

Multimedia presentation of grammatical description: design issues

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Abstract

In this paper, I argue that grammatical description of language is a type of information which is ideally suited to presentation as a multimedia object structured with hypertext. I examine three existing language resources, constructed for different audiences, and discuss various features of each which bear on the design issues relevant to grammatical description. From my examination of these exemplars, I argue for four guidelines in the design of a multimedia grammar: data centricity, multiple linking, exhaustive coding in data structures, and user control of the amount of information accessed.

1. Introduction

Any reasonably complete description of a language is a complex object. Traditionally, such works are divided into various components: a grammar, a dictionary and a text collection. But of course these are really highly inter-related. For example, a single entry in the dictionary is of little value without the general information about words of that class which can be found in the grammar, and any point made in the grammar may be hard to grasp without extensive exemplification from texts..

An impression of the complexity involved can be gauged from the following comments by two reviewers of a description published as three separate volumes (Heath 1980, 1982, 1984): “Unfortunately, F[unctional] G[rammar of] N[unggubuyu] is a very demanding work, both because of the inherent complexity of the language and because it requires the reader to make constant reference to the text volume.” (Blake 1985: 310); “the work is particularly difficult to read. H[earth] makes no pedagogical concessions to the reader. One must look up the attestations for every major grammatical point in another volume.” (Haiman 1986: 654-655).

The interrelatedness of the various components discussed above immediately suggests that hypertext would be a better means of presentation

and additional benefits could come from making the grammatical description a multimedia object, rather than a text object. Examples could be heard in the original sound recorded by the researcher, or even seen as video clips where such presentation would aid the consumer (for example, where gesture added an important element of meaning to the utterance). In addition to the improved accessibility of the descriptive information, such presentation would bring the consumer much closer to the primary data, actual language in use, and therefore multimedia language description would increase substantially the standard of accountability in linguistics.

However, the standard paper and ink presentation of grammatical description has an established linear format which is not suitable for the new medium. In this paper, I examine three existing presentations of language data as multimedia: an online documentation, a documentation published as CD-ROM, and an online language learning site. I suggest that each of these exemplars can provide important hints to the most appropriate structure for multimedia grammatical description.

1. The organization of grammatical description

Most grammatical descriptions published in book format follow more or less closely a standard format. The presentation begins with background information on the language and its speakers, the relationship of the language to other languages, and a survey of previous research. The description proper then follows, moving through phonetics and phonology (the sounds of the language and how they are organized into a system), morphology (word-formation processes), and clausal syntax. Some discussion of syntax above the level of the individual clause and of textual organization may follow. If example texts are included in the volume, as is common, they will come after this, with word lists after them.

The organization of a grammar in this style is linear, that is, one sort of information is presented before another. And the linearity is to a large extent well-motivated. It is generally not easy to understand the morphological processes of a

language before one understands the phonology; it is hard to understand syntax (combinations of words) before one understands morphology (word-formation).

Linearity of presentation is also a consequence of the medium. Paper and ink objects are read normally in sequence; even if one reads only a short section of a larger work, one starts at a particular place and reads on in sequence for as long as necessary. The reservations of the reviewers of Heath's work quoted previously are reflections of their frustration at an organization which attempted to subvert this linearity.

Hypertext, on the other hand, is a non-linear medium and the metaphor of a web is entirely appropriate for such presentation. As already mentioned, hypertext has clear benefits for the presentation of grammatical description, but it is desirable that at least some of the linear logic of the paper and ink model should be accessible in the new medium. Various questions at the conceptual level must therefore be addressed in order to exploit the technological possibilities to their full. These include:

- what should be the starting point for the consumer's navigation of the multimedia object?
- how much linear ordering can or should be built into the interlinking of individual objects?
- how rich can the interlinking be before it becomes confusing for the consumer to navigate?

Underlying all of these questions, is the assumption that all of the coding necessary for full interlinking of information in the description is present in the data structures on which the presentation object is based. I return to this issue in section 3.

2. Three exemplars

2.1. Online documentation of Kolyma Yukaghir (Nikolaeva and Mayer 2004)

2.1.1. Description

This resource (afterwards ODKY) is a documentation of an endangered language (see Himmelmann 1998 for discussion of the notion of documentation). It contains introductory material, texts, dictionaries and images (pictures and maps). The texts are presented so that an entire text can be heard as audio in one track, while a translation is viewed, or the text can be viewed broken into units, with morpheme-by-morpheme glossing and links to audio for each unit. For some text units, notes on grammatical or cultural matters are

provided. In this view, many morphemes and words are also linked to the dictionaries. There are two dictionaries, one a listing of Yukaghir stems, the other a listing of affixes. The dictionaries give rather limited information: a short definition, a note if a word is a loan from another language, and a concordance of occurrences of the morpheme in the text collection. All entries in the concordance are links to the relevant text unit. The concordance lists are exhaustive, and this is unwieldy in the case of common items. For example, the verb 'to be' has a concordance list of around 500 occurrences. Where a morpheme has more than one form, the various possibilities are linked to the form considered basic. Links between words in texts and images are used in a limited way, the most noticeable being that a picture of the speaker who produced a text is often available.

2.1.2. Discussion

The nature of a documentation has influenced the design of ODKY. The aim is to provide a record of the language and of the linguistic behaviour of its speakers. Detailed grammatical description is not a part of the intention, rather the documentation is intended to serve as the basis for description by future scholars. Nevertheless certain features are of interest.

Firstly, the presentation of the material is not complex. There is very little annotation added to the data, and therefore linking paths through the material are straightforward. There are no instances where multiple links lead from a single location, and therefore no design is imposed at the level of hypertext linking.

Secondly, the presentation of the material is centred on actual data. Texts, as audio and as transcriptions constitute the greater part of the documentation. Supporting annotation is minimal; for example, the information given in dictionary entries includes only a single word gloss and a concordance. Not even word class labels are given, let alone more detailed definitions or encyclopaedic information.

Thirdly, concordances are used in the dictionaries. It is a very significant advantage of presenting language data via computer that all of the data relevant to some particular question can be accessed quickly (assuming the underlying annotation is rich enough – see discussion in section 3). However, the way that this feature is exploited in ODKY raises the question of whether it is necessary or desirable to always present such information exhaustively. For example, in a resource based on English data, it may not be useful to have every occurrence of the definite

article listed in the dictionary entry for that word, although in order to answer certain questions one would like to be able to access the information when it is needed. We return to discussion of this question in section 3 below.

2.2.Spoken Karaim (Csato & Nathan 2003)

2.2.1.Description

This source (afterwards SK) embodies a rather more sophisticated approach to the possibilities of multimedia than that discussed in section 2.1. To some extent, this is a result of delivery via CD rather than online. But in many cases, the design features are not dependent on the delivery medium. For example, the SK environment uses multiple windows to present various types of information on a single screen. Such presentation is an option available in web browsers, but one not exploited by ODKY.

This resource presents a variety of information about the Karaim people of Lithuania, including general cultural information along with information about the Karaim language. The package was developed in close collaboration with the community (Csato and Nathan 2004), and therefore the intended audience is different from that for ODKY. The specifically linguistic information is viewed across three windows: one large window contains a text unit in Karaim with an English translation, with a button on a control bar beside the screen allowing access to audio; a second smaller window displays a single item from the lexicon; and a third window, also small, displays the lexicon as a list. In the last two windows, various options are offered. The lexicon list can be viewed in either Karaim or English, or a third option labelled 'Grammar' can be selected. This third option does not give access to descriptive material, but only to a list of the grammatical categories which are represented in the language, for example names of nominal cases. Selecting from any of the three possible views in the lexicon list window results in the chosen item being displayed in the lexicon item window. The division between the dictionary of words and the dictionary of grammatical categories is in effect almost identical to the division between the word dictionary and the affix dictionary used by ODKY.

The information displayed in the dictionary entry window is similar to that given in the ODKY dictionary, that is, simple translations and no word class information. In some cases, some more encyclopaedic information is provided (e.g. *kibin* 'kibin (Karaim national dish, pirog filled with meat or cabbage)'). Additional options offered in this window include links to pictures in some cases,

links to related words, and a morphology demonstration module. For nouns, identified by a graphic signal beside the word, it is possible to display various inflected forms by clicking and dragging on buttons at the top of the window. This feature is intended as an aid to language learners; it does not provide exhaustive information even for nominal morphology.

A short section of grammar notes can be viewed in the main window, that in which text is viewed. These notes are very brief and are not linked at all to text examples. They are also not complete even at the level of detail provided. The section on morphology discusses only some nominal morphology, while the list of grammatical categories, read in conjunction with the dictionary entries, makes it clear that the language also has a considerable amount of verbal morphology.

2.2.2.Discussion

SK shares with ODKY the first two features discussed above, simple annotation and therefore no complex paths of links through the material, and being data-centred. There is no possibility of extracting groups of data in this resource, such as is offered by the dictionary concordance in ODKY. The main feature of interest in SK is that mentioned already at the start of this section: the presentation of various types of information in different areas of the screen. The value of this technique in presenting linguistic data has also been demonstrated for the Shoebox/Toolbox software package (distributed by SIL: <<http://www.sil.org/computing>>) by Austin (2002).

One other issue concerning SK should be mentioned. This resource is presented in a specially designed environment, it does not use a standard web browser as does ODKY and the Nahuatl Learning Environment (see section 2.3). With dissemination via a CD, this poses no problems for the user, however it does raise questions about the portability of the design. Use of open source tools throughout the design, implementation and delivery of any resource is clearly desirable.

2.3.Nahuatl Learning Environment (Amith n.d.)

2.3.1.Description

The Nahuatl Learning Environment (afterwards NLE) is an even more ambitious project which aims to present online a corpus of texts in the Nahuatl language, along with a reference grammar and a comprehensive dictionary. Various possibilities for linking between these modules are planned, although only some are currently implemented. In its current form, this resource

provides a rich dictionary of the Nahuatl language, a corpus of texts which are linked to varying degrees to other information, and grammatical description which is only available as downloadable text files.

Texts are presented with an entire text on a single page with a single link to audio provided for each text. No morpheme-by-morpheme glossing is given for texts, but some complex words are active links with parses displayed as a pop-up on rollover. If the link is clicked, a new window opens with the dictionary entry for the root of the complex word. In comparison to ODKY and SK, these dictionary entries are very detailed with word class information, definitions for multiple senses and supporting examples, and links to related entries and audio. It is also possible to follow links from texts, or from an open dictionary entry, which automatically generate queries to the lexical database.

Some specific notes on grammar are present as footnotes in the texts, accessed via links. These are currently the only links to grammatical description in NLE, although in documentation, it is claimed that it is possible to view for example sets of verbs of the same subcategory via links which automatically query the database.

The dictionary module of NLE is based on a database application (Hyperlex2), and offers powerful query facilities (regular expression searches etc.). Other features include the possibility to switch between English and Spanish as the metalanguage, and detailed encyclopaedia information on topics such as botanical knowledge among the Nahuatl people.

2.3.2. Discussion

Of the three resources discussed here, NLE shows the greatest development of the possibilities of linking between various parts of the available information. As the available information is significantly richer than that in ODKY and SK, for example in the dictionary entries, the presentation does become complex. However, this complexity is currently restricted to the amount of information available on the screen at a single time. Complex paths through the information and multiple linking are not offered. Thus, a link from a complex word form in a text shows a parse of the word and leads to a dictionary entry for the root morpheme. But there is, for example, no path to the other morphemes which occur in the complex form. The implementation of the linking is also less than optimal, with the dictionary entry appearing as a pop-up area which overlays the text from which the user has started. The text is therefore no longer fully visible. The use of separate screen areas, as in

SK, seems a more satisfactory solution.

2.4. Summary

Table 1 summarises the features of the three language resources discussed in this section.

3. Design guidelines for multimedia grammar

Various guidelines for the design of a multimedia grammar emerge from a consideration of the characteristics of the three resources surveyed in section 2, and additional ones can be inferred from the features which are lacking in those resources. Here, I concentrate on four of these: the data-centric nature of such a grammar, the multiple pathways between data and annotation, the exhaustive coding of properties needed in underlying data structures, and the possibility that the user should have some control over the degree to which information is presented exhaustively.

As noted in section 2, all three of the resources surveyed are centred on data. Actual language data, transcribed text or the original audio recording, is the point from which the user gains access to other information. In some cases, descriptive and analytic information can be accessed without viewing or hearing a text, but this is not the preferred mode of use. In these resources, any descriptive annotation has value in relation to the concrete examples provided by real data. This can be seen as both a practical and a philosophical decision. Practically, the combination of description with data provides a richer and more rapid understanding to the user. Philosophically, the great advantage of multimedia as the means for presenting linguistic material is that it allows for easy access to large amounts of data, and this imposes accountability on the analyst. Therefore, I suggest that these resources are following the correct approach and that being data-centric is a desideratum for the design of multimedia grammatical description.

It is clear that there is a huge potential problem in the design of multimedia grammars which arises from the fact that any single piece of data can potentially be linked to multiple annotations. A single word in a text can be linked to a morphological analysis of the word, to dictionary entries for each individual morpheme, as well as (perhaps) a dictionary entry for the whole word, to information on phonology, on syntax and other possibilities. Only NLE has any kind of rich linking of various sources of information in its structure. In at least one case, the potential problem is handled by dividing the work up: rolling over some complex word forms gives a pop-up window

with a morphological parse of the word, while the word in the original text is a live link to dictionary information. In the case where three or more links are needed, such a solution will not work, but the use of pop-up menus on rollover is an elegant solution to making several choices available.

Multiple paths through the available information will also be necessary. For example, a word form in a text might be linked to annotations concerning both morphology and phonology, but the phonological process in question might be dependent on the morphological environment. In such a case, a direct link would exist between the word form and the phonological discussion, but an indirect link would also have to exist via the material on morphology. Note that such paths of linking will mimic some of the linear structure of a book grammar: if one phenomenon cannot be understood without knowledge of some other phenomenon, then the presentation of the one logically precede that of the other. Linear sequence handles this logic in a book, linking paths can handle it in hypertext. Note also that the cases where cross-references are used in a book to circumvent linear sequence are handled in exactly the same way in hypertext – linear and non-linear relationships between material are identical.

The type of rich linking just discussed can only be implemented if the underlying data structures contain all the information needed. Logically, this means that every item in every text has to be explicitly coded for its relationship to every subject covered in the grammatical description. This is an extremely onerous job, although there are undoubtedly some possibilities to automate the coding by triggering mark-up from, for example, word classes. There are additional problems to be faced in deciding how to deal with syntactic description. Is it necessary to represent syntactic structure in the data structures in order to ensure that the linking paths needed will exist? And how should links to syntactic units be implemented: should each word of the unit have a link, should the head word of the unit have a link, or should the link be attached to some abstract location in the text? These are complex questions which I leave for further research.

Following from the point made in the previous paragraph, I would like to suggest that a highly desirable feature in a multimedia grammar will be the possibility for the user to have some control over the amount of information recovered via certain links. ODKY uses concordance lists in its dictionary, and NLE has the possibility of generating lists of words sharing certain features. Such functionality for grouping and recovering data is obviously useful and desirable, but it has to

be handled with care. It is not particularly useful (at least in most circumstances) to have to negotiate a list of all the occurrences of a plural marker, for example (as mentioned previously, in ODKY the list for a common item has several hundred entries). But such information will always be recoverable, given the nature of the coding that I have just argued is needed in underlying data structures, and it is certainly possible to imagine situations in which such exhaustive information will be exactly what the user wants. The ideal solution would therefore seem to be to allow the user to control the amount of information which is retrieved by some functions, rather than having exhaustive lists generated as a default.

4. Conclusion

The presentation of grammatical description as a multimedia object is potentially an extremely exciting development for linguists and others interested in language data. However, the design problems which must be faced, both conceptual and implementational, are complex.

Here, I have discussed some of the conceptual issues on the basis of an examination of three existing multimedia language resources. Four design guidelines have been identified from this process: making the presentation data-centric, allowing for complex and multiple paths of linking through the available information, the necessity for very detailed coding in underlying data, and the need for the user to control the level of detail presented in some cases. These guidelines are certainly not sufficient to give solutions to all the problems which will be encountered in constructing a multimedia grammar, but I believe that they will be of assistance to anyone who undertakes such a project.

I have touched on several problems for the implementation of a multimedia grammatical description above, such as the structure of the data storage to be used, the nature of the presentation software, and the importance of achieving a platform-independent solution, preferably using open-source software. I also consider that the relationship between a multimedia grammatical description and a printed version of some of the material is a problem of implementation. The ideal solution will be that the traditional book grammar can be easily derived from the multimedia product via some type of transformation process. That is, the textual parts of the description should be exportable into a format suitable for printing, with examples and internal cross-references generated as part of the export process. This goal is an additional goal which should be kept in mind in the

design phase of any attempt to construct a multimedia grammar.

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	Components	Delivery	Screen Presentation	Annotation	Data Grouping and Recovery
ODKY	Text (+ audio) Dictionary Images	Web browser	Single screen	Minimal	Concordance
SK	Text (+ audio) Dictionary Annotations Images	Custom environment	Split screen	Medium, more cultural notes rather than language material	None
NLE	Text (+ audio) Dictionary Annotations Images	Web browser	Single screen with pop-ups and roll-overs	Medium-high, language and general material	Query function to lexical database

Table 1 – Summary of features of three multimedia language resources

ODKY: Nikolaeva, Irina and Thomas Mayer. 2004. Online Documentation of Kolyma Yukaghir.

SK: Csato, Eva A. and David Nathan. 2003. *Spoken Karaim*. (CD-ROM)

NLE: Amith, Jonathan D. n.d. *Nahuatl Learning Environment*