustained tonal value; these are where the values of two adjacent tonal targets seem subject to a non-categorical kind of gradual decay, ie. there is very little difference between the two adjacent tones. I depended on the way the utterance sounds to make this distinction.

The following section discusses the distributional parameters used to classify the corpus and presents some initial distributional results. These results will then be discussed in the remainder of the paper.

## 2.2. Distributional Description

One of the main distributional parameters is the logical type of the IRU as defined above, whether it is related to its antecedent as a repetition, a paraphrase, an entailment or a non-logical inference. Of the 63 tokens of IRU's examined here, 13 are repetitions, 30 are paraphrases, 13 are entailments, and 7 are non-logical inferences.<sup>8</sup>

The second main distributional parameter is salience. An IRU may have an antecedent that is currently salient in the discourse context, i.e. just said by the other speaker or within the same turn of the current speaker. An IRU may also have an antecedent that is not currently salient. Its antecedent has been DISPLACED by an intervening change in topic[1]. Of the 63 tokens examined here, 42 have salient antecedents, and 21 have displaced antecedents.

The distribution of the corpus according to these parameters is presented below. Figure 4 shows the distribution of the three main contour types, presented in section 2.1, with respect to whether or not their antecedent is salient or displaced. Figure 4 also includes the 7 tokens that are called One-Tone, those with only one pitch accent and thus could fit in any of the sustained tone, downstep and upstep categories. It also includes the set of tokens classified as Other; these Others typically have an item realized with narrow focus somewhere in the middle of the phrase, or have an atypical syntactic structure such as topicalization. These will be discussed in more detail in section 6.

As figure 4 shows, salience is a predictor of sustained tones ( $\chi^2 = 5.600, p < 0.02$ , for comparing salience as a predictor of sustained tones vs. downstep + upstep + other). Furthermore all the tokens that are difficult to classify because they only have one pitch accent, i.e. the one-tone category, have a salient antecedent. Salience is a predictor of one-tone as well(p < 0.05). The one-tone

<sup>&</sup>lt;sup>8</sup>However, some examples of paraphrases seem closer to inferences based on axioms in lexical semantics.



Figure 2: Marsha 26. Displaced paraphrase, Downstep

|           | SustT | DownS | UpS | 5   One-7 | C   Othe | er |
|-----------|-------|-------|-----|-----------|----------|----|
| Salient   | 8     | 13    | 4   | 7         | 10       |    |
| Displaced | 0     | 12    | 4   | 0         | 5        |    |
|           |       |       |     |           |          |    |

Figure 4: Salience as a Predictor of Contour Distribution

tokens pattern like sustained tones in other respects as well; over half of them are repetitions. If the one-tone contours were classified as sustained tones, the relationship between salience and sustained tones would be even stronger (p < 0.01). Some one-tone contours will be examined in section 4.

Both the downs and upstep contours are equally likely to have a salient antecedent as a displaced antecedent. In section 3, I will compare examples of downstep and sustained tones that occur in similar discourse situations.

|             | SustT | DownS | UpS | One-T | Other |
|-------------|-------|-------|-----|-------|-------|
| Report      | 5     | 1 2   | 1   |       | 1     |
| переаг      | 5     | 2     | 1   | Ŧ     | 1     |
| Paraphrase  | 2     | 18    | 5   | 0     | 5     |
| Entailment  | 0     | 5     | 1   | 2     | 5     |
| Non-Logical | 1     | 0     | 1   | 1     | 4     |
|             |       |       |     |       |       |

Figure 5: Logical Type as a Predictor of Contour

Figure 5 examines the distribution of the various logical types of IRU's with respect to the contour categories. This figure shows that paraphrases are more likely to be realized with a series of downstepping tones ( $\chi^2 = 9.877, p < 0.01$ , as compared to the other logical types and other contour types).

Figure 5 also shows that repetitions are more likely to be sustained tones than any other logical type(p < .01). However this could be due to the fact that repetitions are more likely to have a salient antecedent (p < .02). See figure 6.

|           | SustT | DownS | UpS | One-T | Other |
|-----------|-------|-------|-----|-------|-------|
| Salient   | 5     | 2     | 0   | 4     | 1     |
| Displaced | 0     | 0     | 1   | 0     |       |
|           |       |       |     | L     |       |

Figure 6: Repetitions: Salient vs. Displaced Antecedents

Finally, a comparison of IRU's inferable from their antecedents, ie. logical and non-logical inferences, with repetitions and paraphrases, shows that inferables are less likely to be realized with one of the three main patterns discussed(p < .01).<sup>9</sup> See Figure .

Thus it seems that there is much more variability in the way the inferential IRU's are realized; they are neither realized consistently with the downstepping tones predicted by P&H nor with the stylized contours that were documented by Ladd and McLemore[15, 12, 8]. The following sections will discuss particular examples of the contours discussed here.

<sup>&</sup>lt;sup>9</sup>A comparison of repetitions with all the other logical types is not significant (p < .10). However a comparison of repetitions with inferences alone is significant (p < .05), as is a comparison of paraphrases with inferences alone (p < .05).



Figure 3: Joe 48. Salient paraphrase, Upstep

|                             | Other |   | Not-Other |   |
|-----------------------------|-------|---|-----------|---|
| Repetitions and Paraphrases | 6     |   | 38        |   |
| Inferables                  | 9     |   | 11        |   |
|                             |       | - |           | - |

Figure 7: Inferables are more likely to be Other

#### 3. Sustained Tones vs. Downstep

According to figure 4, the sustained tone contours are predicted by the salience of the antecedent. However why is it that there are so many downstepped contours with salient antecedents? The dialogue segment in 1, from (56) to (58) provides three examples of IRU's. In the dialogue excerpts given here, IRU's will be marked with CAPS whereas their antecedents will be given in *italics*.

- (1) (52) h. and they will maintain their value approximately because they are variable rate funds
  (53) m. I see
  (54) h. Ok
  (55) m. Fine
  (56) h. and but separate it,
  I DON'T WANT IT ALL IN ONE
  (57) m. TWO DIFFERENT ONES
  (57) m. TWO DIFFERENT ONES
  - (58) h. TWO DIFFERENT ONES, three would be even better....

The IRU in (56) is shown in figure 1. In 1-56, the speaker, (h), has paraphrased his own utterance from

the just previous clause. The lexical item separate in (56) entails a division into at least two separate parts. As shown by plot of f0 in figure 1, this utterance is realized with a high sustained tone, followed by a mid-level final value (cf. [9, 10]), H\*: H\* H[ds] L%. This is an example of stylized intonation[8, 12]. Stylized intonation makes sense in these contexts since the information has just been said, it is certainly predictable. However the sense of predictability may be carried by sustained tones or a sequence of downsteps without necessarily depending on the final mid-level[15].

When we compare 1-56 with the paraphrase of it that Mary (m) produces in 1-57, we find that this utterance, in the same context is realized with a downstepping contour, rather than with the sustained tone. See figure 8. However there is a third example of an IRU in example 1-58, where Harry repeats two different ones. This is shown in figure 9. This utterance is counted as a sustained tone because of the difference between it and the downstep seen in figure 8. However the f0 for this utterance does go down slightly as it nears the end of the phrase. It is also realized with a phrase-final level since Harry intends to continue his turn[12, 15].

An almost identical context occurs in the following excerpt:

(2) (24) h. that is correct, it could be moved around so that each of you have 2000
(25) m. I
(26) h. without penalty
(27) m. WITHOUT PENALTY
(28) h. right
(29) m. and the fact that I have a an account of my own ...



Figure 12: Dave 36. Salient paraphrase, Sustained Tone



Figure 11: Ray 34: Salient repetition, Sustained Tone

An example of downstep that is very similar to that given in figure 8 is the repetition in example 5-9. As shown in figure 13, the utterance in 4-9 is realized as a series of downstepped highs, with a pitch accent first on *take* and then *money* realized as an  $H^*[ds]$ .

(5) (8) h. you can stop right there: take your money
(9) j. TAKE THE MONEY
(10)h. absolutely....

Note that while all the sustained tones have a salient antecedent, there are other IRU's that have a salient antecedent and yet are not realized with sustained tones. Thus I currently cannot predict when the sustained tones should occur, only when they should not.



Figure 13: Jane 9: Salient repetition, Downstep

#### 4. One Tone Contours

As noted in section 2.2 there are some tokens which can't be classified as either a sustained tone, a downstep or an upstep because they only have one pitch accent. For example 6-8 in the excerpt below, and shown in figure 14.

- (6) (6) r. Uh 2 tax questions. one: since April of 81 we have had an 85 year old mother living with us. Her only income has been social security plus approximately 3000 dollars from a certificate of deposit and I wonder what's the situation as as far as claiming her as a dependent or does that income from the certificate of deposit rule her out as a dependent?
  - (7) h. Yes it does
  - (8) r. IT DOES

(9) h. Yup that knocks her out.

These tend to be elliptical repetitions such as the one shown here. Figure 4 showed that these one-tone contours pattern distributionally like the sustained tones. However they cannot uncontroversially be collapsed with the sustained tones.



Figure 14: Ray 8, Salient repetition, One-Tone

A similar example is given below in 7 and shown in figure 15.

| (7) | (26) h. first of all with that forty one thousand |
|-----|---|
|     | and that's your pension alone                     |
|     | (27) m. yes                                       |
|     | (28) h. completely taxable                        |
|     | (29) m. yes                                       |
|     | (30) h. ok  |
|     | (31) m. so we're in a                             |

- (32) h. you're in a pretty healthy tax bracket
- (33) m. YES WE ARE

(34) h. as a result i'm not sure that I would want any of that hundred twenty thousand in any more treasury notes

Some of the contours classified as one-tone also share the phrase-final Mid with contours classified as sustained tone. For example consider the excerpt below and the corresponding f0 in figure 16.

(8) (22) b. Are there ah .. I don't think the ah brokerage charge will be ah that excessive
 (23) h. No they're not excessive but THERE ARE CHARGES



Figure 15: Mary 33, Salient repetition, One-Tone

Although this cannot be classified as a sustained tone since there is only one major pitch accent, it is also an example of 'stylized' intonation[9, 12, 8].

## 5. Upstepping Contours

One example of an upstepping contour was given in figure 3. Another example is given below in excerpt 9, and is shown in figure 17.

(9) (8) j. and uh i'd like to start out an I R A for myself and my wife, she doesn't work
(9) h. well how about last year?

( Intervening dialogue about eligibility for 81)

(17) h. ahh that then then you're not eligible for



Figure 16: Bill 23, Salient Non-Logical, One-Tone with Mid



Figure 17: Joe 19: Displaced Paraphrase, Upstep

eighty one (18) j. I see, but I am for eighty two (19) h. You said it. You're eligible for twenty two fifty IF YOUR WIFE IS NOT WORKING OUTSIDE OF THE HOME

These upstepping contours sound as though the speaker is trying to be enthusiastic. The phrase-final tone is also Mid in this particular example. Additional tokens and further distributional analyses of this contour type would be necessary for formulating a more precise characterization.

## 6. Other Contours

There are 20 IRU's whose antecedents are inferable by logical inference or linguistically licensed inferences such as scalar implicatures or presuppositions(Bridge91,Hirschberg85). As discussed in section 2.2 that these are more likely to be realized as Other type contours. An example is shown in the excerpt below, where Harry (h) makes an entailment explicit from information provided in 10-7 by Jane (j).

- (10) (7) j. .... and i'm entitled to a lump sum settlement which would be between 16,800 and 17,800 or a lesser life annuity. and the choices of the annuity um would be \$125.45 per month. that would be the maximum with no beneficiaries
  - (8) h. you can stop right there: take your money(9) j. take the money.

(10) h. absolutely. YOU'RE ONLY GETTING 1500 A YEAR.

Utterance 10-10 is shown in figure 18. This utterance shares the high final pitch accent with the upstepping

\*

contours and shares the note of enthusiasm with those contours.

### 7. Discussion

This paper has examined a number of cases where given information is not deaccented as in the classical view. I have examined the interaction of a semantic definition of given with discourse salience. Independent of whether given information is salient or displaced, given information is realized with a pitch accent.

The work presented here should be extended to actually test whether downstep is correlated with given information as P&H proposed[15]. The fact that 25 out of 63 IRU's are realized with a downstepping contour could be taken as weak support for their claims. However, I have not compared these tokens against a sample of nonredundant tokens to test whether downstep appears on these tokens just as frequently. Furthermore there are a number of other contours that these IRU's are realized with, such as the Sustained Tone, Upstep and Other contours that would not be predicted on P&H's account.

However, this paper has argued that salience is a predictor of one class of contour, the sustained tones. Other accounts have not distinguished salient and displaced mutual beliefs in terms of intonational realization[15] or have suggested that salient is the only relevant notion of given information[1]. I have shown here that, in this type of dialogue, the sustained tone contour is correlated with salience. However discourse salience is not predictive of downstepping contours. In addition, I have shown that IRU's that are inferable from their antecedents are more likely to be realized with some item in narrow focus than IRU's classified as repetitions or paraphrases.



Figure 18: Jane 10: Displaced Inference, Other

I have not examined the influence of boundary tones on the pragmatic use of these contours[12]. Phrase-final Mid, characteristic of 'stylized' intonation[8], cuts across the contour classifications used here. IRU's frequently have these phrase-final Mid's, but not always. This must be examined more closely in future work. Future research should also include examination of these types of utterances in other types of dialogue in order to provide a more general account of the use of the contours described here.

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