How Do Empirical Methods Interact with Theoretical Pragmatics? The Conceptual and Procedural Contents of the English Simple Past and Its Translation into French

Cristina Grisot and Jacques Moeschler

Abstract One major theoretical issue that has dominated the field of theoretical pragmatics for the last twenty years is the conceptual vs. procedural distinction and its application for verb tenses. In this chapter, we address this distinction from both theoretical and empirical perspectives following a multifaceted methodology: work on parallel corpora, contrastive analysis methodology and offline experimentation with natural language processing applications. We argue that the conceptual/procedural distinction should be investigated under the aegis of empirical pragmatics. In the case study, we bring evidence from offline experimentation for the procedural and conceptual contents of the English Simple Past and we use this information for improving the results of a machine translation system.

Keywords Empirical pragmatics • Corpus work • Linguistic experiments • Conceptual/procedural distinction • Natural language processing • Machine translation

1 Introduction[1]

In the last few years, linguists have become aware of the numerous advantages of the collaboration between theoretical and empirical pragmatics, which joined their forces in order to provide more and more insight into the use of language. In our view, empirical pragmatics investigates language use from both descriptive-theoretical and empirical perspectives. The empirical means considered in this

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C. Grisot (✉) • J. Moeschler
Department of Linguistics, University of Geneva, 2 rue de Candolle 1211,
Genève 4, Switzerland
e-mail: cristina.grisot@unige.ch; jacques.moeschler@unige.ch

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study are corpora and experimental methods. These methods are complementary and allow a better view on the linguistic phenomena of interest in this study, specifically the nature of the information encoded by verb tenses.

Theoretical pragmatics can be defined in a broad sense as the study of language in use, and in a narrow sense, as the study of how linguistic properties and contextual factors interact for utterances interpretation (Noveck and Sperber 2004). Two types of properties are involved in verbal communication: linguistic properties that are linked to the content of sentences (phonological, syntactic, semantic assigned by the grammar of each language) and non-linguistic properties that are linked to them being uttered in a given situation, at a given moment by a speaker. One question pragmatics wants to answer is the exact role of each type of property and their interaction. On the one hand, Grice (1975/1989) and neo-Gricean scholars (Gazdar 1979; Horn 1973, 1984, 1989, 1992, 2004, 2007; Levinson 1983, 2000) proposed an explanation based on conversation maxims and principles that guide conversation participants. On the other hand, relevance theorists (Sperber and Wilson 1986/1995; Blakemore 1987, 2002; Carston 2002; Moeschler 1989; Reboul 1992; Moeschler and Reboul 1994; Reboul and Moeschler 1995, 1996, 1998) speak about a unique expectation of relevance that hearers have while participating in an act of communication. According to relevance theorists, this expectation of relevance is sufficient for recovering the speaker's meaning.

Theoretical pragmatics (both neo-Griceans, relevance theorists as well as other pragmaticians) is thus concerned with phenomena related to the interpretation of utterances, including both explicit (in close relation to semantics) and implicit meaning. The main assumption is that propositional structures are systematically underdetermined and must be contextually enriched. Of great interest for the present study is the theoretical distinction between *conceptual* vs. *procedural* meaning, proposed by Blakemore (1987) within the framework of Relevance Theory (RT) (Sperber and Wilson 1986/1995). As Escandell-Vidal et al. (2011) argue, the conceptual/procedural distinction was first meant as a solution for the semantics/pragmatics division of labour and it has remained an important explanation for the contribution of linguistic meaning to utterance interpretation. A speaker is not expected to render more difficult than necessary his/her addressee's task in obtaining a relevant interpretation. Therefore, procedural meanings are instructions encoded by linguistic expressions that specify paths to follow during the interpretation process (manipulation of conceptual representations) in order to access the most relevant context. Wilson and Sperber (1993) attach cognitive foundations to the conceptual/procedural distinction and propose a distinguishing criterion: conceptual representations can be brought to consciousness while procedures cannot. We are particularly interested in this distinction because of its highly debated application for verb tenses (Smith 1990; Wilson and Sperber 1993; Moeschler et al. 1998; Moeschler 2000, 2002; de Saussure 2003, 2011; Amenós-Pons 2011; Moeschler et al. 1998, 2012; Grisot et al. 2012).

The two aims of this chapter are (1) to show that an investigation of the conceptual and procedural meanings of verb tenses should be done under the aegis of empirical pragmatics and (2) to argue for the benefits of combining two

empirical methods, corpus analysis and linguistic experiment. In our study, we combined data from parallel corpora that served as stimulus composition for offline experiments (linguistic judgement task). Parallel corpora revealed variation in translation possibilities of a verb tense from a source language (SL) to a target language (TL). Based on semantic and pragmatic theories we formulated hypotheses about the source of this variation and possible disambiguation criteria. Offline experiments allowed us to validate one of these criteria, as well as to propose new theoretic descriptions of the meaning and usages of verb tenses. We place this study under the cover of empirical pragmatics.

Empirical pragmatics draws on theoretical pragmatics and corpus linguistics, adopting experimental methods at the same time. Empirical pragmatics aims at having consistent data for supporting or challenging current pragmatic theories, as well as proposing new models for the interpretation of linguistic phenomena. Of course, theoretical pragmatics makes use of data consisting of built examples representing mainly the researchers' own intuitions. This type of data is criticisable mainly for its subjectivity and lack of replicability. For this reason robust (objective, quantifiable, replicable) data must be adopted, such as data from corpora (as argued for example by Barlow and Kemmer 2000; Boas 2003) and experiments (Tomasello 2000). Of the two types of experiments used in psycholinguistics, only offline experimentation can be adopted more easily by empirical pragmatics because of the lack of material required (no necessity of a laboratory with electroencephalography EEG material[2] or eye-trackers).

There is one branch of pragmatics that has integrated experimental methodologies for testing pragmatic theories: experimental pragmatics. While theoretical pragmatics is rooted in philosophy of language and in linguistics, experimental pragmatics, drawing on pragmatics, psycholinguistics and psychology of reasoning, has taken over and reinterpreted the psycholinguistic sophisticated experimental methods (Meibauer and Steinbach 2011). For instance, Katsos and Cummins (2010) emphasize the relation between pragmatic theory and psycholinguistic experimental design: linguists benefit from experimental data confirming the psychological validity of their observations and provide critical evidence for cases that go beyond the reach of intuitive reflection, and psychologists benefit from a wide range of phenomena to study and of multiple theories provided by semantics and pragmatics. Recent experimental pragmatics (such as papers from the volume edited by Noveck and Sperber in 2004) has focused on phenomena such as indirect speech acts, metaphors, implicature, presupposition and, more generally, speaker meaning.

Finally, we would like to argue that empirical pragmatics has built a bridge to the Natural Language Processing (NLP) domain thanks to the robust type of data used. The NLP domain needs models of language interpretation inspired from theoretical

[2] EEG is a procedure that measures electrical activity of the brain over time using electrodes placed on the scalp and it reflects thousands of simultaneously ongoing brain processes. Eye tracking is the process of measuring either the point of gaze or the motion of an eye relative to the head and it is used to investigate human thought processes.

pragmatics that can be adapted to machines. NLP also requires large amounts of data that allow quantitative analyses, statistical models and data for training parses and classifiers. Empirical pragmatics is able to provide NLP both linguistic models and empirical data.

This chapter is structured as follows: in Sect. 2, we introduce the role and type of data used in linguistics presented from a general point of view and in semantics and pragmatics, as well as their advantages and limits; in Sect. 3, we describe our case study by pointing out theoretical matters about verb tenses, our hypotheses, our empirical study on parallel corpora and offline experiments. We conclude our chapter in Sect. 4 by addressing the impact of the results of our experiments on theoretical matters about verb tenses and the importance of giving multiple sources of data for empirical pragmatics studies.

2 Type and Role of Data in Empirical Pragmatics

Nowadays, one can observe the increasing aspirations of linguists to use robust and objective findings in addition to intuitive and subjective acceptability judgements or built examples. McEnery and Wilson (2001) highlight that, broadly speaking, linguists have tended to favour the use of either introspective data (that is, language data constructed by linguists) or naturally occurring data (that is, examples of actual language usage). Nowadays, most linguists see these two types of data as complementary approaches, and not exclusive ones. Gibbs and Matlock (1999) and Gries (2002) argue that, although intuition may be poor as a methodology for investigating mental representations, linguists' intuitions are useful in the formulation of testable hypotheses about linguistic structure and behaviour.

Kepser and Reis (2005) point out that introspective and corpus data were the two main sources of data for theoretical linguistics until the mid-1990s. After that time other sources have been considered, such as experimentation (investigating offline and online processes), language acquisition, language pathologies, neurolinguistic, etc. They argue that linguistic evidence coming from different domains of data sheds more light on issues investigated than from a unique source. Multi-source evidence can either validate the theory or bring contradictory results, therefore opening new perspectives.

In what natural occurring data is concerned, Table 1 provides an overview of kinds of linguistic data (Gilquin and Gries 2009). They are presented in descending order of naturalness of production and collection (only corpora with written examples are produced for other aims than the specific purpose of linguistic research, and are thus the most natural kind).

In this chapter, we are interested in the first and the last type of data, namely corpora with written texts and data coming from experimentation where subjects are required to do something with language they do not usually do (using units they usually interact with involving typical linguistic output). We argue that both types

Table 1 Kinds of linguistic data (Sorted according to naturalness of production/collection) (Gilquin and Gries 2009: 5)

	Data source
1.	Corpora with written texts (e.g. newspapers, weblogs)
2.	Example collections
3.	Corpora of recorded spoken language in societies/communities where note-taking/recording is not particularly spectacular/invasive
4.	Corpora with recorded spoken language from fieldwork in societies/communities where note-taking/recording is spectacular/invasive
5.	Data from interviews (e.g. sociolinguistic interviews)
6.	Experimentation requiring subjects to do something with language they usually do anyway (e.g. sentence production as in answering questions in studies on priming or picture description in studies on information structure)
7.	Elicited data from fieldwork (e.g. response to "how do you say X in your language?")
8.	Experimentation requiring subjects to do something with language they usually do, *on units they usually interact with (e.g. sentence sorting, measurements of reaction times in lexical decision tasks, word associations)
9.	Experimentation requiring subjects to do something with language they usually do not do, *on units they usually interact with, involving typical linguistic output (e.g. measurements of event-related potentials evoked by viewing pictures, eye-movement during reading idioms, acceptability/grammaticality judgements *on units they usually do not interact with, involving production of linguistic output (e.g. phoneme monitoring, ultrasound tongue-position videos)

of data are complementary and necessary in pragmatic research, and may be used within various frameworks of linguistic description and analysis.

Before presenting the advantages and difficulties, as well as the complementarity of both empirical methods used in this study, we will define and describe briefly corpora and offline experiments.

2.1 Corpora

The well-known description of a corpus as being "a body of naturally occurring language" (McEnery et al. 2006: 4) is largely accepted in the corpus linguistics community, as well as other domain that work on corpora, such as empirical pragmatics or translation studies (Baker 1993, 1995). The same is true for corpora as having a *machine-readable* form, a feature that allows its compilation and analysis semi-automatically and automatically. As far as size is concerned, corpora become larger and larger and this is due to the possibility to be tagged, compiled and analysed automatically. The most important aspect to take into account when doing corpus work is to have an appropriate match of the research goal and the corpus type and size (Gries 2013).

Another feature of corpora is the number of languages and type of texts they contain, for example, monolingual or multilingual. Multilingual corpora can be of

two main types: (a) *parallel* (or *translation*) *corpora*, containing source texts and their translation in one or several target languages, which can be unidirectional (from language A to language B) or bi/multidirectional, and (b) *comparable corpora*, containing non-translated or translated texts of the same genre. Each type can be used for specific research goals.

A first advantage of working on corpora is that they represent an empirical basis for researchers' intuitions. Intuitions are the starting-point of any study but can be misleading and sometimes a few striking differences could lead to hazardous generalizations. Moreover, results of analyses of quantifiable data allow not only generalizations (through statistical significance tests) but also predictions through statistical analyses, such as correlations[3] or multiple regression models,[4] which are often used for investigating such a complex phenomenon as language.

Furthermore, multilingual corpora have quite naturally been used in contrastive studies. Contrastive Linguistics, also called Contrastive Analysis (CA), is "the systematic comparison of two or more languages, with the aim of describing their similarities and differences" (Johansson 2003: 31) and it is often done by focusing on one linguistic phenomenon. Mainly, the methodology used in a contrastive study consists of a first phase of monolingual description of the data (the phenomenon to be analysed), followed by the juxtaposition of two or more monolingual descriptions and the analysis of the elements according to a *tertium comparationis* (James 1980; Krzeszowski 1990). In our case study, we argue that the necessary *tertium comparationis* for verb tenses should be defined in terms of cross-linguistic valid features, such as *conceptual* and *procedural* information.

The practice of contrastive languages comparison based on corpora has itself numerous advantages, such as (a) new insights into the languages to be compared (which would have remained unnoticed in studies of monolingual corpora), (b) the highlighting of language-specific features and (c) the possibility of making semantic and pragmatic equivalences for the considered linguistic phenomenon between the SL and the TL. In some cases, corpus-based studies with a contrastive perspective have applicable purposes, such as our case study, which aims at modelling verb tenses for improving the quality of the texts translated by machine translation systems.

Another advantage is that data from corpora can be annotated (enriched) with semantic and pragmatic information, which allows more complex analyses. Annotation is the practice of adding interpretative linguistic information to a corpus, as underlined by Leech (2005). Annotation is thus an enrichment of the original raw

[3] Correlation is a monofactorial statistical method, which investigates the relation between one independent variable (the predictor) and one dependent variable (the phenomenon of interest). Correlation does not involve obligatorily causality between the two variables (they can be only associated) and can be used only when relationship is linear (cf. Gries 2009; Baayen 2008).

[4] Multiple regressions are multifactorial statistical methods, which investigate the relation between several independent variables (predictors) and one dependent variable, as well as their interactions. The relation between independent variables and the dependent variable can be linear or non-linear. (cf. Gries 2009; Baayen 2008).

corpus. From this perspective, adding annotations to a corpus is providing additional value and thus increasing their utility (McEnery and Wilson 2003; Leech 2004). Firstly, annotated corpora are useful both for the researcher(s) who made the annotation and for other researchers, who can use them for their own purposes, modify or enlarge them. Secondly, annotated corpora allow both manual and automatic analysis and processing of the corpus and by assuring its multifunctional utilisation, the annotations themselves often revealing a whole range of uses which would not have been practicable unless the corpus had been annotated. Thirdly, annotated corpora allow an objective record of analysis open to future analysis, decisions being more objective and reproducible. Due to automatic analysis of the corpus, annotated corpora are often used for training of NLP tools, such as classifiers (see Sect. 3.4).

Corpus work is thus interesting when the researcher is concerned with a descriptive approach of the linguistic phenomenon considered, as well as the study of language in use, given the fact that most of the time cotext and contextual information is also available in the corpus. Corpora permit monolingual and cross-linguistic investigations. Furthermore, corpus work allows the researcher to uncover on the one hand, what is probable and typical and, on the other hand, what is unusual about the phenomenon considered.

Corpus work has also some difficulties, such as the insufficiency of multilingual corpora for less widespread languages or the predilection for 'form-based research' where there is an interest in a specific grammatical form (Granger 2003). These difficulties constrain researchers to carry out their research manually, including building their corpus themselves and annotating it if they are interested in other phenomena than a specific grammatical form, such as semantic or syntactic categories. Another difficulty about corpus work is when the researcher is interested in infrequent phenomena[5] that will have insufficient occurrences in the corpus. Difficulties are also encountered when phenomena that are not lexically expressed such as world knowledge used in inferences as well as the cognitive basis of language are investigated.

This is one reason why corpus data are more and more combined with other types of evidence, such as experimentation. In what follows, we will briefly describe the use of experimentation in pragmatics and put forward the complementarity between corpus work and experimentation.

2.2 *Experimentation*

In pragmatics, experimentation is extremely useful for studying issues from the semantics/pragmatics interface and testing theories concerning the psychological

[5] For example, Grivaz (2012) who studied causality in certain pairs of verbs in a very large corpus and with human annotation experiments, found that less frequent pairs had a good causal correlation while very frequent pairs had a small causal correlation.

real competence native speakers have regarding semantics and pragmatics (Katsos and Breheny 2008).

One important distinction at the semantics/pragmatics interface was proposed by Grice (1975/1989) between what is 'said' vs. what is 'implicated' within the entire meaning of an utterance. The first experimental study of the identification and labelling by ordinary speakers of what is 'said' vs. what is 'implicated' was Gibbs and Moise (1997). In their chapter, Gibbs and Moise designed their experiments to determine whether people distinguished what speakers say from what they implicate and if they viewed what is 'said' as being enriched pragmatically. They used five categories of sentences[6] and participants had to choose between a minimal vs. enriched interpretation. Example (1) illustrates the *temporal relation* type of sentence as well as the two possible interpretations (minimal or literal meaning and the pragmatically enriched meaning):

(1) 'The old king died of heart attack and a republic was declared'.
(2) Minimal: order of events unspecified
(3) Enriched: the old kind died and then a republic was declared

The experiments were designed in order to manipulate the type of sentence, the instructions and the context of the targeted sentence. In the first experiment, the instructions consisted in explaining the two categories of interpretation of the sentence and no context was given. In the second experiment, the instructions were more detailed, including information about linguistic theories addressing the distinction between what is 'said' and what is 'implicated'. In the last two experiments, linguistic contexts were provided (a short story) in order to favour enriched interpretation (in the third experiment) as in example (4) and the minimal interpretation (in the fourth experiment) as in example (5), regarding *temporal relation* sentences.

(4) The professor was lecturing on the life of Jose Sebastian. He was a famous rebel in Spain who fought to overthrow the King. Many citizens wanted Sebastian to serve as their President. "Did Jose Sebastian ever became President?" one student asked. The professor replied, *The old king died of a heart attack before and a republic was declared.*
(5) Mike liked to take long bike rides each day. He also liked to sing as he rode because he has a terrific voice. Mike's roommate thought this was funny. He said to someone that *Mike likes to ride his bike and sing at the top of his lungs.*

Gibbs and Moise's four experiments showed that speakers assume that enriched pragmatics plays a significant role in what is said: the enriched interpretation was preferred in the first three experiments but not in the last one where the context biased strongly for the minimal interpretation. Manipulation of instructions and training did not have any effect on the participants' judgements.

[6] Cardinal (*Jane has three children)*, possession (*Robert broke a finger last night*), scalar (*Everyone went to Paris*), time-distance (*It will take us some time to get there*) and temporal relations.

We can make three observations concerning the temporal relation sentences: (a) temporal sequencing is an inference drawn contextually,[7] (b) it is independent of the specific instructions that speakers received and (c) it can be blocked in a context biasing for the minimal interpretation, that is the unspecified order. On the basis of their results, Gibbs and Moise argue that there might be two types of pragmatic processes, one that provides an interpretation for what speakers say and another one that provides an interpretation for what speakers implicate. They argue that this position can be explained by the principle of optimal relevance (Sperber and Wilson 1986/1995) and they acknowledge the difficulty of testing it experimentally. In our case study, we will consider temporal sequencing under the label [± narrativity] as being an inferential type of information that can function as a disambiguation criterion for usages of the English Simple Past (SP).

We now turn to experimentation as a type of methodology used in empirical and experimental pragmatics and we point out two advantages of adopting it: (a) it makes possible systematic control of confounding variables, and (b) depending on the nature of the experiment, it permits the study of online processes (Gilquin and Gries 2009: 9). One difficulty with experimentation is the artificial setting experiments require that can influence the behaviour of the participants in this unnatural setting. If experimental pragmatics completely adopted the psycholinguistics methodology as well as the study of online processes (through EEG and eye-tracking tools), empirical pragmatics focused mainly on offline experimentation, preserving the very essence of experimental studies: systematic manipulation of independent variables in order to determine their effect on dependent variables.

Concerning the complementarity of the two empirical sources of data, Gilquin and Gries argue that a corpus has a fourfold purpose in experimentation: (a) validator: the corpus serves as a validator of the experiment, (b) validatee: the corpus is validated by the experiment, (c) equal: corpus and experimental data are used on an equal footing and (d) stimulus composition: the corpus serves as a database for the items used in experiments. They also note that corpus work deals with a larger range of phenomena that can be investigated compared to experimentation. Experiments, however, allow the study of phenomena that are infrequent in corpora. Corpora and experiments have thus advantages and disadvantages that are complementary and thus linguists nowadays tend to use both of these empirical methods.

Finally, we would add that data from experiments represent human annotated data and can be used for NLP as training for automatic classifiers, thus proving the machines with different sorts of information (linguistic, contextual and world knowledge) that humans have and use in language interpretation process.

[7] In his Model of Directional Inferences (2000, 2002), Moeschler makes the same prediction about temporal relations between eventualities. They have an inferential nature and are drawn based on contextual assumptions. They can be blocked (minimal interpretation) under certain specific linguistic and contextual conditions.

In this research we consider data from experimentation (the 9th type of data in Gilquin and Gries'classification), focusing on linguistic judgments made by participants. Linguistic judgments were used mainly for acceptability and grammaticality tasks but nowadays they concern all types of linguistic information. By presenting our case study, we aim at pointing out the complementarity of corpus work and experimentation for testing theoretic hypothesis, build description models and apply them to NLP.

In what follows, we provide a case study presenting our investigation on verb tenses and show how the methodology presented above has been used, as well as how the results of our study support our thesis about the advantages of combining corpora work and experimentation when doing empirical pragmatics research.

3 Case Study

The case study presented in this article belongs to two research projects that aim[8] at improving the results of statistical machine translation (SMT) systems by modelling intersentential relations, such as those that depend on *verb tenses* and *connectives*. We investigate the 'meaning' of verb tenses, where the meaning is seen as consisting of both *what is said* and *what is implicated*. We deal thus with the semantics and pragmatics of verb tenses. Within the frame of empirical pragmatics, we study verb tenses within RT from a contrastive perspective based on parallel corpora and offline experimentation. Moreover, data from experimentation (human annotation) was used for automatic annotation and, furthermore, for training of a statistical machine translation (SMT) system.

As Aménos-Pons (2011) correctly underlines, any approach to tenses must deal with the fact that they present a certain stability of some basic features, combined with a high adaptability at discourse level that depends on contextual information (semantic and pragmatic) and world knowledge. A great challenge for linguists was, and remains, to know which of the features of verb tenses are stable and which are not.

Probably, one of the few generally accepted ideas about the meaning of verb tenses is the linguistic underdeterminacy thesis, as developed in RT and applied specifically to verb tenses by Neil Smith (1990). According to it, verb tenses are defined as a referential category: they can be characterized as locating temporal reference for eventualities with respect to three coordinates: speech moment S, event moment E and reference point R (Reichenbach 1947) through contextual enrichment following the expectation of optimal relevance (Wilson and Sperber 1998).

[8] The COMTIS Project (Improving the Coherence of Machine Translation Output by Modeling Intersentential Relations; project no. CRSI22_127510, March 2010-July 2013) and the MODERN Project (Modeling discourse entities and relations for coherent machine translation; project no. CRSII2_147653, August 2013–August 2016) belong to the Sinergia interdisciplinary program funded by the Swiss National Science Foundation.

The consequence of this theory is that verb tenses do not have several meanings but several usages corresponding to different contextual interpretations.

In the literature, two main trends are opposed regarding the nature of the encoded content verb tenses: on the one hand, verb tenses have only rigid procedural meanings that help the hearer reconstruct the intended representation of eventualities (Nicolle 1998; Aménos-Pons 2011; de Saussure 2003, 2011). de Saussure (2003) proposes algorithms to follow, consisting of the instructions encoded by verb tenses, in order to grasp the intended meaning of a verb tense at the discourse level.

On the other hand, verb tenses are seen as having both procedural and conceptual contents, as argued in Moeschler (2002) and Grisot et al. (2012). In Grisot et al. (2012) we argue that the conceptual content is given by a specific configuration of Reichenbachian coordinates event moment E, reference point R and speech moment S. The procedural content consists of instructions and constraints for contextual usages, namely [± narrative] and [± subjective]. Conceptual and procedural information represent bare-bone semantics that are contextually worked out through inferences (explicatures consisting of pragmatically determined aspects of what is said). The hearer has to ascertain the contextual value for both types of encoded information in order to access the right contextual hypotheses to get the intended cognitive effects.

Regards conceptual information, the assumption is that the specific configuration of the temporal coordinates S, R and E behaves like *pro-concepts* (Wilson 2011; Sperber and Wilson 1998: 15). *Pro-concepts* are semantically incomplete, they are conveyed in a given utterance and have to be contextually worked out. Once the enrichment process is completed the propositional form of the utterance is also available. This temporal information is not defeasible, i.e. it cannot be cancelled. The temporal coordinates S, R and E combine with the predicate's lexical aspect, in order to allow the calculation of the aspectual class (state, process, event). This conceptual information is the skeleton of the usage for each verb tense, which is enriched with contextual information and world knowledge in the inferential interpretation process.

Concerning the status of the temporal coordinates, de Saussure and Morency (2012) argue that tenses encode instructions on how the eventuality is to be represented by the hearer through the positions of temporal coordinates. They consider thus that temporal location with the help of S, R and E is of a procedural nature. We will show later on in this chapter that experimental studies revealed the contrary: the configuration of temporal coordinates is of a conceptual nature, specifically, they are variables that are saturated contextually.

The procedural content of verb tenses, on the other hand, consists of two types of instructions: (a) the [± narrative] instruction: to verify whether R is part of a series of points of reference available in the context and thus, eventualities are temporally sequenced, and (b) the [± subjective] instruction: to verify whether there is a perspective or a point of view on the eventuality presented. The experimental work that we conducted (see Sect. 3.3.3) showed that the [± narrative] feature includes temporal sequencing (inferential temporal relation as in Gibbs and

Moise's experiments described in Sect. 2.2) and causal relations holding between eventualities (cf. Moeschler 2003, 2011 for the relation between causality and temporal sequencing).

Another important point in the model described in Grisot et al. (2012) is that the specific combination of conceptual content and procedural content characterises contextual usages of verb tenses and not the meaning of a verb tense. For this point Grisot et al.'s analysis joins Aménos-Pons (2011) who assumes that tenses do not encode temporal relations. They are only the result of the tense meaning in specific environments.

In this chapter we adopt the view proposed by Grisot et al. (2012) and we bring new arguments, as well as evidence from experimental work, that support the procedural and conceptual nature of the information encoded by verb tenses expressing past time in French (FR) and English (EN).

3.1 Our Hypotheses

An investigation of parallel corpora consisting of several stylistic genres revealed the five most frequent translation divergences: (a) EN into French FR: the SP, the Simple Present and the Present Perfect (PresPerf), and (b) from FR into EN – the Passé Composé (PC) and Présent. In a first research phase, we chose to investigate the translation of the EN SP into FR, where its semantic and pragmatic domain is rendered through the Passé Simple (PS), the PC and the Imparfait (IMP). In order to grasp the meaning of the EN SP and its usages, we assume that the distinction between *conceptual* and *procedural* types of information is very important.

Our assumptions are: (1) a verb tense encodes conceptual and procedural information and (2) conceptual and procedural contents explain cross-linguistic variation. In what concerns the first hypothesis, we argue and bring evidence from offline experiments that procedural information encoded by the English SP is inaccessible to consciousness and hard to describe in conceptual terms, while conceptual information is accessible to conscious thinking and can be conceptualized. We also argue that the conceptual content of verb tenses (specifically, a specific configuration of temporal coordinates S, E and R) behaves like pro-concepts in that they are conveyed in a given utterance and have to be contextually worked out (explicature).

Concerning our second hypothesis, we assume that conceptual and procedural contents of verb tenses explain their cross-linguistic variation revealed by an investigation of our parallel corpora. A verb tense can have several usages, where each usage is triggered by a language-specific combination of conceptual and procedural contents. Parallel corpus analysis reveals that each usage of a verb tense in a SL is rendered by a different verb tense in a TL. Specifically, the translation divergence of the English SP into FR can be resolved if contextual usages of the SP are considered.

In the following sections, we bring evidence for our model for the semantics and pragmatics of the English SP from parallel corpus (Sect. 3.2) and offline experiments (Sect. 3.3). Section 3.4 is dedicated to the NLP application of the model defended in this case study.

3.2 Data from Parallel Corpora with a Contrastive Perspective

In Grisot and Cartoni (2012) we studied the discrepancies between theoretical descriptions of verb tenses and their use in parallel corpora. We investigated corpora consisting of texts in EN and their translations into FR that belong to four different genres (literature 18 %, journalistic 18 %, legislation 33 % and EuroParl 31 %). A total of 1275 predicative verb tenses have been considered, which represents 77 % of the verb tenses occurring in the corpus. The qualitative and quantitative analysis of the corpus was done in two steps. In the first monolingual step, we identified tenses that occur in the corpus and calculated their frequency in the SL. In the second bilingual step, we identified the tenses used as translation possibilities in the TL of a certain tense from SL and calculated their frequency. Analysis of frequency of tenses in SL provided information about tenses that are possible candidates for being problematic for machine translation systems. The asumption is that frequent tenses, if wrongly translated, decrease the quality of the translated text. Bilingual analysis with focus on identifying verb tenses used as translation possibilities in TL for ambiguous tenses in SL revealed that the SP is translated into FR using mainly three tenses (PS, PC and IMP representing 80 % of translation possibilities) as in examples (6), (7) and (8) and that the PresPerf is translated using two tenses (PC and Présent, 100 % of translation possibilities) as in examples (9) and (10). These are two of the translation divergences shown by analysis of parallel corpora.

(6) EN/SP: General Musharraf **appeared** on the national scene on October 12, 1999, when he ousted an elected government and announced an ambitious "nation-building" project. (Journalistic Corpus: "News Commentaries")

FR/PC: Le Général Moucharraf **est apparu** sur la scène nationale le 12 octobre 1999, lorsqu'il a forcé le gouvernement élu à démissionner et annoncé son projet ambitieux de "construction d'une nation".

(7) EN/SP: With significant assistance from the United States—warmly accepted by both countries—disarmament was orderly, open and fast. Nuclear warheads **were returned** to Russia. (Journalistic Corpus: "The New York Times")

FR/PS: Avec l'assistance non négligeable des Etats-Unis – chaleureusement acceptée par les deux pays: le désarmement a été méthodique, ouvert et rapide. Les ogives **nucléaires furent renvoyées** en Russie.

(8) EN/SP: He **seemed** about seventeen years of age, and was of quite extraordinary personal beauty, though somewhat effeminate. (Literature Corpus: O. Wilde, "The picture of Mr. W.H")

(continued)

FR/IMP: Il **paraissait** avoir seize ans, et il était d'une beauté absolument extraordinaire, quoique manifestement un peu efféminée.

(9) EN/PresPerf: I would like to fully support Mrs Roth-Behrendt's proposals, but we have spent over 20 years talking about people's willingness to spend more money on food; it is just that the distribution process **has** totally **changed**. ("EuroParl" Corpus)

FR/Présent: Je soutiendrais vraiment de tout coeur les propositions de Mme Roth-Behrendt; cela fait vingt ans que nous parlons de la possibilité de consacrer plus d' argent à l' alimentation mais, quand il s' agit du processus de distribution, c'**est** tout autre chose.

(10) EN/PresPerf: Whether or not the government was involved, the fact remains that Pakistan **has lost** a desperately needed leader. (Journalistic Corpus: "News Commentaries")

FR/PC: Que le gouvernement soit ou non impliqué, le fait est que le Pakistan **a perdu** un leader dont il a cruellement besoin.

The ambiguity of the EN SP, as well as the PresPerf, is illustrated by their translation into FR. In order to improve their translation by SMT systems, these tenses must be disambiguated. Following the CA's methodology, the SP and the PresPerf, as well as the FR tenses used for their translation, must be compared in three steps. The first step consists of the monolingual description, followed by bilingual juxtaposition of the two monolingual descriptions and finally, their analysis according to the *tertium comparationis* defined in terms of conceptual and procedural contents.

Now in what concerns the SP, known as *preterit*, it describes an action or state as having occurred or having existed at a past moment or during a past period of time that is definitely separated from the actual present moment of speaking or writing. Comrie (1985: 41) emphasized that the SP "only locates the event in the past, without saying anything about whether the situation continues up to the present or into the future". Radden and Dirven (2007: 219) argue that the use of the SP to express bounded past situations, presented as a series of events, typically in narratives, as in (11). The individual events from example (11) are temporally ordered (signalled by the coordination and the conjunction *and*) and are thus interpreted as being successive.

(11) I *grabbed* his arm and I *twisted* it up behind his back and when I *let* go his arm there *was* a knife on the table and he just *picked* it up and *let* me have it and I *started* bleeding like a pig. (Labov and Waletzky 1967, quoted by Radden and Dirven 2007: 219)

The most frequent verb tenses used in FR for translating the SP are, as we have already noted, the PC, PS and IMP. The PC is classically described from a monolingual point of view as a "tense with two faces" (Martin 1971) because it can express both past and present time. The PS is described as a tense that expresses a past event completely accomplished in the past with no connection to present time (Grevisse 1980, Wagner and Pinchon 1962) and used in contexts where events are temporally ordered (Kamp and Rohrer 1983). Finally, the IMP is a tense that expresses background information (Weinrich 1973). The focus on the accomplishment of the event in the past is the feature that distinguishes the PS from the PC, the second one expressing a link to present time, while perfectivity is a feature that distinguishes the PS from the IMP, the former being perfective and the latter imperfective.

Given these monolingual descriptions, when juxtaposed, we can observe the multitude of facets for describing these four tenses: in terms of temporal location (time preceding, simultaneous or even following speech moment), grammatical aspect (perfective or imperfective), discursive grounding (foreground or background information) and relation to other eventualities (temporally ordered or not). Another point that can be observed is the lack of a one-to-one correspondence between the several meanings of the SP and the three FR tenses used for its translation. In Grisot et al. (2012), we argue that the meaning of these verb tenses should be investigated cross-linguistically in terms of their conceptual and procedural information, and more specifically that the procedural information [± narrativity] is a disambiguation criterion for the usages of the SP. In this study we bring evidence for our claim that the [± narrativity] feature is procedural (through experimental work presented in Sect. 3.3.3). We show that occurrences of SP annotated by two human annotators as having a narrative usage correspond in the parallel corpora investigated to translation through either PS or PC and occurrences annotated as having a non-narrative usage correspond to translation through an IMP (detailed results provided in Sect. 3.3.3).

The EN PresPerf is characterized by a grammatical combination of present tense and perfect aspect and it is used to express a past eventuality that has present relevance. The same grammatical combination exists in other languages such as the FR PC, with the specificity that the PC can also express eventualities accomplished in the past. In EN, there is a competition between the SP and the PresPerf for referring to past time eventualities, with the particularity that PresPerf is incompatible with adverbials expressing define past time. The first annotation experiment considered the competition between SP and PresPerf forms for expressing past time eventualities, showing that each verb tense encodes conceptual information and it can easily be dealt with by human annotators (Sect. 3.3.2).

A benefit of parallel corpora is the availability of context and cotext, information that facilitates establishing semantic and pragmatic equivalence for each verb tense. This information is crucial as regards usages of verb tenses.

From the corpus described above, we used a subset of 30 excerpts randomly selected (that we call *items* and all contain occurrences of the SP or PresPerf) for the first experiment and 458 items (containing occurrences of the SP) for the second experiment. In what follows, we describe and provide the results of annotation experiments.

3.3 Data from Offline Experiments

Experimental work we have conducted brought evidence for the hypothesis that verb tenses encode both conceptual and procedural information. Conceptual information concerns different combinations of Reichenbachian temporal coordinates, which are contextually saturated variables. Procedural information concerns instructions relating temporal and causal relations holding between the eventualities expressed

in the sentence. In this section, we will provide the general design of our experiments (participants, procedure and evaluation), followed by the presentation of the two experiments and their results.

3.3.1 Design of Experiments and Participants

The two annotators were native speakers of EN with basic knowledge of FR. They were asked to follow the instructions (given below for each type of information annotated) and went through a training phase in order to check whether the instructions given were clear and correctly understood. For the effective annotation task, annotators received a file with the total number of excerpts that were taken from the EN part of the parallel corpora. For each item, sentences including the verb tense considered, as well as one sentence before or after, were provided in order to have sufficient context for pragmatic judgement.

One way of evaluating human annotation is to calculate the inter-annotator agreement with the help of the *kappa* coefficient (Carletta 1996). One issue that influences corpus annotation by raters is the subjectivity of the judgements, which can be quite substantial for semantic and pragmatic annotations (Artstein and Poesio 2008). It can be tested whether different raters produced consistently similar results, so that one can infer that the annotators have understood the guidelines and that there was no agreement just by chance. The kappa statistic factors out agreement by chance and measures the effective agreement by two or more raters. The kappa coefficient has values between 0 to 1, going from no agreement other than that expected to occur by chance to total agreement among raters. We used this measure for quantifying the inter-annotator agreement in our experiments.

3.3.2 Annotation of Conceptual Information

Through this annotation experiment, we wanted to determine the conceptual meaning of two verb tenses in EN, SP and PresPerf. Our expectation was that human annotators should be able to think of the meaning of SP and PresPerf consciously, conceptualize it and make specific decisions in each context with easiness. Annotators received annotation guidelines (presented below) and went through a training phase before the actual annotation phase.

As there are no quantitative measures[9] proposed in the literature to evaluate the conceptual and procedural type of information encoded by linguistic expressions, at least none that we are aware of, we propose to use the kappa coefficient to quantify

[9] de Saussure (2011) proposes a qualitative criterion to evaluate procedural expressions: an expression is procedural if it triggers inferences that cannot be predicted on the basis of an identifiable conceptual core to which general pragmatic inferential principles are identified.

conceptual and procedural information. Wilson and Sperber (1993) and Wilson (2011: 11) descibe conceptual information as accessible to consciousness, capable of being reflected on, evaluated and used in general inference, and procedures as "relatively inaccessible to consciousness, resistant to conceptualisation, thus we can not discover through introspection the rules of our language, the principles governing inferential comprehension, or the processes involved in mental-state attribution". We assumed thus that manipulating conceptual information described as easily graspable concepts is related to the notions of sensitivity and accessibility to consciousness, specifically native speakers' sensitivity is a cue to direct access to the encoded conceptual content. We expected thus high values of the inter-annotator agreement coefficient based on the relative facilty of the task, namely to identify striking information.

As far as procedural information is concerned, we expected low agreement, related to a more difficult task: procedural information is notoriously hard to pin down in conceptual terms (Wilson and Sperber 1993:16) and not accessible to consciousness. The processing of the narrative feature is predicted to be less accessible because it is the result of a non-guaranteed pragmatic inference (*non-demonstrative inference*[10] for Sperber and Wilson 1986/1995: 65) based on conceptual information, cotextual information and contextual hypotheses. As inferential processes are costly and depend on several factors, they are predicted to produce lower values of the inter-annotators agreement coefficient.

Based on our claim (Grisot et al. 2012) that the configuration of Reichenbachian coordinates should be split into three pairs of two coordinates (E/R, R/S and the inferred E/S) instead of the classical view of three coordinates as Reichenbach proposed. We defined the conceptual content of the Simple Past, as in example (12) to be the pair E < S which bears the focus (from the line E = R, R < S and E < S), in other words '*situation that happened in the past*' and the conceptual meaning of Present Perfect, as en example (13) to be the pair R = S (from the line E < R, R = S, E < S),[11] in other words the "*current resulting state of a past situation*".

(12) EN/SP: After almost a decade in self-imposed exile, Bhuto's return to Pakistan in October **gave** her a fresh political start. Pakistan had changed, as military dictatorship and religious extremism in the north played havoc with the fabric of society. (Journalistic Corpus: "NewsCommentaries")

(13) EN/PresPerf: Some of the proposals concerning greater focus on equality **have** also **been accepted**, but the Council did not want to accept some very central proposals from Parliament. ("EuroParl" Corpus)

[10] Sperber and Wilson (1986/1995: 65) argue that the process of inferential communication is non-demonstrative: even under the best circumstances, it might fail (the addressee can not deduce the communicator's communicative intention).

[11] In the parallel corpus both the SP and the PresPerf from these two examples are translated by a PC in French, highlighting thus another translation divergence: the French PC into EN. A hint of the disambiguation criterion is a focus either in the E < S relation for the SP or on the R = S relation for the PresPerf (as we argued in Grisot et al. 2012).

The annotation guidelines included: (a) a description of the two types of meaning (b) one example for each usage, as given in the examples below and (c) the instruction to read each excerpt, identify the meaning of the verb highlighted and decide on the type of usage. In the first example, the most salient information is the result state in the present: the fact that the false declaration is now filled. In the second example, the most salient information is the situation that happened in the past: the lack of choice of Musharraf.

(14) And instead of full cooperation and transparency, Iraq **has filed** a false declaration to the United Nations that amounts to a 12,200-page lie. (Journalistic Corpus: "NewsCommentaries")

(15) In a historic ruling that Musharraf **had** little choice but to accept, the Supreme Court itself reinstated the Chief Justice in July. Subsequently, the energized judiciary continued ruling against government decisions, embarrassing the government – especially its intelligence agencies. (Journalistic Corpus: "NewsCommentaries")

In what concerns the annotation guidelines, three aspects should be mentioned: (a) the 'meaning' of the SP and PresPerf, respectively, was easily identified and conceptualized in order to explain the task to annotators, (b) they were asked to identify 'the most salient information' in order to identify the focus and (c) annotators understood the annotation task easily, as well as the examples used for training.

In this experiment, annotators made decisions on 30 excerpts from the corpus following the annotation instructions. They agreed on all the items annotated (kappa = 1) and pointed out the easiness of the task. This result can be interpreted as evidence for the conceptual nature of the information considered in this experiment. We assume that the total agreement is due to the highly accessible conceptual information, that is, the ability for the raters to consciously represent the temporal coordinates as part of the conceptual meaning of tenses.

3.3.3 Annotation of Procedural Information

One of the features tested with the help of the annotation experiment is [± narrativity]. As mentioned, this feature is a procedural information encoded by tenses that instructs the hearer/reader to verify whether the reference point is part of a series of R that increases incrementally, in other words if the eventualities presented are temporally ordered. Wilson (2011) emphasized that procedures are not part of the meaning of a linguistic expression but are merely activated or triggered by the occurrence of that expression in an utterance. If the feature is activated ([+ narrative]), then we can talk about a *narrative* usage of the verb tense considered. And respectively, if the feature is not activated [non-narrative], then the verb tense considered has a non-narrative usage.

Numerous studies have already addressed narrativity either in the traditional rhetoric (since the nineteenth century, such as Alexander Bain 1866 and John Genung 1900), in DRT (Kamp and Reyle 1993) and SDRT (Lascarides and Asher 1993) or within a semantics and pragmatics perspective (Hinrichs 1986; Partee 1984; Reboul and Moeschler 1998; Smith 2001, 2003, 2010). Mainly, in these studies, narrativity is a discourse relation or a discourse mode associated with temporal sequencing of eventualities. In this chapter, we adopt this view of narrativity and postulate that it is a binary variable ([± narrativity]) that represents procedural information conveyed by verb tenses and which can be used as a disambiguation criterion for various usages of tenses expressing past time in EN and FR.

The verb tense considered in this annotation experiment is the EN SP. As in the first experiment, annotators received annotation guidelines (presented below) and went through a training phase. Narrativity was defined and explained to annotators as it follows:

(16) In *narrative* contexts a story that is being told (you might not have the whole story available in the sentence) and eventualities are temporally ordered, while *non-narrative* contexts are associated with descriptive passages, where no story is being told.

Annotation guidelines included: (a) a definition of narrativity (b) the explanation of each usage (narrative and non-narrative) with two examples for each usage, as given in the examples below, (c) the instruction to read each excerpt, identify the verb highlighted and decide if in context, the highlighted verb is part of the underlying theme (the verb tense would have a narrative usage) or not (the verb tense would have a non-narrative usage).

In the first example below, there are two events, i.e. 'the marriage that happened' and 'the wealth which was added'. The second event is presented in relation to the first (first he got married and then he added to his wealth), which is why the SP verbs happened and added are in narrative usage. In the second example, there are three states (was a single man, lived and had a companion) that describe the owner of the estate. States are not temporally ordered, which is why this example illustrates the non-narrative usage of the SP.

(17) By his own marriage, likewise, which happened soon afterwards, he **added** to his wealth. (Literature Corpus: J. Austen, "Sense and Sensibility")

(18) The late owner of this estate was a single man, who **lived** to a very advanced age, and who for many years of his life, had a constant companion and housekeeper in his sister. (Literature Corpus: J. Austen, "Sense and Sensibility")

The value of kappa coefficient for this annotation experiment was 0.42. This value is above chance, but not high enough to point to entirely reliable linguistic decisions (values generally accepted around 0.6–0.7). What this first result shows about the procedural feature [± narrativity] encoded by the EN SP is the difficulty hearers/readers have in the interpretation process to conceptualize the language rules they have and make decisions about their functioning.

The two annotators agreed on 325 items (71 %) and disagreed on 133 items (29 %). Error analysis showed that the main source of errors was the length of the temporal interval between two eventualities, which was perceived differently by the two annotators. This lead to ambiguity between temporal sequence or simultaneity, each of them corresponding to narrative, respectively, non-narrative usage, as in example (19) where the eventualities "qualify" and "enable" were perceived as being simultaneous by one annotator and successive by the other.

(19) Elinor, this eldest daughter, whose advice was so effectual, possessed a strength of understanding, and coolness of judgment, which qualified her, though only nineteen, to be the counsellor of her mother, and **enabled** her frequently to counteract, to the advantage of them all, that eagerness of mind in Mrs. Dashwood which must generally have led to imprudence. (Literature Corpus: J. Austen, "Sense and Sensibility")

A possible explanation is the fact that personal world knowledge is used to infer temporal information, such as the length of the temporal interval between two eventualities, i.e. information that allows the annotator to decide whether the eventualities are temporally ordered or not. Cases where the length of the temporal interval between two eventualities was very reduced were ambiguous for the annotators, so each of them decided differently whether it was long enough for temporal sequencing or too short, so that the simultaneity meaning was preferred.

Disagreements were resolved in a second round of the annotation experiment, where the narrativity feature was identified with a new linguistic test that was explained to two new annotators.[12] Annotators were asked to insert a connective such as *and* and *and then* when possible, in order to make explicit the 'meaning' of the excerpt, namely the temporal relation existent between the two eventualities considered. The connective *because* (for a causal relation) has also been proposed by annotators under the [+ narrative] label showing that causal relations should also be considered. We thus considered causal relations under the [+ narrative] tag but we will not look more into causality in this chapter. The inter-annotator agreement in this second experiment was $kappa = 0.91$, signalling very strong and reliable agreement. This result emphasizes the procedural nature of the feature taking into account that one of the characteristics is the possibility to render explicit the instructions encoded with the help of discourse markers.

The cross-linguistic application of these findings consists of the observation of a pattern in the parallel corpus. We investigated the data containing agreements from both annotation rounds (435 items) and analyzed them in the parallel corpus. We observed that the narrative usages of the SP identified by annotators correspond to narrative usages[13] in the FR part of the corpus (translation by a PC or PS) and the

[12] The new annotators were one of the authors and a research peer, who was not aware of the purpose of the research.

[13] In Grisot et al. (2012), we describe a similar annotation experiment made on the French tenses used for translating the EN SP, namely PC, PS and IMP. In this experiment, the PC and PS have been identified as being narrative and the IMP as being non-narrative with a kappa value of 0.63 (reliable agreement).

non-narrative usages of the SP correspond to the non-narrative usages in the FR text (translation with an IMP) in 338 items (78 %). This leaves 22 % where annotators agreed on the narrativity label but where it is not consistent with the tense used in FR. Future work will focus on investigating the other factors that explain the 22 % of the variation in the translation of the SP in French.

3.4 Natural Language Processing Application

Nowadays, linguistic research tends more and more to integrate language automatic processing techniques. Human annotation and classification of texts is often used in NLP and Machine Translation (MT). Most of the current MT systems incorporate a language model that analyses texts at the sentence level. But there are linguistic phenomena whose interpretation is done using information that goes beyond sentence boundaries, such as verb tenses. The theoretical model of the pragmatics and semantics of the EN SP described in this chapter has been validated empirically also through an NLP technique called *automatic annotation* or *classification*. Human-annotated data provides to the machine translation system pragmatic information that humans make use of in the interpretation process, such as the reference point R, the relative sequence of eventualities, the length of the interval and any causal relation existent between eventualities.

Human-annotated texts described in this chapter served as training data for machine-learning tools,[14] specifically a maximum entropy classifier (Manning and Klein 2003). A classifier is a machine-learning tool that will take data items and place them into one of the available classes (in the present case, narrative and non-narrative) according to a statistical algorithm. The underlying principle of maximum entropy is that, when assigning a class, it should be done uniformly (uniform distributions) unless there is some external knowledge that would instruct the system to do it differently. Annotated data used for training these classifiers provide external knowledge and thus inform the automatic labelling technique where to be minimally non-uniform. Iterative runs of the classifier results in automatically labelled or annotated texts with the considered features.

The feature tested in our case study was [± narrativity] and the human-annotated data was used for training the classifier (see Grisot and Meyer 2014). The results of automatic annotation are similar to human annotation; the classifier correctly annotated 76 % of the items. The purpose of using automatic annotation is the possibility to do it on large amounts of data. Human annotation has the disadvantages of being tedious and costly, and it is often done on a reduced amount of data.

The final purpose was to improve the results in what concerns verb tenses of a statistical machine translation system. Current machine translation systems have

[14] The NLP work was done by our colleagues Thomas Meyer and Andrei-Popescu Belis from the Idiap Research Institute (Martigny, Switzerland) to whom we address our gratitude.

difficulties in choosing the correct verb tense translations, in some language pairs, because these depend on a larger context than systems consider. A machine translation system generally misses information from previously translated sentences, which is detrimental to lexical cohesion and coherence of the translated text.

A first run of an SMT system, which uses the classifier trained on the annotated data with the [± narrativity] feature, had slightly better results than without this pragmatic feature. When trained and tested on automatically annotated data, the [± narrativity] feature improves translation by about 0.2 BLEU points.[15] More importantly, manual evaluation shows that verb tense translation and verb choice are improved by respectively 9.7 % and 3.4 % (absolute), leading to an overall improvement of verb translation of 17 % (relative) (for more detailed results see Meyer et al. 2013).

4 Conclusion

This chapter has given an account of the place of empirical pragmatics among theoretical pragmatics and experimental pragmatics, for the study of language in use. We have argued for the need to have robust data for pragmatic research, data provided by both corpus work and experimentation.

We have shown that corpus work can be fruitfully done with a contrastive perspective, following the specific three-steps methodology of CA. As far as experimentation is concerned, we have looked into offline experiments consisting of linguistic judgement task that resulted in human annotated data. We have discussed the example of the first experiment for the pragmatic distinction between what is 'said' and what is 'implicated' designed by Gibbs and Moise (1997). Another important topic of this chapter was the discussion about the advantages and difficulties of each of the two methods considered (corpus work and experimentation), as well as their complementarity.

In our case study, we investigated the nature of the information encoded by verb tenses. We assumed and validated empirically through annotation experiments that verb tenses encode both procedural and conceptual information. We defined conceptual information as being involved in the language of thought in a Fodorian framework (Fodor 1975, 1998) having the characteristic of being accessible to consciousness and capable of being reflected on, evaluated and used in general inference. We proposed thus, based on these two features, that verb tenses encode conceptual information consisting of a certain configuration of temporal coordinates. The basic meaning of a tense is to locate an eventuality related to the speech moment, passing through a reference point. A verb tense encodes instructions to verify the

[15] BLEU (Bilingual Evaluation Understudy) is an evaluation measure for machine-translated texts. It calculates the degree of resemblance to a human-translated text and it is a number between 0 and 1, where values closer to 1 represent more similar texts.

contextual value of several features that are important and relevant for utterance comprehension. In this chapter, we investigate one feature: [± narrativity].

As far as procedural information is concerned, we followed Wilson and Sperber's idea (1993) that procedures are not part of language of thought and thus are not accessible to consciousness and easily conceptualized, as representations are. The results of the annotation experiment showed that verb tenses encode procedural information that instruct the reader/hearer to look for other eventualities that are related to the eventuality considered, namely the [± narrativity] procedural feature.

Taken together, the empirical findings of this research provide an example of the relation between theoretical framework(s) and empirical methodologies. Theoretical hypotheses have an impact on the choice of empirical methodologies. For example, a cross-linguistic perspective requires work on parallel corpora in order to have access to both source and target texts. The disambiguation of the usages of the targeted verb tense requires the formulation of possible disambiguation criteria that need to be validated through experimentation involving linguistic judgement tasks. Genuine data dealt with empirical methods can challenge theoretical positions. For verb tenses, for example, the results of our experiments challenged the theoretical assumption that verb tenses do not encode conceptual information, but only procedural information. Next to existent qualitative measures for conceptual and procedural information, we proposed a quantitative measure: the kappa coefficient for inter-annotator agreement. This measure makes use of the knowledge that native speakers have about their language.

Finally, our work has illustrated how empirical pragmatics can work together with the NLP domain. The pragmatic feature identified as procedural information and validated through human annotation experiments has been used as a label for discourse tagging with an automatic classifier. Moreover, a SMT system trained on the annotated corpus had better results for translating verb tenses than if it hadn't made use of the [± narrativity] pragmatic feature.

An issue that was not addressed in this study was the cross-linguistic application of the model to more than one pair of languages. This issue will be addressed in further studies and it targets the translation of the English SP into Italian and Romanian. The application of the conceptual/procedural distinction for verb tenses could also be done using online experimental methodology. This would probably reduce any remaining doubts about the existence of a conceptual content of verb tenses.

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