NLP for writing: What has changed?

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It might appear that few advances have been made in proofreading technology since the 1980s\textsuperscript{1}. On the one hand, spelling and grammar checking have become standard features in many kinds of applications that involve writing. On the other hand, a number of advanced research ideas and results from the 1980s do not seem to have been applied or further pursued in newer research. While there is continued research activity in the area of NLP for writing, the scale of projects in this area is not what it used to be. The present moment is therefore an opportunity to look back and reflect on what has been done so far and what has changed\textsuperscript{2}.

In the 1980s, several academic and commercial research groups in NLP started to turn their attention to automatic proofreading or text critiquing. One of the earliest large scale projects was the Writer’s Workbench (Macdonald et al., 1982), followed by IBM’s EPISLTE project (Heidorn et al., 1982), continued as CRITIQUE (Richardson and Braden-Harder, 1988), which was intended to check and correct the spelling, grammar and style of business letters in English. CRITIQUE uses a parser and grammar of English with relaxation and backoff, and applied lexical substitution to easily confused words. Figures 1 and 2 present screenshots from IBM terminals showing CRITIQUE feedback on mistakes in a business letter.

ESPRIT project OS-82 ‘Intelligent Workstation’ was one of the earliest European applied IT projects that included the development of a proofreading tool. Under the name Author Environment, the tool was targeted at business letters in Dutch and English. Like CRITIQUE, Intelligent Workstation used a grammar and a parser with relaxation to correct grammatical

\textsuperscript{1}In his summary submitted to the present workshop, Sjur Nørstebo Moshagen writes “Utviklinga av grunnleggjande språkteknologiske verkty for vanlege brukarar, slik som gode stavekontrollar og presis orddeling, har i praksis ikkje gått framover sidan 1980-talet.”

\textsuperscript{2}The present contribution has a limited scope and does not intend to present an encompassing overview of past work.
errors. It combined grapheme-to-phoneme conversion with trigrams so as to find similar-sounding spellings (van Berkel and De Smedt, 1988) and it provided single-click consultation of a dictionary and encyclopedia. The most advanced functionality consisted of the production of textual variants, not only by finding synonyms and related words, but also by changing from singular to plural and from active to passive and vice versa. The necessary changes were propagated throughout the document by means of a grammar spreadsheet. Figures 3 to 6 show examples of interaction with the Author Environment.

In the 1990s, some new techniques were explored and new insights were gained. Vosse (1994) built further on some techniques from OS-82, resulting in the comprehensive CORRIE system for Dutch spelling and grammar checking, which was also used as the basis for the SCARRIE project, supported by the European Commission and aimed at Danish, Norwegian and Swedish. Both CORRIE and SCARRIE offer advanced compound analysis, which is very important for the targeted languages. Parsing at sentence level was also included and functional, but the parser was not disambiguating, so that the number of ambiguities in authentic text remain a problem. GRANSKA (Domeij et al., 2000) for Swedish concentrated on grammar checking, using an HMM disambiguating tagger, tokenizer and rules, and generated a lot of exciting research, not only on techniques but also on user acceptance.

In the 1990s, commercialization by Microsoft, Lingsoft and other companies began to take a hold. Microsoft developed a grammar API and started to provide comments through red squiggles, dialogue boxes and the now discontinued paperclip ‘Clippy’ with a speech bubble. However, part of the targeted application area was moving faster than the technology. By the turn of the millennium, the typing of business letters was no longer a major office chore. Today, formal business letters have to some extent been replaced by communication through new channels such as email and web-based interaction, while also SMS must be mentioned as a new medium and voice input is starting to become a plausible option. The need for basic spelling and grammar checking remains, so that these functions have also become available in email and browser text windows, but the need for advanced functions like the grammar spreadsheet no longer seem important enough to justify their further development. Dictionaries, thesauri and encyclopedias have become available for free online, and Google can often be useful to check a word’s spelling. Translation and summarization systems are also available online.

While the original target for the early dedicated proofreading systems had disappeared, the interest in the relation between NLP and the writing process remained strong and was explored in different ways. Experience with
CRITIQUE had already revealed that different groups profit differently: non-professional writers reported that more than 80% of CRITIQUE's suggestions to them were correct or useful, against 41% of professional writers. Domeij (1998) conducted a study and found that such tools can have a positive effect, but different writers cope differently with these tools. On the one hand, studies like these emphasize the importance of a thorough evaluation of NLP tools for writing in practical use. On the other hand, the larger cognitive and societal context in which writing takes place means that we must also consider the promotion of writing ability in the context of language learning and teaching and in relation to language policy issues.

Language learning and teaching started to become a target for NLP for writing relatively early. Research in proofreading had soon emphasized the distinction between mechanical and cognitive errors. Since the latter are in an obvious relation to language ability as the result of learning, they can be the target of various learning and teaching schemes. On the one hand, second language learners with gaps in their knowledge of the language may benefit not only from corrections but also from additional explanatory material that comes with good proofreading systems. On the other hand, native language learners are sometimes insufficiently aware of homophones with different spellings in different grammatical contexts, e.g. Norwegian å vs. og or French verbal forms ending in -er, -ez, or -é.

In the early 1990s, the Dutch company Cognitech developed several systems for spelling and grammar learning. Among these, SPELRAAM focused on spelling, and especially homophones, in syntactic contexts. The system is targeted at native speakers of Dutch and uses a decision tree to make learners aware of the grammatical choices that influence a word form. Figures 7–9 are screenshots of this system.

More recently, dedicated writing tools for second language learners were developed that combine proofreading with targeted pedagogical components. The Grim system (Knutsson, 2005) is a prime example of this line of research. By targeting the system to a specific audience, it is easier to optimize its usefulness. This presupposes empirical studies of writing processes and problems. As more data is becoming available, a systematic study of spelling and grammar problems in authentic writing situations is becoming feasible. The ASK project (Tenfjord et al., 2006) has collected a large number of Norwegian essays by students of Norwegian as a second language. These have been carefully error-coded and made searchable. Figure 10 shows a selection of the corpus revealing adjective form errors, while figure 11 shows the different distribution of some error types among different learner groups.

The second link concerns language policy, especially for languages that have complicated spelling systems. Public bodies governing language policy...
tend to be very interested in promoting good spelling practice among language users. It is interesting that in the preparations for the Dutch spelling reform in the 1990s, consideration was given to NLP applications that would handle this spelling. Ultimately a simplification was achieved by establishing a single official spelling for each word, replacing preferred and less preferred variants. The even more complicated variation in Norwegian presented a headache for SCARRIE. Eventually, the Norwegian partners in SCARRIE solved this by establishing a limited set of subnorms and enabling adherence to a chosen subnorm though sophisticated dictionary and grammar codings. In the wake of this research, attention was drawn to the complications of the subnorms and the fact that many allowed lexical variants do not appear to be ever used (Rosén, 2000). A simplification of the variation in Bokmål was adopted by Norsk Språkråd in 2005 and there are plans for further empirical investigations of the situation. It should also be mentioned that political priorities have spurred the development of special writing tools to promote the participation of people with language-related disorders in social communication. In Norway, companies like Include and LingIT have been active in the development of such tools.

In conclusion, I would like to observe, firstly, that NLP for writing has been a research field that has seen important shifts in its intended application environments during the past couple of decades. Secondly, there are links between NLP for writing and other fields that directly or indirectly benefit from this research or vice versa, including language learning and teaching and language policy. Finally, a holistic approach to writing is needed, where NLP research better interacts with the study of cognitive aspects of the writing process (including first and second language learning and language disorders) and with an investigation of the changing environments for written communication and our appreciation of correctly written texts also in the new media.

References


Figures

Figure 1: Screenshot of CRITIQUE proposing a correction (from a 35mm slide courtesy of Stephen Richardson).
Figure 2: Screenshot of CRITIQUE highlighting suspected errors (from a 35mm slide courtesy of Stephen Richardson).

Proudly we present this entirely new demonstration of the English author-system in Muenchen.

This system that performs a very difficult task is an extremely powerful tool for text-processing.

The person that gives you this demonstration will tell you something about the usage and advantages.

The system is not surprised by this strenuous demonstrations.

An interesting sentence produced by the English nlp system is the following:

I saw that he whom

This sentence is ungramatical

the system is not surprised by this strenuous demonstrations.

this strenuous demonstrations

Head with wrong determiner (sing/plu)

_correction proposal:

the system is not surprised by these strenuous demonstrations.

Figure 3: Screenshot of Author Environment proposing a diagnosis and correction.
Proudly we present this entirely new demonstration of the English author-system in Muenchen.

This system that performs a very difficult task is an extremely powerful tool for text-processing.

The person that gives you this demonstration will tell you something about the usage and advantages.

The system is not surprised by these strange changes.

An interesting sentence that will show you the capabilities of our nlp-parser is the following statement.

I saw that he whom she saw saw the saw that I saw.
Proudly we present this entirely new demonstration of the English author-systems in Muenchen.

These systems that perform a very difficult task are extremely powerful tools for text-processing.

The person that gives you this demonstration will tell you something about the usage and advantages.

The systems are not surprised by these strenuous demonstrations.

An interesting sentence that will show you the capabilities of our nl-parser is the following statement.

I saw that he whom she saw saw the saw that i saw.

Figure 6: Screenshot of Author Environment showing the result of propagating a change from singular to plural.

Figure 7: Screenshot of SPELRAAM showing how the user completes a decision tree (from a 35mm slide courtesy of Gerard Kempen).
Figure 8: Screenshot of SPELRAAM showing a spelling rule for conjugation (from a 35mm slide courtesy of Gerard Kempen).

Figure 9: Screenshot of SPELRAAM giving spelling advice for conjugation by applying a rule (from a 35mm slide courtesy of Gerard Kempen).
Figura 10: Screenshot of KWIC search result for wrong forms of adjectives in ASK.

Figura 11: Frequencies of two error types in ASK, grouped according to mother tongue: Wrong form of adjective (left); orthographical error (right).