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Variable Intonational Phrasing in English

TOKIZAKI Hisao
Hokkaido University

0. Introduction

This paper is concerned with determining the principles and rules by which sentences are divided into intonational phrases.[1] Downing (1970) argues for the necessity of distinguishing between obligatory and variable intonational phrases. The sentences of (1) (obligatory intonational phrasing) contain two separate constructions, the vocative and the question tag, which, obligatorily, are set off by a pause:[2]

(1) a. / John, / you've met Marie, / haven't you? /
    b. */ John, you've met Marie, / haven't you? /
    c. */ John, / you've met Marie, haven't you? /
    d. */ John you've met Marie haven't you? /

On the other hand, the sentences of (2) (variable intonational phrasing) are equally acceptable regardless of which of the three phrasings is chosen:

(2) a. / The boys you met / are all members / of the same
        fraternity. /
    b. / The boys you met / are all members of the same
        fraternity. /
    c. */ The boys you met are all members / of the same
        fraternity. /
    d. / The boys you met are all members of the same
        fraternity. /   (Downing 1970: 14)

The unacceptability of (2c), however, shows that there are rules governing even variable phrasing. In this paper, I will concentrate on the latter type, variable intonational phrasing, and investigate the principles and constraints that govern the phenomena.

In section 1, I will briefly review the previous studies, and show that both syntactic and semantic factors are involved in variable intonational phrasing. In section 2, I will present an analysis which uses 'silent demibeats', a term first used by Selkirk (1984), as the device to represent the pauses in a sentence.

1. Previous Studies on Variable Intonational Phrasing

There have been two types of approach in studies of variable intonational phrasing; the syntactic approach (Downing 1970, Selkirk 1978) and the semantic approach (Halliday 1967, Bing 1979, Selkirk 1984). In this section, I will review Downing (1970) and Bing (1979) and indicate some of the problems they fail to resolve.

1.1. The Syntactic Approach: Downing (1970)

First, let us look at Downing's observation about variable intonational phrasing:

(3) One of these is the principle that in general variable
    pause occurs at minor constituent breaks only if pause is
    also present at all major constituent breaks (cf.
    Bierwisch 1966).   (Downing 1970: 14f)

This principle explains the unacceptable phrasing (2c) above, because in (2c) there is a pause within the predicate, but not between the subject and the predicate. This principle also explains the following phrasings:

(4)

    a. / Two of our horses / suddenly got restive. /
    b. */ Two of our horses suddenly / got restive. /
                                  (Imai & Nakajima 1978: 469)

Since in (4b) there is no pause between NP and VP, there can be no pause within the VP. These examples show that variable intonational phrasing involves a syntactic factor.

1.2. The Semantic Approach: Bing (1979)

Variable intonational phrasing also involves a semantic factor. Bing (1979) investigates variable intonational phrasing in terms of her Noun Phrase Prominence Principle:[3]

(5) Noun Phrase Prominence: A node in metrical structure
    which corresponds to a node in syntactic structure which
    is a noun phrase cannot be dominated by any node labelled
    WEAK except when that node has been destressed because of
    reference to previous discourse.   (Bing 1979: 126)

Let us compare the following examples:

(6) A: What's happening?
    B: / Tom Roeper / is going to Germany. /
(7) A: What's Tom Roeper doing this summer?
    B: / As far as I know, / Tom's going to Germany. /

Note that the sentence <u>Tom (Roeper) is going to Germany</u> is divided into two intonational phrases in (6B), but not in (7B). The NP <u>Tom Roeper</u> in (6B) is New information, while <u>Tom</u> in (7B) is Old information. Thus, the Noun Phrase Prominence Principle (5) predicts that the metrical structures of the sentences (6B) and (7B) are (8) and (9), respectively:[4]

(8)   (9)

    Tom Roeper is going to Germany   Tom's going to Germany
                                              (Bing 1979: 129f)

We can regard an R node as an intonational phrase. The whole NP <u>Tom Roeper</u> in (8) cannot be dominated by any W and is dominated by another R, because it does not refer to previous discourse. <u>Tom</u> in (9), however, has been destressed because of the reference to <u>Tom Roeper</u> in (7A) and is dominated by W. In this way, Bing explains the difference of phrasing between (6B) and (7B).

1.3. Unresolved Problems in the accounts of Downing (1970) and Bing (1979)

The above review shows that the variable intonational phrasing involves both syntactic and semantic (functional) factors. A syntactic constraint such as Downing's (3) can not therefore explain the phrasing in (8) and (9), because the syntactic structures of these sentences are almost the same. Further, this constraint (3) incorrectly rules out such natural phrasings as (28a) to be noted below. On the other hand, a semantic explanation such as Bing's Noun Phrase Prominence Principle (5) is not able to predict the unacceptability of (2c) and (4b). This approach, moreover, crucially depends on the somewhat vague notion of New or Old information, and has the weakness that we can not formulate the principle in definite

terms.

I will, in contrast, argue below that variable intonational phrasing can be explained in terms of the length of constituent, and I shall propose some rules and constraints to deal with all the phenomena.

2. Variable Intonational Phrasing and the Silent Demibeat Addition

2.1. The Silent Demibeat Addition (Selkirk 1984)

Let us consider Selkirk's Silent Demibeat Addition which articulates the syntactic timing of a sentence:

(10) <u>Silent Demibeat Addition</u>
      Add a silent demibeat at the end of the metrical grid
      aligned with
      a. a word
      b. a word that is the head of a nonadjunct
      c. a phrase
      d. a daughter phrase of S.   (Selkirk 1984: 314)

This rule applies to the sentence (11) to assign the silent demibeats ($\underline{X}$) in (12):[5]

(11)   [[[Mary]]   [[finished] [[her] [[Russian]]
         S NP N   N NP VP V   V NP   AP A   A AP
         [novel]   ]]]
          N   N NP VP S

(12)   X   X   X   X
          X   X   X   X   X
          X   XXX X X   XX X   X   X   X   X X XXXXX
         Mary ↑ finished ↑ her Russian ↑ novel   ↑
         (a,b,d)   (a,b)   (a)   (a,b,c,d)
                                          (Selkirk 1984: 316)

In (12), <u>Mary</u> is followed by three silent positions, because <u>Mary</u> is a word (10a), an argument (of VP) (10b), and a daughter of S (10d).   Similarly, the other silent demibeats are assigned by (10).

While Selkirk (1984) says that the number of silent demibeats represent the syntactic timing of the sentence, she does not analyse the intonational phrasing by the Silent Demibeat Addition (10), but by her semantic condition, the Sense Unit Condition. I will give the reasons for preferring my analysis to Selkirk's Sense Unit Condition in the Appendix.

2.2 Bracket Notation and Variable Intonational Phrasing

Selkirk's Silent Demibeat Addition (10) is, however, conceptually inadequate. It simply describes the different cases (a, b, c, d) where the silent demibeats are assigned. So let us generalize (10) into the following formulation:[6]

(13) <u>Silent Demibeat Addition</u>
      Add a silent demibeat at the beginning and end of
      the metrical grid aligned with X^n

The Silent Demibeat Addition (13) is simplified by using the general category X^n, and is modified to add a silent demibeat at the beginning of X^n as well as its end. Note that this rule (13) is a device designed to count the number of brackets in the s-structure.

Further, let us assume that there is the following convention in the phonological form:
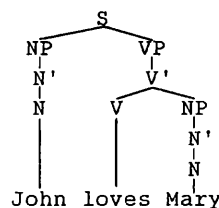
(14) <u>Invisible Bracket</u>
      The pair of brackets $_X$[and]$_X$ in the following
      configuration is invisible to the Silent Demibeat
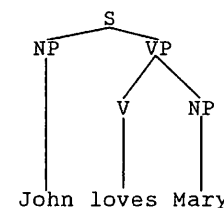   Addition:
      ... $_Y$[$_X$[...]$_X$]$_Y$ ...

The convention (14) states that if the node Y exclusively dominates X, X is invisible to the rule (13). To take a simple example, the Silent Demibeat Addition (13) does not apply to (15a) but to (15b) by virtue of (14):

(15) a.

Thus, in bracket notation (16), the Silent Demibeat Addition (13) applies to (16b), not (16a), to give (17b), not (17a):

(16) a. [[[[John]]]   [[loves] [[[Mary]]]]]]
        S NP N' N   N N' NP VP V   V NP N' N   N N' NP VP S
     b. [[John]   [[loves] [Mary]]]
        S NP   NP VP V   V NP   NP VP S
(17) a. <u>XXXX</u> John <u>XXXXX</u> loves <u>XXXX</u> Mary <u>XXXXX</u>
     b. <u>XX</u> John <u>XXX</u> loves <u>XX</u> Mary <u>XXX</u>

I consider that the silent demibeats in (17b) represent the basic timing of the sentence. Therefore (17b) predicts that the pause duration between <u>John</u> and <u>loves</u> is longer than between <u>loves</u> and <u>Mary</u> by a silent demibeat.

I therefore propose the following rule for variable intonational phrasing:

(18) <u>Variable Intonational Phrasing</u>
Delete <u>n</u> silent demibeats in every sequence of silent demibeats, and then put a pause in every position where silent demibeats are left. (<u>n</u> corresponds to the speed of utterance.)

To see how this rule works, consider the possible phrasings of the sentence (17b). If we specify the number <u>n</u> as 1, 2, and 3, we will get the phrasings (19a), (19b), and (19c) respectively:

(19) a. / John / loves / Mary /
         <u>X</u>   <u>XX</u>   <u>X</u>   <u>XX</u>   (n=1)

     b.   John / loves Mary /
                <u>X</u>   <u>X</u>   (n=2)

     c.   John loves Mary
                              (n=3)

     d. ? John loves / Mary /
                      <u>X</u>   <u>XX</u>
         <--- n=3 >< n=1 ----->

If the sentence (19) is uttered very slowly (the speed n=1), Variable Intonational Phrasing (18) deletes a silent demibeat in all their sequences as in (19a). In this case, silent demibeats are left in every position, and the sentence contains three intonational phrases.

If the speed of utterance is increased (n=2), the silent demibeats between <u>loves</u> and <u>Mary</u> are deleted. Thus the phrasing separates the subject and predicates as in (19b). Further, if we increase the speed of utterance (n=3), all silent demibeats are deleted so that the whole sentence is included in one intonational phrase.

How, then, shall we describe (19d)? This phrasing is a possible but not a natural one, compared to (19a, b, c). In other words, this phrasing need some particular context in order to be acceptable. We can explain the unnaturalness of (19d) in the following way. In order to phrase as in (19d), three silent demibeats must be deleted between <u>John</u> and <u>loves</u>, but only one silent demibeat can be deleted between <u>loves</u> and <u>Mary</u>. There-

fore, the unnaturalness of (19d) seems to be due to the inconsistency of speed of utterance (n). It has seemed to me that if the utterance changes its speed, the hearer can not reproduce the right structure of the sentence and thus finds the the utterance unnatural or unacceptable. I therefore propose the following constraint:[7]

(20) <u>Pragmatic Constraint on Variable Intonational Phrasing</u>
In a sentence (or paragraph), the number of silent demibeats to be deleted (<u>n</u>) should be as constant as possible.

Note that in a similar way, this constraint (20), together with (13), (14), and (18), also explains the examples for syntactic constraint such as (2) and (4) above:

(21) [[[Two] [[of] [[our] [horses]]]]
     S NP N   N PP P   P NP D   D N'   N' NP PP NP
     [[suddenly] [[got] [restive]]]]
     VP AdvP   AdvP V' V   V   A   A V' VP S

By virtue of the Invisible Bracket (14), the structure (21) is the input to the Silent Demibeat Addition (13), and the result of its application is (22):

(22) <u>XXX</u> Two <u>XXX</u> of <u>XXX</u> our <u>XX</u> horses <u>XXXXXX</u> suddenly <u>XXX</u> got
     <u>XX</u> restive <u>XXXX</u>

If we specify the number of silent demibeats to be deleted (n) as three, we get (23a) which is a natural phrasing. To get (23b), however, we must delete six silent demibeats between <u>horses</u> and <u>suddenly</u>, and only two between <u>suddenly</u> and <u>got</u>:

(23) a. Two of our horses / suddenly got restive /
                            <u>XXX</u>   <u>X</u>   (n=3)

     b. *Two of our horses suddenly / got restive /
                                     <u>X</u>   <u>XX</u>
         <-------------- n=6 -><-- n=2 ------------>

Thus, in (23a), the four difference in value of n violates the consistency constraint (20) and makes the phrasing unacceptable.

2.3. Length of Constituents

So far, I have shown that the rules and constraints proposed here can explain the examples for such a syntactic analysis as Downing's (1970). Further, I have argued that they can also explain the phenomena concerned with the speed of utterance such

as (19). Let us next consider the examples for such a semantic analysis as (6B) and (7B):

(24) a. / Tom Roeper / is going to Germany. /
     b. / Tom's going to Germany. /

The subject NP <u>Tom (Roeper)</u> makes a intonational phrase of its own in (24a), but not in (24b). This is, as Bing (1979) argues, because the information of the NP is new in (24a), but old in (24b). Note, however, the fact that the new NP <u>Tom Roeper</u> in (24a) includes two word, but the old NP <u>Tom</u> in (24b) is one word. Therefore, the newness of information might be judged by the length of the constituents.' The notion of length can be captured by our Silent Demibeat Addition (13). Consider the following examples:

(25) a. [[[Tom] [Roeper]] [[is][[going][[to][Germany]]]]]
         S NP N   N N   N NP I'I I ...
     b. [[Tom] [[is][[going][[to][Germany]]]]]
         S NP   NP I'I I ...

The word <u>Roeper</u> is dominated by N and NP in (25a), but <u>Tom</u> is dominated only by NP because of the Invisible Bracket (14). The Silent Demibeat Addition (13) applies to (25) to give (26):

(26) a. <u>XXX</u> Tom <u>XX</u> Roeper <u>XXXX</u> is <u>XXX</u> going <u>XXX</u> to <u>XX</u>
         Germany <u>XXXXX</u>
     b. <u>XX</u> Tom <u>XXX</u> is <u>XXX</u> going <u>XXX</u> to <u>XX</u> Germany <u>XXXXX</u>

Note that the silent demibeats between <u>is</u> and <u>going</u> are four in (26a) but three in (26b). Variable Intonational Phrasing (18) applies to (26) to give the right phrasings (27), if the speed of utterance is specified as n=3:

(27) a. Tom Roeper / is going to Germany. /
                    <u>X</u>   <u>XX</u>   (n=3)
     b. Tom's going to Germany. /
                              <u>XX</u>   (n=3)

Thus the proposed analysis can explain the semantic factor such as the newness of information in a formal way.
     Let us consider another example:'

(28) a. I took my handkerchief / out of my pocket.
     b. Those who were present / laughed at him.

The slant lines show the most likely phrasing position. If we apply Downing's syntactic constraint (3) to (28a), we will

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wrongly predict a phrasing pause between the subject NP <u>I</u> and <u>took</u>. The syntactic constraint can not capture the fact that the subject NP is short in (28a), but long in (28b). The proposed analysis, however, can capture the notion of length, and correctly predict the right phrasings (28). The structures of (28) are (29), and (30) are the results of the application of the Silent Demibeat Addition (13):

(29) a. [[I]   [[took] [[my] [handkerchief]]
         S NP NP VP V   V NP D   D N'   N' NP
         [[out] [[of] [[my] [pocket.]]]]
         PP P   P PP P   P NP D   D N'   N' NP VP S
     b. [[[Those] [[who] [[were] [present]]]]
         S NP N   N S' C   C VP V   V A   A VP S' NP
         [[laughed] [[at] [him]]]]
         VP V   V PP P P NP NP PP VP S

(30) a. <u>XX</u> I <u>XXX</u> took <u>XXX</u> my <u>XX</u> handkerchief <u>XXXX</u> out <u>XXX</u>
         of <u>XXX</u> my <u>XX</u> pocket <u>XXXX</u>
     b. <u>XXX</u> Those <u>XXX</u> who <u>XXX</u> were <u>XX</u> present <u>XXXXXX</u>
         laughed <u>XXX</u> at <u>XX</u> him <u>XXXX</u>

In (30a), the longest sequence of silent demibeats is the one between <u>handkerchief</u> and <u>out</u>, but not between <u>I</u> and <u>took</u>. If we apply Silent Demibeat Addition (13) with n=3 to (30a), we get the right phrasing (31a). In a similar way, (30b) is phrased into (31b), and this case shows that the phrasing follows the subject NP:

(31) a. I took my handkerchief / out of my pocket /
                                <u>X</u>   <u>X</u> (n=3)
     b. Those who were present / laughed at him /
                                <u>XXX</u>   <u>X</u> (n=3)

Note that the example (28) can not be explained by Bing's semantic principle (5), because no previous discourse has been indicated.
     To summarise, I have shown that the proposed analysis is able to explain both syntactic and semantic factors in variable intonational phrasing in a unique and formal way. Furthermore, it has been shown that this analysis is superior to those previously published ones in that it can also explain a performance factor, the speed of utterance.

2.4. Silent Demibeat and Cognition

     Finally, let us consider the cognitive support for the

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proposed analysis. Consider the following configurations:

(32) a. ○ ○ ○   ○ ○   b. ○ ○   ○ ○ ○

(Jackendoff 1983: 128)

As Jackendoff (1983) says, (32a) is most naturally seen as three circles to the left of two other circles; (32b) as two circles to the left of three. Jackendoff argues that this fact is due to the perceptual principle of proximity. That is, the things that are close together tend to form a visual group. This principle seems to hold for the function of silent demibeats as well. We may regard a circle in (32) as a word, and the space between circles as the time between words. Then a space in (32) can be said to correspond to a silent demibeat in our analysis. Thus if we replace a word by a circle and a silent demibeat by a space in (30), we get the following configurations:

(33) a. ○ ○ ○ ○   ○ ○ ○ ○
     b.   ○ ○ ○ ○   ○   ○ ○

Where we broke the sentence (28) into two intonational phrases with a slant line, we may, similarly, indicate the phrasing by the placing of two groups of circles in (33). This process is that of variable intonational phrasing, and the most natural way of phrasing is to pause between the circles which are most distant from each other. This fact is formulated in (13), (14), (18), and (20) in our analysis.

Note that the speaker seems to utter the sentence according to its internal structure by taking pauses of different lengths, not of the same length. The hearer also seems to restructure the sentence by judging the length of pauses. The example (34) is the result of an experiment made by Grosjean et al. (1979). The numbers under the sentence show the rate of pause duration in each position, with a maximum total of 100:

(34)   Closing his client's book, the young expert
            6   5   6   26   2   4   15
        wondered about this extraordinary story
            8   9   11   8

(Grosjean et al. 1979: 71)

From this example, we can say that the length of pauses between words is not the same, and reflects the internal structure of the sentence.

3. Conclusion

So far we have considered the phenomena of variable intonational phrasing. In section 1, I have shown that the syntactic constraint (3) proposed by Downing (1970) is not able to explain the difference between (6) and (7), and makes a wrong prediction in (28a). Moreover, it has been shown that the semantic principle (5) proposed by Bing (1979) can not rule out the unacceptable (2c) and (4b), and is not definite enough to explain the examples (28).

In section 2, I have proposed the acceptance of the generalized Silent Demibeat Addition (13) and the Invisible Bracket (14). I have also formulated Variable Intonational Phrasing (18) and put a Pragmatic Constraint on Variable Intonational Phrasing (20). It has been shown that these formulations enable us to explain the factor of speed of such utterances as (19), and to deal with the examples for syntactic analysis such as (19d) and (23b). Moreover, it has been argued that our analysis can also explain the examples for semantic analysis (24); further examples (28) have been given. Finally, I have argued that our analysis is supported by the cognitive study made by Jackendoff (1983) and Grosjean et al. (1979).

To summarize, variable intonational phrasing can be said to be the means by which the speaker informs the hearer of the proper internal structure, both syntactic and semantic, of a sentence. The formulations proposed here state this fact in a formal way.

Appendix: Selkirk's (1984) Analysis

As noted in section 2.1, Selkirk (1984) explains the intonational phrasing by the following semantic condition, not by her Silent Demibeat Addition (10):
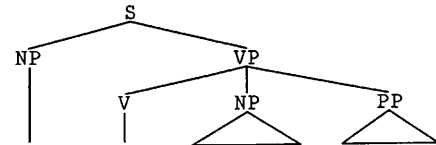
(35) The Sense Unit Condition on Intonational Phrasing
      The immediate constituents of an intonational phrase must
      together form a sense unit.   (Selkirk 1984: 286)

The cases where constituents form a sense unit are:

(36) Two constituents C_i, C_j form a sense unit if (a) or (b)
      is true of the semantic interpretation of the sentence:
      a. C_i modifies C_j (a head)
      b. C_i is an argument of C_j (a head). (Selkirk 1984: 291)

Consider the following examples:

(37)

```
                    S
            ┌───────┴────────┐
           NP               VP
            │       ┌────────┼─────────┐
            │       V       NP         PP
            │       │      ╱  ╲       ╱  ╲
          Jane    gave   the book   to Mary   (Selkirk 1984: 292)
```

(38) a. / Jane   gave   the book   to Mary /
     b. / Jane / gave   the book   to Mary /
     c. / Jane   gave   the book / to Mary /
     d. / Jane   gave / the book / to Mary /
     e. */ Jane / gave / the book   to Mary /
     f. */ Jane   gave / the book   to Mary /
     g. / Jane / gave   the book / to Mary /
     h. / Jane / gave / the book / to Mary /(Selkirk 1984: 293)

(38e) and (38f) is ruled out by the Sense Unit Condition, because
the book and to Mary are not in the relation of head-modifier nor
head-argument.

However, her analysis has some weakness. Are the acceptable
phrasings (38) equally natural? The Sense Unit Condition alone
predicts that they are, but this does not seem to be the case.
Moreover, Selkirk says that the three phrasings (39) are all
possible, but (39c) is much less likely than the other two. In
other words, (39c) needs some particular context in order to be
acceptable:

(39) a. / The mayor of Chicago won their support. /
     b. / The mayor of Chicago / won their support. /
     c. / The mayor of Chicago won / their support. /

                                    (Selkirk 1984: 161)

Thus Selkirk (1984) can not explain the unnaturalness of (39c),
while our analysis can by the constraint (20):

(40) a. XXX The XXX mayor XXX of XX Chicago XXXXXX won XXX
         their XX support XXXX
     b.??The mayor of Chicago won / their support. /
                                 X   XX
         <--------------- n=6><- n=2 ------------->

Therefore, Selkirk's analysis is not adequate enough to explain
the naturalness of phrasing.

NOTES

1. I adopt Selkirk's (1984) term 'intonational phrase'. There
are many other terms for this phenomenon, such as breath-group,
tone-unit, and phonological phrase. See Cruttenden (1986: 35).
2. I will use the slant line (/) to indicate the intonational
boundary.
3. The page numbers of Bing (1979) indicated here are those of
Bing (1985).
4. In metrical structures, the node R represents Root, S Strong,
and W Weak. See Bing (1979) and Cruttenden (1986: 30).
5. In (12), the stress beats (X) are assigned by other rule than
Silent Demibeat Addition (10).
6. In (13), X^n represents any category; X, X', or X". I assume
the X-bar theory of Chomsky (1986).
7. I believe that the theory proposed here, including (13),
(14), (18), and (20), can be extended to apply to units larger
than a sentence, such as a paragraph or even a complete dis-
course.
8. Bolinger (1972: 640) says "... we rarely use just a given
name unless the referent is conceptually close by ...."
9. The examples (28) are taken from the entrance examination of
Shookei University, 1987.

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