A COMPUTATIONAL THEORY OF THE FUNCTION OF CLUE WORDS IN ARGUMENT UNDERSTANDING

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ABSTRACT

This paper examines the use of clue words in argument dialogues. These are special words and phrases directly indicating the structure of the argument to the hearer. Two main conclusions are drawn: 1) clue words can occur in conjunction with coherent transmissions, to reduce processing of the hearer 2) clue words must occur with more complex forms of transmission, to facilitate recognition of the argument structure. Interpretation rules to process clues are proposed. In addition, a relationship between use of clues and complexity of processing is suggested for the case of exceptional transmission strategies.

I Overview

In argument dialogues, one often encounters words which serve to indicate overall structure - phrases that link individual propositions to form one coherent presentation. Other researchers in language understanding have acknowledged the existence of these "clue words". Birnbaum [Birnbaum 82] states that in order to recognize argument structures it would be useful to identify typical signals of each form.

In [Cohen 83] we develop a computational model for argument analysis. The setting is a dialogue where the speaker tries to convince the hearer of a particular point of view; as a first step, the hearer tries to construct a representation for the structure of the argument, indicating the underlying claim and evidence relations between propositions. Within this framework, a theory of linguistic clues is developed which categorizes the function of different phrases, presenting interpretation rules.

What we have done is develop a model for argument analysis which is sufficiently well-defined in terms of algorithms, with measurable complexity, to allow convenient study of the effect of clue words on processing. Two important observations are made: (1) clue words cut processing of the hearer in recognizing coherent transmissions (2) clue words are used to allow the recognition of transmissions which would be incoherent (too complex to reconstruct) in the absence of clues.

Considering arguments as goal-oriented dialogues, the use of clue words by the speaker can be construed as attempts to facilitate the hearer's plan reconstruction process. Thus, there exist words and even entire statements with the sole function of indicating structure (vs. content) in the argument. The importance of structure to argument understanding is first of all a by-product of our imposed pragmatic approach to analysis. To understand the argument intended by the speaker, the hearer must determine, for each proposition uttered, both where it fits with respect to the dialogue so far and how, in particular, it relates to some prior statement. In addition, it is precisely the expected form of arguments which can be used to control the analysis (since content can't be stereotyped as in the case of stories). It is this importance of form which necessitates clue words and presents the research problem of specifiying their function precisely.

II Background

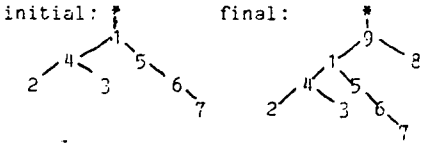
To understand the role of clue words in facilitating analysis, some detail on the overall argument understanding model is required. (For further reference, see [Cohen 80], [Cohen 81], [Cohen 83]). Each proposition of the argument is analyzed, in turn, with respect to the argument so far. A proposition is interpreted by determining the claim and evidence relations it shares with the rest of the argument's propositions. Leaving the verification of evidence to an oracle, the main analysis task is determining where a current proposition fits.

To understand the examples introduced in this paper, it is useful to present the starting definition of evidence, as used in the model. A proposition P is evidence for a proposition Q if there is some rule of inference such that P is premise to Q's conclusion. The rule most often observed is modus ponens, with missing major premise - i.e. P, Q are given and one must fill P --> Q to recognize the support intended from P to Q. More detail on the definition of evidence is presented in [Cohen 83].

Determining an interpretation for a proposition is restricted to a computationally reasonable task by characterizing possible coherent transmission

strategies on the part of the speaker and reducing analysis to a recognition of these forms. These algorithms are outlined in detail in [Cohen 83]. The basic restrictions yield a limited set of propositions to search. The representation is a tree of claim and evidence relations where evidence are sons to the father claim. Essentially, the last proposition eligible to relate to the current is tracked (called LAST). LAST and its ancestors in the tree are all eligible relatives and each is tested in turn, to set the interpretation of the current proposition. The analysis algorithm is termed "hybrid reception" because it is designed to recognize transmission strategies where each constituent sub-argument is presented either claim first or claim last. Complexity analysis of this algorithm indicates that it works in linear time (i.e. it takes a linear factor of the number of nodes of the tree to locate all propositions in the representation).

A sample tree and the processing required for the current proposition is illustrated below:



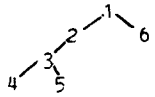
With the initial argument above, a new proposition (8) would be checked to be evidence for 7, 6, 5 and 1 in turn. If these tests fail, it is then attached as a son to the dummy root (expecting a father in upcoming propositions). The final tree above, for example, may result if the next proposition (9) is processed and succeeds as father to 8. Note that in processing 8 initially, 4, 3, and 2 were not eligible relatives. This is because an earlier brother to a subsequent proposition is closed off from consideration according to the specifications of the hybrid algorithm. See Appendix I for a detailed description of possible coherent transmission strategies and their "reception" algorithms.

III Clues to reduce processing (Helpfulness)

With coherent transmissions characterized, the role of clue words can be investigated more closely. Note first that the restrictions of the analysis algorithms are such that the proposition to which the current one relates is not always the immediate prior proposition. In fact, sometimes the claim is located far back in the dialogue. Consider the following example:

EX1: 1)The city is a mess
2)The parks are a disaster
3)The playground area is all run down
4)The sandboxes are dirty
5)The swings are broken
6)The highway system also needs revamping

Here, the representation for the argument is the following tree:



The last proposition, 6, is evidence for 1, one of the claims higher up in the tree. Many arguments which re-address earlier claims assist the hearer by specifically including a clue of re-direction as in EX2 below.

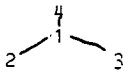
EX2: 1)The city is a mess
2)The parks are a disaster
3)The playground area is all run down
4)The swings are broken
5)The sandboxes are dirty
6)Returning to city problems, the highway system needs revamping

Here, the search up the right border of the tree (from 5, 3, 2 to 1) for a possible claim to the current proposition 6 is cut short and the correct father (1) indicated directly. One can hypothesize a general reduction on processing complexity from linear to real-time, if clues are consistently used by the speaker to re-direct the hearer with chains that are sufficiently long.

Connectives are another type of clue word, used extensively. Hobbs ([Hobbs 76]) attempts a characterization with respect to his coherence relations for a couple of words. Reichman ([Reichman 81]) associates certain expressions with particular conversational moves, but there is no unified attempt at classification. We develop a taxonomy so that clues of the same semantic function are grouped to assign one interpretation rule for the dominated proposition within the claim and evidence framework. Consider the following example:

EX3: 1)The city needs help
2)All the roads are ruined
3)The buildings are crumbling
4)As a result, we are asking for federal support

with the representation:



The connective in 4, "as a result", suggests that some prior proposition connects to 4 and that this proposition acts as evidence for 4. The relation of the prior proposition is set out below according the the interpretation rule for the category that "as a result" belongs to in the taxonomy. The particular evidence connection advocated here is of the form: "If our city needs help, then we will ask for federal aid". [Note: Whether 1 is evidence for 4 is tested by trying a modus ponens major premise of the form: "(For all cities) if a

city needs help, then it can ask for federal aid", and then using "our city" as the specific case].

The taxonomy (drawn from [Quirk 72]) is intended to cover the class of connectives and presents default interpretation rules.

(P indicates prior proposition; S has the clue)

CATEGORY	RELATION:P to S	EXAMPLE
parallel	brother	in addition
detail	father	in particular
inference	son	as a result
summary	multiple sons	in sum
reformulation	father and son	in other words
contrast	father or brother	conversely

Note that the classification of connectives provides a reduction in processing for the hearer. For example, in EX3 with a casual connective, the analysis for the proposition 4 is restricted to a search for a son. In short, connective interpretation rules help specify the type of relation between propositions; re-direction clues help determine which prior proposition is related to the current one. All together, clue words function to reduce overall processing operations. See Appendix II for more examples of relations of the taxonomy.

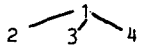
IV Clues to support complex transmissions (Necessity)

Clue words also exist in conjunction with transmissions which violate the constraints of the hybrid model of expected coherent structure. The claim is that clues provide a necessary reduction in complexity, to enable the hearer to recognize the intended structure. Consider the following examples:

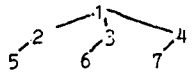
EX4: 1)The city is a mess
2)The parks are run down
3)The highways need revamping
4)The buildings are crumbling
5)The sandbox area is a mess
...

EX5: 1)The city is a mess
2)The parks are run down
3)The highways need revamping
4)The buildings are crumbling
5)With regard to parks,
the sandboxes are a mess
6)As for the highways, the gravel is shot
7)And as for the buildings,
the bricks are rotting

The initial tree for the argument is as follows:



In EX4, the last proposition cannot be interpreted as desired; the probable intended father proposition (2) is not an eligible candidate to relate to the current proposition (5) according to the hybrid specifications. In EX5, however, a parallel construction is specifically indicated through clue words, so that the connections can be recognized by the hearer and the appropriate representation constructed as below:



It now becomes important to provide a framework for accommodating "extended" transmission strategies in the model. First, the complexity of processing without clues is a good measure for determining whether a strategy should be considered exceptional. Then, to be acceptable in the model the proposed transmission must have some characterizable algorithm - i.e. still reflect a coherent plan of the speaker. Further, exceptional tranmsission strategies must be clearly marked by the speaker, using clues, in cases where the transmission can be assigned an alternate reading according to the basic processing strategy. The hearer should be expected to expend the minimum computational effort, so that the onus is on the speaker to make exceptional readings explicit.

In brief, we propose developing a "clue interpetation module" for the analysis model, which would be called by the basic proposition analyzer to handle extended transmissions in the presence of clues. Then, complexity of processing should be used as a guide for determining the preferred analysis.

To illustrate, consider another acceptable extended transmission strategy - mixed-mode sub-arguments, where evidence both precedes and follows a claim.

EX6: 1)The grass is rotting
2)The roads are dusty
3)The city is a mess
4)In particular, the parks are a ruin

Preferred rep: 

Other possible rep: 

Here, it is preferable to keep 1 and 2 as evidence for 3, because this requires less computational effort than the re-attachment of sons which takes place to construct the other possible representation. In other words, computational effort is a good guide for the specification of processing strategies.

Finally, it is worth noting that the specific clue word used may influence the processing for these extended transmissions. In EX6, if the last proposition (4) was introduced by the clue word "in addition", then the alternate tree would not be an eligible reading. This is because "in addition" forces 4 to find a brother among the earlier propositions, according to the interpretation rule for the "parallel" class of the taxonomy of

connectives.

In sum, we propose particular extended transmission strategies for the model, including (i) parallel (ii) mixed-mode (iii) multiple relations. [Note: More discussion of (iii) is in [Cohen 83]. We consider as an acceptable exceptional strategy the case where one proposition acts as evidence for an entire set of claims following it immediately in the stream. Other configurations of multiple relations seem to present additional processing problems]. We demand clue words to facilitate the analysis and we begin to suggest how to accommodate uses of these exceptional cases in the overall analysis model.

V Related Topics

A. Nature of clues

The exact specification of a clue is a topic for further research. Since it is hypothesized that clues are necessary to admit exceptional transmissions, what constitutes a clue is a key issue. Within Quirk's classification of connectives ([Quirk 72]) both special words and connecting phrases ("integrated markers") are possible. For example, one may say "in conclusion" or "I will conclude by saying".

Quirk also discusses several mechanisms for indicating connectives which need to be examined more closely as candidates for clue words. These constructions are all "indirect" indications.

a) lexical equivalence: This includes the case where synonyms are used to suggest a connection to a previous clause. For example: "The monkey learned to use a tractor. By age 9, he could work solo on the vehicle." In searching for evidence relations, the hearer may faciltate his analysis by recognizing this type of connective device. But it unclear that the construction should be considered an additional "clue".

b) substitution, reference, comparison, ellipsis: Here, the "abbreviated" nature of the constructions may be significant enough to provide an extra signal to the hearer. For now, we do not consider these devices as clues, but examine the relations between the use of anaphors and clues in the next section.

Even within the classification of connectives, there is a question of level of explicitness of the clues. Consider the example:

EX7: 1)The city is dangerous
2a)I will now tell you why this is so
2b)The reason for the danger is...
2c)The reason is...
2d)The problem is ...

2a) is an explicit indication of evidence; b) and c) have a phrase indicating a causal connection, but c) requires a kind of referent resolution as well; d) requires recognizing "the problem" as an indication of cause. The problem addressed in this example is similar to the one faced by Allen ([Allen 79]): handling a variety of surface forms which all convey the same intention. In our case, the "intention" is that one proposition act as evidence for another.

Finally, there are different kinds of special phrases used to influence the credibilty of the hearer: 1) attitudinal expressions reflecting the speaker's beliefs and 2) expressions of emphasis. Since our model focuses on the first step in processing of recognizing structural connections, these clues have not be examined more closely. However, examples of these expressions are listed in Appendix III, along with phrases indicating structure.

B. Relation to reference resolution and focus

There are some important similarities between our approach to reconstructing argument structure and the problem of representing focus for referent resolution addressed in [Sidner 79] and [Grosz 77]. For both tasks, a particular kind of semantic relation between parts of a dialogue must be found and verified. In both cases, a hierarchical representation is constructed to hold structural information and is searched in some restricted fashion.

Grosz's hierarchical model of focus spaces, with visibility constraints imposed by the task domain, is maintained in a fashion similar to our tree model. Information on which of the focus spaces is "active" and which are "open" (possible to shift to) is kept; open spaces are determined by the active space and the visibilty constraints. Analysis for a problem such as resolving definite noun phrase referents can be limited by choosing only those items "in focus".

In [Sidner 79] focus is introduced to determine eligible candidates for a co-specification. But the ultimate choice rests with verification by the hearer, using inferencing, that the focus element relates to the anaphor. This is parallel to our approach of narrowing the search for a proposition's intepretation, but requiring testing of possible relations in order to establish the desired link. To set the focus, Sidner suggests either: 1) using special words to signal the hearer or 2) relying on shared knowledge to establish an unstated connection. This is analogous to our cases of processing with and without clues.

In Sidner's theory there is also a clear distinction between returning to an element previously in focus (one from the focus stack) or choosing a completely "new topic" from prior elements (using the alternate focus list). We distinguish returning to some ancestor of the last proposition (a choice of eligible proposition) from the case of re-addressing a "closed" proposition.

In this latter case, we require a clue word to re-direct. What we have tried to do is clearly separate eligible relatives from exceptional cases and connect the required use of clues to the exceptional category. Grosz and Sidner both allow "focus shifts" and Sidner explicitly discusses uses of "special phrases", but we have tried to study the connections between clues and exceptions more closely.

Finally, it is worth noting that the problem of reference resolution is similar to that of evidence determination, but still distinct. In the example below, constraints suggested by referent resolution theories should not be violated by our restricted processing suggestions:

EX8: 1)The city is a mess
2)The park is ruined
3)The highway is run down
4)Every 3 miles, you find a pothole in it

In 4, "it" is resolved as referring to "the highway" in 3; this proposition is eligible and the closer connection is preferred.

But clue interpretation is not equivalent to referent resolution. The clue "for example" may be expressed as "one example for this is" but could also be presented as "one example for this problem is". Since the search for a referent may differ according to the surface form ([Sidner 79]) there is no clear mapping from processing propositions with clues to those with referents. For our model, surface form may vary widely, but the search is restricted according to interpretation rules for a taxonomy - according to the semantics of the clue - and the solution is dictated by the structure of the argument so far.

C. Necessity in the base case

The main points raised in this paper are that clues can be used with a basic transmission strategy to cut processing and must be used in more complex transmissions. The question of whether certain basic transmissions still require clues is worth investigating further. In particular, it has been suggested (personal communication with psychologists) that deep stacks require clues to remind the hearer, due to "space" limitations. It may be productive to examine the computational properties of this situation more closely. Further, clues are often used to delineate sub-arguments when shifting topics. Again, some memory limitations for the hearer may be in effect here.

VI Conclusion

In conclusion, this paper outlines one crucial component of the computational model for argument analysis described in [Cohen 83]. It presents a first attempt at a solid framework for clue interpretation within argument understanding. The approach of studying goal-based dialogue and structure reconstruction also allows us to comment on the the function of clue words within analysis. The theory of clue interpretation gives insight into a known construction within sample dialogues; examining the computational properties provides a framework for design of the analysis model. It is important to note that there has been no effort to date to study the use of clue words extensively, distinguishing cases where they occur and suggesting when clues are necessary. The clue theory presented here also has possible implications for other application areas. For example, in resolving referents Sidner ([Sidner 79]) has suggested that clues will occur whenever the alternate focus list is consulted, beyond the focus stack default. Our claim is that the necessity for clues is closely tied to the complexity of processing and the reduction in processing operations afforded by the additional structural information provided by the clue words.

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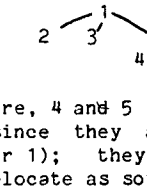
Appendix I: Coherent Transmission Strategies

Coherent transmissions are illustrated and reception algorithms required to recognize these transmissions outlined. This material is first introduced in [Cohen 81].

a)PRE-ORDER: state claim, then present evidence

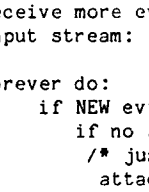
EXA1: 1)Jones would make a good president
2)He has lots of experience
3)He's been on the board for 10 years
4)And he's honest
5)He refused bribes while on the force



In the above example, each claim consistently precedes its evidence in the stream of propositions.

b)POST-ORDER: present evidence, then state claim

EXA2: 1)Jones has been on the board 10 years
2)He has lots of experience
3)And he's refused bribes
4)So he's honest
5)He would really make a good president

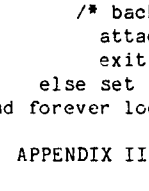


Here, the comparable example in post-order (where evidence precedes claim in the stream) is still coherent.

The hearer can construct particular reception algorithms to recognize either of the transmission strategies. To interpret a current proposition in the case of pre-order transmission, the hearer must simply look for a father; in fact, the test is performed only on the last proposition and its ancestors, up the right border of the tree. In post-order, the algorithm makes use of a stack to hold potential sons to the current proposition; the test is to be father to the top of the stack; if the test succeeds, all sons are popped and the resulting tree pushed onto the stack; if the test fails, the current proposition is added to the top of the stack.

c)HYBRID: any sub-argument may be in pre- or post-order

EXA3: 1)Jones would make a good president
2)He has lots of experience
3)He's been on the board 10 years
4)And he's refused bribes
5)So he's honest



The above example illustrates a coherent hybrid transmission. The hybrid reception algorithm is then a good approximation to a general processing strategy used by the speaker. Essentially, the algorithm combines techniques from pre- and post-order reception algorithms, where both a father and sons for a current proposition must be found. The search is still restricted, as certain propositions are closed off as eligible relatives to the current one, according to the specifications of the hybrid transmission. There is an additional problem, due to the fact that evidence is treated as a transitive relation. Sons are to be attached to their immediate father; so, it may be necessary to relocate sons that have been attached initially to a higher ancestor. This situation is illustrated below:

Here, 4 and 5 would succeed as evidence for 1 (since they are evidence for 6 and 6 is evidence for 1); they will initially attach to 1 and relocate as sons to 6 when 6 attaches as son to 1.

Here is an outline of the proposed hybrid reception algorithm. It makes uses of a dummy root node, for which all nodes are evidence. L is a pointer into the tree, representing the lowest node that can receive more evidence. For every node NEW in the input stream:

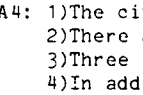
```
forever do:
     if NEW evidence for L then
        if no sons of L are evidence for NEW then
         /* just test lastson for evidence*/
          attach NEW below L
          set L to NEW
          exit forever loop
        else
          attach all sons of L which are
          evidence for L below NEW
        /* attach lastson; bump ptr. to lastson */
        /* back 1 and keep testing for evidence */
          attach NEW below L
          exit forever loop
     else set L to father (L)
end forever loop
```

APPENDIX II: Examples of Taxonomic Relations

[Cohen 81] first suggests using common interpretation rules for connectives in one category of a taxonomy. Various examples presented in that paper are included here as additional background. In the discussion below, S refers to the proposition with the clue; P refers to the prior proposition which connects to S.

1)Parallel: This category includes the most basic connectors like "in addition" as well as lists of clues (e.g. "First, secondly, thirdly..."). P must be brother to S. Finding a brother involves locating the common father when testing evidence relations.

EXA4: 1)The city is in serious trouble
2)There are some fires going
3)Three separate blazes have broken out
4)In addition, a tornado is passing through



The parallel category has additional rules for cases where lists of clues are present. Then, propositions with clues from the same list must relate. But note that it is not always a brother relation between these specific propositions. In fact, the brothers are the propositions which serve as claims in each sub-argument controlled by a list clue.

EXA5: 1)The city is awful
2)First, no one cleans the parks
3)So the parks are ugly
4)Then the roads are a mess
5)There's always garbage there

Here, 2 and 4 contain the clues; 3 and 4 are brothers.

2)Inference: There are clues like "therefore" which directly indicate inferences being drawn. The classification of "result" covers cause and effect relations which are of the form: if cause true then (most likely) effect true. Clues of this type are also included in the inference category. P will be son for S.

EXA6: 1)The fire destroyed half the city
2)People are homeless
3)As a result, streets are crowded

3)Detail: Included in this category are clues of example and particularization, where S lends partial support to P. Here, P will be father to S.

EXA7: 1)Sharks are not likeable
2)They are unfriendly to humans
3)In particular, they eat people

4)Summary: Ordinarily, summary suggests that a set of sons are to be found. S is father to a set of P's.

EXA8: 1)The benches are broken
2)The trails are choppy
3)The trees are dying
4)In sum, the park is a mess

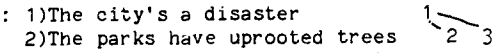
5)Reformulation: The taxonomy rule suggests looking for a prior proposition to be both father and son to the one with the clue. To represent this relation our tree model is inadequate. However, reformulations are often seen as additional evidence, adding detail and emphasis, and could then be recorded simply as sons to the prior statement. The example below suggests that interpretation:

EXA9: 1)We need more money
2)In other words, we are broke

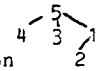
Note that additional discussion of the role of reformulation is included in [Cohen 83].

6)Contrast: Although the notion of contrast is complex, for now we interpret a proposition which offers contrast to some evidence for a claim as providing (counter) evidence for that claim, and hence S is a son of P; likewise, a proposition which contrasts another directly without evidence presented, is a (counter) claim, and hence S is a brother to P.

EXA10: 1)The city's a disaster
2)The parks have uprooted trees
3)But at least the playground's safe



EXA11: 1)The city is dangerous
2)The parks have muggers
3)But the city has no pollution
4)And there are great roads
5)So, I think the city's great



In EXA10, the clue signals a son to higher claim; in EXA11, the clue connects two brother claims.

APPENDIX III:Sample List of Clue Words

This list is drawn from [Quirk 72]. Note that some words may belong to more than one category.

I Coinciding with the connective taxonomy
1:Parallel

1 first	17 on top of it all
2 second..etc.	18 and what is more
3 secondly..etc.	19 and
4 next	20 neither...nor
5 then	21 either...or
6 finally	22 as well as
7 last	23 rather than
8 in the first place	24 as well
9 for one thing	25 too
10 for a start	26 likewise
11 to begin with	27 similarly
12 to conclude	28 equally
13 furthermore	29 again
14 moreover	30 also
15 in addition	31 further
16 above all	

[Note that 24-31 are appositions; 20 - 23 operate between clauses in one sentence].

2: Summary

32 altogther	38 in sum
33 overall	39 to conclude
34 therefore	40 to summarize
35 thus	41 I will sum by saying
36 all in all	42 My conclusion is
37 in conclusion	

[Note that 41 and 42 are whole phrases or "integrated markers"].

3: Reformulation

43 namely	45 that is to say
44 in other words	46 alternately

4: Detail

47 for example	49 another instance is
48 for instance	50 in particular

5: Inference

51 that is
52 accordingly
53 consequently
54 hence
55 as a consequence
56 as a result
57 if so
58 if not
59 That implies
60 I deduce from that
61 You can conclude from that

[Note 57 and 58 operate between clauses within one sentence; 60 and 61 are whole phrases].

6: Contrast

62 otherwise
63 conversely
64 on the contrary
65 in contrast
66 by comparison
67 however
68 nonetheless
69 though
70 yet
71 in any case
72 at any rate
73 after all
74 in spite of that
75 meanwhile
76 rather than
77 I would rather say
78 The alternative is

[Note 77 and 78 are whole phrases].

II Attitudinal expressions

These adverbs indicate a degree of belief of the speaker.

primarily, principally, especially, chiefly, largely, mainly, mostly, notably, actually, certainly, clearly, definitely, indeed, obviously, plainly, really, surely, for certain, for sure, of course, frankly, honestly, literally, simply, kind of, sort of, more or less, mildly, moderately, partially, slightly, somewhat, in part, in some respects, to some extent, scarcely, hardly, barely, a bit, a little, in the least, in the slightest, almost, nearly, virtually, practically, approximately, briefly, broadly, roughly, admittedly, decidedly, definitely, doubtless, possibly, reportedly, amazingly, remarkably, naturally, fortunately, tragically, unfortunately, delightfully, annoyingly, thankfully, correctly, justly

III Emphasis: indicate and defend a claim

to be sure, it is true, there is little doubt, I admit, it cannot be denied, the truth is, in fact, in actual fact

IV Transitions (re-directing structure)

let us now turn to, speaking of, that reminds me

Note that this appendix is not intended to list all possible clue words, but merely gives the reader an indication of the existing forms and possible categories.