

Some Facets of Argument Mining for Opinion Analysis

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Abstract. In this paper, we present some foundational elements related to argument extraction in opinion texts with the objective to further analyse and synthesise user preferences and value systems as they emerge in such texts. We show that (1) within the context of opinionated expressions, a number of evaluative expressions with a 'heavy' semantic load receive an argumentative interpretation and (2) that the association of an evaluative expression with a discourse structure such as an elaboration, an illustration, or a reformulation must also be interpreted as an argument. We develop a conceptual semantics of these relations and show how they are analyzed using the Dislog programming language on the <TextCoop> platform, dedicated to discourse analysis.

Keywords. opinion analysis, discourse analysis, arguments in opinions.

The Role of Arguments in Opinion Expression

Opinion analysis applies to various areas, from the evaluation of a product or a cultural event to the approval or disapproval of a certain social attitude or a political decision. Most opinion analysis systems are based on a global and shallow statistical analysis of positive or negative terms found close to a given term (e.g. a product name). This approach gives interesting general trends when applied to large sets of documents. In a second stage, language models of opinion expression have been developed to refine this initial schematic view. These models are much more elaborated and may include e.g. taking into account figures of communication such as irony or emphasis [7, 14]. These models however do not allow a much deeper analysis of author's feelings.

The results produced by the still scarce opinion analysis systems based on a semantic analysis of evaluative expressions (basically the evaluated attribute, the polarity of the associated value and the role played by adverbs to reinforce or weaken the evaluation) are of much interest and can produce relatively accurate opinion analysis in context, e.g. [3, 5, 8, 2]. At this stage, there is however no 'deep' analysis of the satisfaction or dissatisfaction of consumers or citizens that would indicate **why** they like or dislike a product, or approve or disapprove of a decision [6]. On a large set of texts over a closely related range of products, this type of analysis would allow the induction of the main priorities, value systems or preferences of consumers or citizens. Argument extraction in opinion texts is a new area, to the best of our knowledge, this constitutes an innovative step in opinion analysis that allow the capture of consumers underlying motivations.

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A system of preferences can be induced from attribute-value pairs and a recommendation, e.g. from a list of attributes which are positively evaluated at various degrees (e.g. *very well located, quite cheap*) and another list of attributes which are negatively evaluated (*not so clean, small rooms, quite noisy*), and a recommendation, e.g. *I strongly recommend it, do not stay here, go there if no alternative*, etc. For a given consumer, it is then possible to identify his preferences: if the overall evaluation is positive, this roughly means that the positive attributes are globally more important than the negative ones. For a given product, on a larger scale, considering the pros and cons and the recommendations over a set of consumer evaluations, it is then possible to infer that some features are more essential than others, e.g. that localization and fares are more important than comfort for young consumers. In general, a system of values or preferences must be elaborated by categories, e.g. by age and aims, since priorities may be different.

Extracting arguments associated with evaluative expressions provides a deeper understanding of consumer motivations and preferences. Identifying these arguments and making a synthesis is of much importance for the service provider or decision-maker who can then focus on the criteria which need to be improved in priority.

In this paper, we show that (1) within the context of opinion expression, a number of evaluative expressions with a 'heavy' semantic load are interpreted as arguments and (2) that the association of an evaluative expression with a discourse structure such as an elaboration, an illustration, or a reformulation must also be interpreted as an argument. These constructions help us to identify the *why* behind the evaluated statement. We develop in this article a global conceptual semantic representation for these constructions. Then, we briefly show how an automatic recognition of these structures can be implemented in the Dislog programming language on the <TextCoop> platform, dedicated to discourse analysis [15].

The work reported here has been carried out on a development corpus of French and English opinion texts in the domains of hotels and restaurants, hifi products, and the French political campaign.

1. The Structure of evaluation in opinion expression

Opinions about a product or an event are in general sequences of language utterances, each evaluating an attribute or facet of that product or event. We will not address here the facet or attribute analysis which has been the subject of many debates in AI and language. Let us call each element in such a sequence an evaluative expression: it provides an evaluation about a given attribute. An evaluative expression is often rendered in a rather direct style. However, it can be constructed from metaphors or from forms of irony, dramatisation or emphasis. To avoid this, on most specific systems where consumers are invited to express their opinion, style guidelines are provided to avoid unclear or too personal descriptions. In the case of large public products, attributes or properties to be evaluated are suggested to consumers which do not necessarily have a high literacy level.

1.1. The Structure of Evaluative Expressions

An evaluative expression is in general realized in natural language by a short expression which has the form of an attribute-value pair. The attribute is the head of the structure, it

'subcategorizes' for an evaluation (the value) and, since it conveys the context, it gives the evaluative expression its interpretation. The attribute is in general realized as a noun or an event. The evaluation has its own head term, often an adjective, which may be modified by several types of constructions, in particular adverb phrases. In: *very good communication system*,

'Communication system' is the attribute, 'very good' is the evaluation, composed of a head, the adjective 'good' with a positive orientation (or polarity). This positive character is reinforced by the modifier 'very'.

An evaluative expression integrates several aspects:

- a positive or a negative orientation,
- the strength of that orientation, - a detailed semantic characterization of the orientation, which is often very rich and entail very subtle and challenging conceptual interpretations. For example *cheap fares*, *competitive fares* and *good quality/fare ratio*, where 'fares' is the attribute, do not convey exactly the same meaning.

Finally, an evaluative expression can be associated with various discourse elements such as illustrations, elaborations, or reformulations. These are viewed syntactically as adjuncts to the evaluative expression.

1.2. About Attributes and Values

Attributes defined for a domain are more or less independent. This is potentially a source of contradictions in the evaluation. For example in the political domain, competence and educational level are somewhat related attributes with similar polarities a priori. However, strong competence and poor educational level may be found in an evaluation.

An attribute may not be explicitly mentioned in an evaluative expression, as in: *very well located*. In that case, the attribute is said to be incorporated into the head of the evaluation, here the adjective 'located'. The above expression is indeed equivalent to: *location: very good*. In a number of situations, the identification of the incorporated attribute may be ambiguous.

In a large majority of cases, values associated with an attribute range over a large set of possibilities. These possibilities may be further extended via adverbial modification. These values form a discrete system, with a partial order, along the conceptual dimension covered by the attribute. In lexical semantics, such forms are called non-branching proportional series [1]. For example, for the competence attribute in politics, a scale can be defined as follows:

incompetent, useless, inexperienced, capable, efficient, competent, proficient, expert.

2. Evaluative expressions as arguments: a Decompositional Semantics approach

Similarly to componential analysis, we consider a prelexical level, language independent, where the different 'facets' of a concept receive a kind of conceptual realization, not yet lexicalized. However investigations show that a number of adjectives found in evaluative expressions, besides their polarity and strength, **incorporate** semantic features which can be interpreted as arguments in the framework of opinion analysis. This occurs when the meaning of the adjective is rich or unusual (foregrounding phenomenon) w.r.t. to the attribute being evaluated. Those features make more explicit the reasons behind the evaluation and shed some light on the consumer analysis, motivations and preferences.

For example, an expression in the hotel domain such as: *clean rooms* has no real argumentative power because 'clean' is a standard value for rooms. It simply has a positive orientation w.r.t. the attribute 'cleanliness'. It can be contrasted with: *accueil familial* (English gloss: you are welcomed as a family member) which has the following features:

- positive orientation, strength: high, (given in the domain lexicon)
- incorporated argument, since 'familial' has a rich semantic structure, with the probable interpretation: 'because the owners behave as if you were part of their family'.

The extraction in an adjective of the incorporated meaning which can be interpreted as an argument raises major challenges in lexical semantics and in lexical inference. In conceptual semantics, the semantics of an adjective is defined by either a set of features, in attribute value form, or by a formula based on a language of primitives. This is the well-known **decompositional semantics** approach to meaning. It is crucial when the adjective is higher-order or polysemous. Furthermore, the semantics of the adjective is often largely underspecified because it depends on the semantics of the modified term.

Concerning the above example, 'familial' is a higher-order adjective which may have, roughly, the following representations depending on the domain considered:

- Communication domain: (*accueil familial, conversation familiale, etc.*) (family welcome), globally means that one is welcomed as if one is part of the family. A representation based on features would include e.g.: warm, friendly, etc. To produce a representation based on predicates, telic elements of the Generative Lexicon could be considered, but this remains largely open due to the fuzzyness of telic roles.
- Concrete object domain: e.g. *repas familial* (family-style meal) means a meal that has properties such as: casual, home-made, good and abundant, etc. Meal has at least two facets: contents and atmosphere. The contents feature can be represented by a formula, based on a system of primitives, as follows: $meal(X) \wedge food - of(Y, X) \wedge good(Y) \wedge abundant(Y) \dots$

These sample formulae (or their language paraphrase) constitute the argument(s) which can be extracted. They support the evaluation provided by the customer by making more explicit the elements of the evaluation.

In a first stage, we consider the feature-based approach, where features may be domain dependent. The main technical objection is feasibility and scalability. A solution comes from the language engineering point of view: for a given domain, the number of adjectives found in consumer evaluations is in general relatively limited: between 120 and 300 adjectives, for about 5 to 20 attributes (adjectives may be proper to an attribute or shared by several attributes). Only about 80 adjectives are really frequent. About 40% of the adjectives in a given domain are semantically stable over all the attributes and have fixed semantic representation, polarity and strength. Given a set of features, semantic descriptions can then be realized manually from a corpus. Furthermore, a number of these adjectives are also stable across domains such as fares, cleanliness, design, and welcome.

Descriptions are implemented in the adjective lexicon. 'Familial' in the communication domain would be represented as follows in an informal typed-feature system (the argument is made fully explicit here):

Familial : [cat: adjective, domain: communication, attribute_type: human_attitude,

gradable: yes, orientation: positive, strength: high,
semantics: heavy, sem_features: warm, friendly,
sem_representation: $\lambda X, Z \text{ behave}(X, \text{family} - \text{of}(Z, X))$]

This representation describes the type of the adjective, its semantic features and indicates that it has a heavy semantic load (i.e. for the domain at stake it incorporates semantic elements which can be interpreted as arguments). Those semantic features are those that should be considered to characterize the incorporated argument. Depending on the strength of those features and their prototypicality w.r.t. the attribute they evaluate, only a subset of those features could be considered as really having an argumentative orientation. Relevance or selection principles must be defined at this level.

When several documents from various consumers are considered for a given product, it is obviously of much interest to construct a synthesis of evaluations per attribute. Developing argument fusion techniques is a very challenging task. At this stage, we can, for each attribute, (1) either construct a list of the adjectives found (and their modifiers), add frequencies, or (2) construct a list of the selected semantic features underlying the adjectives (given under *sem_features* in the lexicon), and indicate weight for each feature from the occurrence frequency of the adjective. In any case, this constitutes an informal set of arguments for each attribute which may be of much interest for the service provider. Developing a synthesis based on conceptual logical formula would be much more challenging, introducing more complexity, but could follow the same principles.

3. Discourse relations as argument supports

3.1. Evaluative Elements and Explanation

As advocated above, evaluative expressions come quite frequently with additional elements such as comments, elaborations, comparisons, illustrations, etc. which are forms of explanation [9, 4] that realize argument schemas [17]. In our view, explanation is not a basic rhetorical relation as introduced in RST, but a very generic construction, a 'proto-relation', which covers a large number of communication situations [4]. In our view, explanation is a process which is realized in language by means of several types of rhetorical relations (elaboration, arguments, illustration, etc.) which can be combined (possibly using a planning strategy).

In: *very well located (close to the railway station, restaurants and cinemas)*
the expression : '(close to the railway station, restaurants and cinemas)' can be analyzed either as an elaboration or as an illustration of the head expression 'very well located'. According to RST theory [10, 11], this head expression is a nucleus while the elaboration or illustration is its satellite.

In this paper, we argue that rhetorical elements related to explanation behave as argument supports and make explicit the semantic and pragmatic function of the support: e.g. they justify, illustrate, develop the evaluative expression. The main hypothesis of our approach is that while elaborations, illustrations and other rhetorical relations related to explanation do not have any argumentative power or orientation a priori, they acquire such power or orientation when combined with an evaluative expression. Consider the contrast between:

Red fruit tart (strawberries, raspberries).

Excellent location (3 mns from the Capitole, 5 mns from St Sernin Cathedral,...).

In the first statement, the illustration relation simply provides more detailed information about red fruits, while in the second, the proximity of touristic spots justifies the value 'excellent': the location is excellent because tourist spots are very close-by. The pair evaluative expression - rhetorical relation becomes an argument with its conclusion and support.

Each type of rhetorical relation introduces a particular type of support, with a particular semantics, communicative goal and orientation. This is investigated below with a conceptual analysis of the relation in terms of the role it plays as an argument support. The general form is:

evaluative expression - reasons for that evaluation.

Investigating these discourse relations allows a better understanding of argument elaboration and how they function in opinion expression. Besides evaluations involving a single relation, we frequently observed sequences (or networks) of rhetorical elements associated with an evaluative expression (cf. 3.4).

3.2. Analysis of discourse relations conveying arguments

Let us now investigate how rhetorical relations related to explanation give an argumentative interpretation to evaluative expressions and exactly what kind of role they play w.r.t. the evaluative expression. In our corpus, we do not take into account metaphors, irony, emphasis, or propositional attitudes, although this is also an important aspect. These elements are often higher-order modifiers.

3.2.1. Justification

Justification clarifies the reasons of an evaluation:

The hotel is 2 stars [JUSTIFICATION due to the lack of bar and restaurant facilities].

The general abstract schema is: X is Eval because of Fact*

where Eval denotes the evaluative expression and Fact* a set of facts acting as justifications. Connectors are basically causal, such as *because, due to*.

The conceptual interpretation of a justification is:

Fact* provide reasons, based on inherent properties of the object being evaluated, for the Eval which is given. Justification supports the evaluative expression, it does not change the orientation (positive/negative) and does not add a priori any strength to the evaluation.

While the polarity of the previous example is neutral, the introduction of an adverb such as 'only' introduces a negative polarity to the evaluative expression, without changing the effect of the justification:

The hotel is only 2 stars [JUSTIFICATION due to the lack of bar and restaurant facilities].

3.2.2. Reformulation

Reformulation (also called restatement) is a relation where the support rephrases the evaluative expression without adding any significant information, the goal being e.g. to make sure that the evaluation is clear and unambiguous:

Could be improved [REFORMULATION in other words, not so good].

Localisation is perfect for a stay in town [REFORMULATION : it cannot be better located.]

The general abstract schema is: X is Eval, in other words, B.

Cue terms introducing reformulations are in particular:
in other words, to put it another way, that is to say, i.e., put differently .

The conceptual interpretation of a reformulation is: B provides another way of saying X is Eval, without adding any informational contents. Reformulation supports the evaluative expression but does not add any substantial strength to the evaluation. If the repetition of the informational contents with a different formulation is viewed as a form of insistence, then it may add a slight strength to the statement.

3.2.3. *Elaboration by Illustration or Enumeration*

Illustration is a relation where the support instantiates segment 'X is Eval', via example:
The bathrooms were in a bad condition: [ILLUSTRATION the showers leaked, and the plug mechanism in the bath jammed ...]

The staff went out of their way to be helpful [ILLUSTRATION (I had thrown away my return ticket by mistake and they emptied their rubbish sack to find it).]

The general abstract schema is: X is Eval, for example B*.

Where B* denotes a set of examples illustrating 'X is Eval'. B denotes objects or events.

Examples are introduced by a large variety of markers, including typographic markers and punctuation. The conceptual interpretation of an illustration in this case is: B* are instances of 'X is Eval' which illustrate this statement. They all have the same polarity, which is shared with 'X is Eval' (an illustration cannot be in contradiction with its head, unless it is a form of irony). Depending on the amount of elements in B* and their prototypicality, illustration is a support that adds more or less strength to the argument, without affecting its polarity.

Illustration is called an enumeration when all the elements are explicit:

Breakfast selection is very good [ENUMERATION with a range of cereals, tea and coffee, cold meats and cheese, fresh and canned fruit, bread, rolls and croissants, and a selection of cooked items.]

Enumeration clearly supports the evaluative expression and adds a substantial strength to the evaluative expression.

3.2.4. *Elaboration via Precision*

Precision is a relation that adds specific information to the evaluative expression or focusses on a specific point. This specific information confirms the orientation, adding some strength:

It is great value being able to accommodate a family of four in one room [PRECISION (99 Euros including breakfast).]

Friendly and helpful staff, [PRECISION especially the service executives at the counter.]

The general schema is: X is Eval, in particular B.

Cue terms introducing precision are in particular:

with, especially, more precisely, in particular.

The conceptual semantics of 'precision' is that B adds specific information and somewhat confirms the statement X is Eval. Precision supports the evaluative expression and adds some strength, depending on the importance of the precision.

3.2.5. *Elaboration via Comparison*

Comparison is a strong means to reinforce a statement, making a parallel with a better or worse situation or object, more or less explicit:

These head phones are excellent, [COMPARISON as if you are in a concert room.]

The general schema is: X is Eval, like B*.

Cue terms are typical of comparative expressions, in particular: *like, such as, as if*.

Comparison supports the evaluative expression while B* adds, via the evocation of another situation or product, substantial strength to the evaluative expression.

We also observed a frequent type of statement which could be viewed as a negatively oriented comparison, which either reinforces a negative evaluation (support), or has a limited positive or negative impact on a positive or neutral evaluation:

The price is high [NEG-COMPARISON] compared with the comfort.

The food in the restaurant was OK [NEG-COMPARISON] for the price.

In the first statement, the evaluative expression is negative (for this attribute), the comparison reinforces the negative feeling. We will see below that a contrast has the opposite effect. The second statement has a neutral evaluation which is somewhat made positive.

3.2.6. *Elaboration via Consequence*

Consequence is here used in a rather limited way, it is quite often a type of elaboration. It mainly develops the advantages of a positive or a negative evaluation:

a high soundproofing [ELAB-CONSEQUENCE that allows you to have a rest after a long working day].

In general, the support stresses the importance of the attribute rather than adding any real strength to the evaluation itself.

3.2.7. *Contrast*

Contrast introduces a statement which is somewhat symmetric but in opposition with the evaluation:

It was clean and comfortable, [CONTRAST but the carpet was in need of replacing.]

The price is very reasonable [CONTRAST but comfort is rather poor.]

The support is not in a total opposition with the evaluation (it may range over a different but related property) but weakens it because the elements in the head and in the satellite have different polarities.

Due to this partial opposition character, contrast can co-occur with relations that reinforce the evaluation without introducing inconsistencies:

A nice room [PRECISION with a flat screen TV] [CONTRAST but with no real charm.]

It can also modify another relation such as precision:

A nice room [PRECISION with a flat screen TV [CONTRAST but without any interesting channels.]]

The general schema is: X is Eval but B*. Linguistic markers typical of contrast are, for example: *whereas, but, while*.

The conceptual semantics states that B* is opposed to X is Eval to a certain degree or along a certain meaning component related in some way to X is Eval, weakening its argumentative value. A contrast is therefore not a support but an attack of (or a contradiction to) the evaluative expression. Contrast is often used in forms of irony, in that case, the argumentative value is reversed, not weakened.

3.2.8. *Concession*

Similarly to contrast, concession introduces a form of contradiction between the evaluation and the support. This contradiction weakens or reinforces the evaluative expression

depending on the polarity of the connector:

The hotel has a nice 'modern' bar and restaurant, [CONCESSION although not particularly cheap.]: 'although' is negatively oriented, the evaluation of the restaurant is affected on a specific subproperty of 'nice', its fares.

Very quiet [CONCESSION in spite of its downtown location in a nightlife area.]: 'in spite of' is positively oriented and supports the evaluation.

The linguistic structure is very close to contrast, but a number of linguistic markers are specific to concession: *however, although, though, even though, even if, notwithstanding, despite, in spite of.*

3.3. Overall Recommendation Processing

Finally, consumer opinions end (or sometimes start, e.g. using a title) with an overall recommendation. It is composed of a few words that conclude on the product or event global opinion, given the different evaluated attributes and the values attached for a given situation:

... I strongly recommend it. / buy it. /go there if no alternative.

The recommendation attribute has a 'value' which is not a clear-cut good/bad. It is very difficult, if not impossible, to give recommendations a semantics or even organize them along a linear scale. It would make sense to define groups of recommendations which would have approximately the same kind of impact on the reader.

3.4. Complex rhetorical constructions: towards argumentation forms

From an argumentation point of view, it is interesting to note that most of the relations presented here can be combined to form complex structures, as developed in [16]. Let us give here a few typical cases. It is clear that, in these cases, the strength and even the polarity are more difficult to characterize since the evaluative expression may receive supports and attacks of various types.

A typical case is the combination of a precision and a contrast:

The desserts were excellent [PRECISION with very imaginative exotic fruit salads] [CONTRAST but with limited choice of pastries].

In this example, probably the precision and the contrast, which are antagonists in terms of polarity, compensate each other, but this depends on the reader's preferences.

A relation can be modified by another one, possibly with a different orientation:

Breakfast selection is very good [ENUMERATION with a range of cereals, tea and coffee, cold meats and cheese, fresh and canned fruit, bread, rolls and croissants, and a selection of cooked items, [CONTRAST but there are no pancakes.]]

The enumeration is here attacked by the contrast, the support is then slightly less strong than it could have been.

3.5. An overall formal model for opinion texts

A consumer evaluation text about an event is a sequence of one or more evaluative expressions. This sequence may be associated with two other components: a recommendation or a title, playing the role of a global feeling about the evaluation at stake and possibly a context (or frame in RST) that restricts the scope or the validity of the statement, e.g. *(we stayed in this hotel during a strike...)*.

The general form of an evaluative expression is: $X_i \text{ is } E_i [R_{i,k}]$
where X is the attribute name, E the evaluation, and R is a set of k rhetorical elements.

A sequence of n evaluative expressions is a conjunction of evaluative expressions, with a recommendation or title and an optional context:

[Context: $X_1 \text{ is } E_1 [R_{1,k}] \wedge X_2 \text{ is } E_2 [R_{2,m}] \wedge \dots \wedge X_n \text{ is } E_n [R_{n,p}]$]
 \Rightarrow Recommendation is Y.

An important issue is the order in which attributes appear. Since most texts remain informal, it is difficult to elaborate a strategy deployed by authors. A trend would be to keep the attributes which correspond to the overall recommendation for the last part of the text so that it looks more coherent. However, structural and planning aspects [8, 13] of the opinion discourse remained relatively weak in our corpus.

3.6. Summary: a few comprehensive examples

Here are a few examples processed by <TextCoop> from our corpus that illustrate the above formal model for specific attributes. Rhetorical relations modify the attribute that immediately precedes them:

The staff are helpful and the restaurant [PRECISION (for breakfast and lunch)] is excellent. However the location is not so good [REFORMULATION - it is a very long walk to the centre of Toulouse.]

The hotel was clean and comfortable, [CONCESSION though the air conditioning was broken in our room [PRECISION (and supposedly in other guests' rooms too)], [CONTRAST but we opened a window, and were able to stay comfortable that way.]]

[CONTEXT We stayed here for a one day conference off-season], and the hotel was fine [CONCESSION - although the room I had was kind of weird.] I think it was the sitting room to the suite on the top floor [PRECISION - the bed was a fold-out bed [CONCESSION (slept okay though)], and the coffee table was pushed to the side.] [CONCESSION It did have a lovely terrace though] - shame it was raining cats and dogs. [RECOMMENDATION I may not come back there.]

The last example shows that understanding complex statements may be difficult: there are indeed many scoping ambiguities, in particular when the style is not good or when punctuation marks are not present. The second concession is within the precision, as a kind of cleft construction.

4. Implementation in <TextCoop>

4.1. Overview of the rule system

To process these relations, we use <TextCoop>, which is a platform we designed for discourse analysis, with a logic and linguistic perspective [15]. For the present purpose, we have designed argument extraction rules that precisely correspond to the types of discourse structures that appear in consumer opinion texts. These rules have been adapted (following principles given in e.g. [12, 8]) from our rule repository dedicated to explanation structures [4]. This involved developing additional lexical resources (terms expressing polarity, adverbs of intensity, domain verbs), and revising the structure of rules (in particular characterizing in more depth their boundaries) and adding a few more rules.

For example, for the contrast relation, in readable form, here are three among the six rules we have defined:

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Contrast → conn(opposition_whe), gap(G), punct(comma). /
conn(opposition_whe), gap(G), end. /
conn(opposition_how), gap(G), end.
conn(opposition_whe): whereas, but whereas, but while
conn(opposition_how): however
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The symbol 'end' is a punctuation mark or any connector.

4.2. Results and performances

From a test corpus (21 500 words, 50 texts), we have the following coverage and accuracy rates, expressed in terms of recall and precision. Our strategy was to favor precision over recall since some discourse structures may be somewhat ambiguous or close to each other. We propose here an indicative evaluation that gives the main trends of our results. The goal is to identify components which need to be revised and improved before realizing a more elaborated evaluation.

The following figures are based on a comparison of the system performances w.r.t. manual annotations. A structure is correct if it is correctly identified and well-delimited. Context and recommendation are not included here.

structure	number manually annotated	precision (%)	recall (%)
justification	49	92	86
reformulation	27	85	76
illustration	112	91	82
precision	52	90	85
comparison	58	89	85
consequence	12	92	87
contrast	49	86	79
concession	35	89	82

Table 1. Textcoop performances for the identification of discourse relations

5. Conclusion and Perspectives

In this paper, we have developed an approach to argument identification and analysis as they appear in opinion texts. We have shown by means of examples that arguments are either (1) incorporated into evaluative expressions with a heavy semantic load, in particular evaluative adjectives, or (2) composed of an evaluation (conclusion) combined with one or more discourse structures such as justification, elaboration or illustration (support) whose goal is to persuade the reader of the evaluation.

Identifying those relations in opinion analysis is of much importance in order to be able to determine **why** consumers or citizens are happy or not with a certain product or decision, and what are their preferences and values. Arguments partly convey this information. We have briefly shown how the rules and the lexical structures can be imple-

mented in the <TextCoop> platform and have given results of an indicative evaluation. At the moment, the system works on French, and is being developed for English.

To make these results really useful, constructing a synthesis of arguments would be welcomed. At the level of evaluative expressions (adjectives), we have sketched out a proposal to synthesise their underlying features, when this approach is semantically appropriate and feasible. A synthesis based on conceptual formula requires more language and inferential investigations. It is obviously much more complex to construct a synthesis of the discourse relations that play the role of argument supports, as developed in the second part of this paper. Argumentation-based reasoning tools can certainly be used, but these cannot handle the high complexity and subtleties of language expressions found in these discourse units: a very rich semantic lexicon and a set of inferential patterns are needed. If this is not fully satisfactory from a scientific point of view, users are rather happy of getting lists of arguments and making their own synthesis manually: this process could be investigated to elaborate tools to construct such a synthesis. In spite of these limitations, a useful corpus of real-life tagged arguments is produced which can be used in argumentation analysis.

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