MMAX2 Annotation Tool
Quick Start Guide

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1 About this Document

This document is intended as a quick hands-on introduction to the MMAX2 annotation tool (version beta 4). It provides information on how to install and run the tool, and how to create, load, browse and manipulate annotations and base data. If you want to get an idea about MMAX2 and what you can do with it, this document is for you.
Important note: The examples used throughout this document are from the Heidelberg Text Corpus (HTC), and they deal solely with coreference and bridging annotation. This does ***not*** mean that MMAX2 is in any way restricted to or especially tailored for this type of annotation! Rather, we are convinced that the tool is sufficiently general and powerful to be useful for the annotation of a wide range of diverse phenomena. Please note the other sample files supplied with this distribution, in particular the samples taken form the Trainline corpus and from the Korean Treebank.
This document does **not** describe everything you can do with MMAX2, and even the things that are described are not necessarily complete in every detail. In particular, it does not explain how to design and implement user-definable annotation schemes. A detailed document describing this central aspect of MMAX2 will be added to the tool's documentation later. For information about other topics not covered in the current document, please refer to the following:

- MMAX2 Annotation Tool Style Sheet Guide
- MMAX2 Query Language Reference Manual

2 Installing MMAX2 (Updated for version 1.0 beta 4)

MMAX2 requires a current Java version to be properly installed on your system. MMAX2 has been tested and is in use on both Windows, LINUX and Macintosh (MAX OS X) platforms and with various versions of Java (incl. 1.3., 1.4 and 1.5). If you encounter problems during installation or later, please contact the developers via the MMAX2 web site (http://mmax.eml-research.de).
Installing the MMAX2 annotation tool is very simple. You should have received the MMAX2 distribution as a compressed archive file.
Just uncompress the archive. This will create a single top level directory `MMAX2_`*version* plus some subdirectories:

```
MMAX2_version
    Libs
    Samples
        HTC
            Basedata
            Customizations
            Markables
            Schemes
            Styles
        KoreanTreeBank
            Basedata
            Customizations
            Markables
            Schemes
            Styles
        ...
```

The root directory will contain a file named `MMAX2Key.jar`. This file is required for MMAX2 to run. If this file is missing, MMAX2 will not start and a message will be displayed. If this happens, please contact us via the MMAX2 web site (http://mmax.eml-research.de) to obtain a valid key. The `Libs` directory contains a number of libraries for XML and XSL support[1] and the MMAX2 library proper. The `Samples` directory contains (among others) the `HTC` directory which in turn contains the actual annotation files, including a file named `common_paths.xml`. This file is used by MMAX2 to locate the different files pertaining to a complete MMAX2 project. **Note:** In contrast to earlier versions of MMAX2 (beta 2 and earlier), the `common_paths.xml` is not platform-dependent any more.
New in version 1.0 beta 4
From version 1.0 beta 4, references to individual markable files need no longer be stored in the indivual .mmax files. This practice was becoming extremely inconvenient when e.g. a new level of annotations was to be added to a non-trivial number of annotated documents. Instead, from the current version on, the file `common_paths.xml` can be used to store references to markable levels. At load time, MMAX2 first checks this file for any references to markable files, and it will expect these references in the individual

[1]Note that MMAX2 uses for XML and XSL support versions of the *Apache* Xalan and Xerces libraries which are **not** the most recent ones (but may may very well be compatible with these). Therefore, the required libraries are supplied with the MMAX2 distribution and reside in the `Libs` directory. If you already have more recent versions of the required libraries on your system, you are encouraged to try them out with MMAX2, but note that the tool has only been tested with the supplied versions!

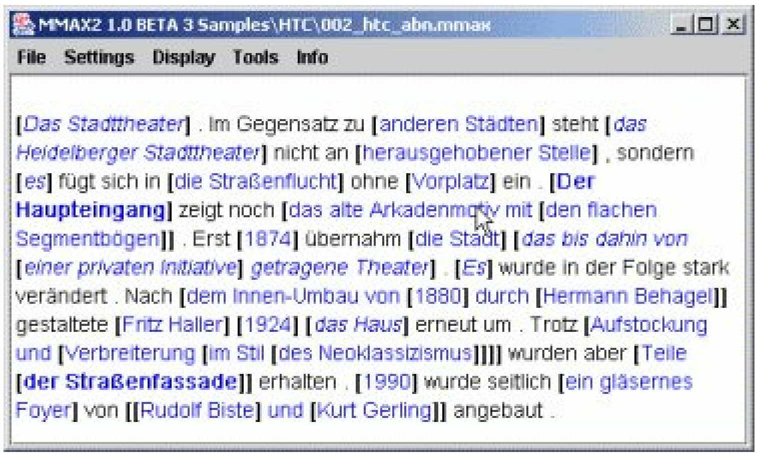
.mmax file *only if* it does not find any in `common_paths.xml`. In the other case, any references in the .mmax files will be ignored. The form of references in the file `common_paths.xml` is very similar to the form in the .mmax files, with one important difference: The .mmax files contain the *complete* names of the files that contain the markables for the individual annotated document. E.g. the file `doc1.mmax` contains a reference to a markable level called *coref*, and the name of the file containing the pertaining markables, i.e. `doc1_coref_level.xml`. In contrast to that, the file `common_paths.xml` will only contain the name *scheme* for the names of the defined level, with the name of the actual document (i.e. *doc1* in the example) being replaced by a placeholder $. At load time, a $ placeholder found in a reference to a markable level in the file `common_paths.xml` will be **replaced** by the name of the currently loaded .mmax file without the .mmax extension). The sample data supplied with this distribution of MMAX2 already takes advantage of this new method.
The installation is complete. In order to test it, run the script `startmmax2_htc_win.bat` (Windows) resp. `startmmax2_htc_linux.sh` (LINUX/MAC)[2]. It is recommended that you call either script initially by typing its name on the console (as opposed to double-clicking it in your file explorer). This way, you will be able to read the screen output and error messages even if the tool crashes immediately after startup. While this does not normally happen, there *can* be cases, e.g. if Java is not correctly installed. Afterwards, when you know that everything does work, you can start the tool by double-click. After executing the correct `startmmax2_htc_.*` file, you will see the screen described in the next section.

[2]Under LINUX and MAC, you first have to make the script executable using the command `chmod u+x filename`

3 MMAX2 Display Basics

3.1 The Main Window

After opening the supplied sample HTC file, you will be asked whether you wish to validate the current annotation. Validation will check the annotation for consistency, and supply default values for those markable attributes that do not yet have a value. Validation is only necessary once, i.e. after the annotation has been created or modified outside the tool. Therefore, the default option is 'Do not validate'. After the validation dialog, several windows appear on the screen. For the purposes of this introduction, a particular style sheet has to be used. In order to select it, please open the *Settings* menu in the *Markable level control panel* (small window initially in the upper right corner). From this menu, please select the *StyleSheet* menu, and from this menu the entry *htc_3.xsl*. After a few moments, the MMAX2 main window should look as in Figure 1. Initially, MMAX2 uses a default (ASCII-based) display font. Both the name and the


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax
File Settings Display Tools Info

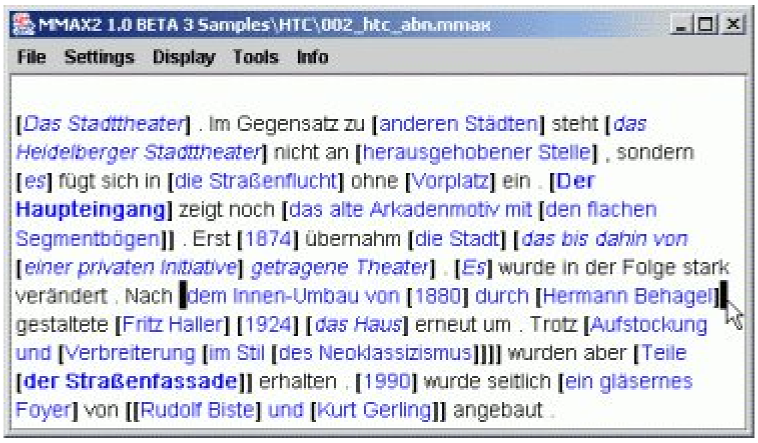
[*Das Stadttheater*] . Im Gegensatz zu [anderen Städten] steht [*das Heidelberger Stadttheater*] nicht an [herausgehobener Stelle] , sondern [*es*] fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [**Der Haupteingang**] zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst [1874] übernahm [die Stadt] [*das bis dahin von* [*einer privaten Initiative*] *getragene Theater*] . [*Es*] wurde in der Folge stark verändert . Nach [dem Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller] [1924] [*das Haus*] erneut um . Trotz [Aufstockung und [Verbreiterung [im Stil [des Neoklassizismus]]]] wurden aber [Teile [**der Straßenfassade**]] erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste] und [Kurt Gerling]] angebaut .

Figure 1: MMAX2 Main Window

size of the used display font can be changed via the **Font** submenu in the **Display** menu. Note that the list of fonts that are offered here depend on which fonts are installed on your system! By default, changes to the font name will affect only the display, and not the popup menus used for markable selection. If you want to use the display font also in the popup menus, you can check the corresponding menu item in the **Font** submenu. This is necessary when using e.g. Korean fonts (as for the KoreanTreeBank sample), which cannot be displayed otherwise. In the HTC sample display you see, some parts of the text are black, some are blue, and some are blue and in italics. Black is the default text color; it is used for all portions of the text for which no special rendering style has been defined. For markables on the coreference level, on the other hand, a customized rendering style has been defined.[3] This style specifies that every markable on this level should be rendered in blue, and that every markable in a coreference relation should *in addition* be rendered in italics.

The brackets appearing in the text are so-called ***markable handles***. In the sample annotations, each markable on the coreference level is associated with a black, bracket-style markable handle. Markable handles serve several purposes. Apart from simply visualizing the extent of the markable they are associated with, they are also sensitive to mouse moves: Moving the mouse on a markable handle causes the matching handle to be highlighted (Figure 2). Markable handles are also sensitive to mouse clicks and allow direct

[3]The XML files responsible for these so-called *markable customizations* can be found in the `HTC/Customizations` directory.



[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern [es] fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der Haupteingang] zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst [1874] übernahm [die Stadt] [das bis dahin von [einer privaten Initiative] getragene Theater] . [Es] wurde in der Folge stark verändert . Nach [dem Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller] [1924] [das Haus] erneut um . Trotz [Aufstockung und [Verbreiterung [im Stil [des Neoklassizismus]]]] wurden aber [Teile [der Straßenfassade]] erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste] und [Kurt Gerling]] angebaut .

Figure 2: Matching Markable Handles

selection of a markable even in cases of multiple embedding. Once a markable has been selected, it is highlighted (i.e. rendered with a yellow background).

3.2 Markable Selection

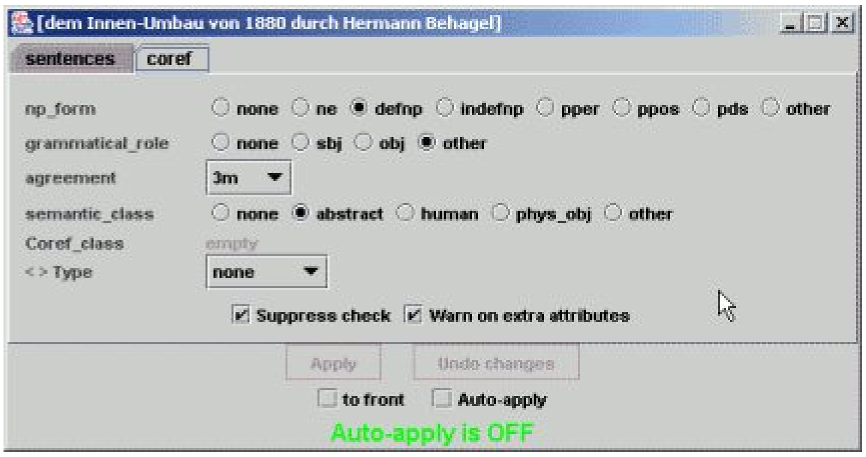
Before a markable can be modified or its attributes can be displayed, it has to be *selected*. Generally, the **left mouse button** will always select a markable for the purpose of displaying its attributes. If there is only one markable at a left-clicked position, this markable will be immediately selected and its attributes will be displayed (cf. below). The same is true if a markable handle is present at the left-clicked position: since each markable handle is associated with exactly markable, this markable can be immediately selected. If more than one markable (from one or more levels) is present at a left-clicked position, the click is ambiguous and a popup menu containing all markables will be displayed. From this menu, select the desired markable by left-clicking its respective entry. The **right mouse button**[4], on the other hand, is used for selecting markables for other purposes than display of their attributes, such as deletion, etc. (cf. Section 4). Markable handles and disambiguation popup menus, however, work the same as for left clicks.

3.3 Attributes and the Attribute Window (updated for version 1.0 beta 4)

Markables are not just sequences of words that have been grouped together; rather, they are the carriers of the actual annotation. Annotations consist of markable ***attributes*** and ***relations*** (cf. Section 3.4). The attributes associated with the currently selected markable are displayed in the MMAX2 attribute window (Figure 3). The attribute window contains one tab panel for each markable level in the annotation project (here: *sentences* and *coref*). Since the selected markable is from the coreference level, the *coref* panel is active in Figure 3.
Attributes consist of a name (e.g. **np_form** or **grammatical_role**) and a set of possible values, one of which is always selected. Possible values are displayed as either a number of radio buttons (e.g. **np_form**) or as a drop-down list (e.g. **agreement**)[5]. Changing the value of a given attribute is done by simply clicking

[4]On MAC, hold the `Alt` or `Ctrl` key while pressing the mouse button

[5]The appearance of an attribute in the attribute window is controlled by the type it is assigned in the scheme file. Radio buttons are created by using the type *NOMINAL_BUTTON*, and lists by using the type *NOMINAL_LIST*.


[dem Innen-Umbau von 1880 durch Hermann Behagel]

sentences | coref

np_form: none ne [✓ defnp] indefnp pper ppos pds other
grammatical_role: none sbj obj [✓ other]
agreement: 3m
semantic_class: none [✓ abstract] human phys_obj other
Coref_class: empty
< > Type: none

[✓ Suppress check] [✓ Warn on extra attributes]

Apply | Undo changes

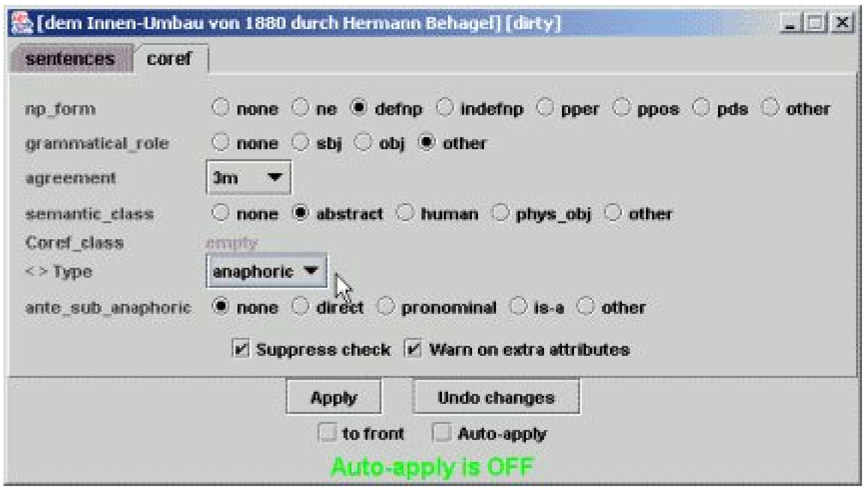
to front | Auto-apply

Auto-apply is OFF

Figure 3: MMAX2 Attribute Window

the corresponding radio button, or selecting the corresponding entry in the list. This causes the attribute window to display the newly selected value. At the same time, the *Apply* and *Undo changes* buttons in the bottom of the attribute window will be enabled. This will happen unless the *Auto-apply* option is activated: if *Auto-apply* is activated, all changes in the attribute window will *immediately* (and, at least for the moment, irrevocably) be applied to the current markable, possibly overwriting earlier values. Therefore, this option should be used with caution, particularly in connection with branching attributes (cf. below).

Branching attributes are those whose current value influences the availability of other attributes who are said to be ***dependent*** on the former. Branching attributes can easily be identified in the attribute window because they have the characters < > prepended to their names. In the sample file, the attribute **type** is one of several branching attributes. Changing its value from *none* to *anaphoric* causes the dependent attribute **ante_sub_anaphoric** to appear (Figure 4). If the changes are confirmed by clicking the *Apply*


[dem Innen-Umbau von 1880 durch Hermann Behagel] [dirty]

sentences | coref

np_form: none ne [✓ defnp] indefnp pper ppos pds other
grammatical_role: none sbj obj [✓ other]
agreement: 3m
semantic_class: none [✓ abstract] human phys_obj other
Coref_class: empty
< > Type: anaphoric
ante_sub_anaphoric: [✓ none] direct pronominal is-a other

[✓ Suppress check] [✓ Warn on extra attributes]

Apply | Undo changes

to front | Auto-apply

Auto-apply is OFF

Figure 4: Attribute Window Change as Result of Branching Attribute Modification

button[6], the dependent attribute and its current value will become part of the currently selected markable's annotation. Likewise, switching the value back to *none* and clicking the *Apply* button will remove the attribute from both the attribute window and the markable. Clicking the *Undo changes* button restores the currently selected markable's attributes to the state directly after the last changes were applied, which is the state directly after the markable was selected, if no changes were applied since then. It is important to understand that at all times the attribute window shows *all* and *only* the valid attributes of the currently selected markable: If no confirmation is pending[7] and some attribute-value combination is displayed in the attribute window, it is part of the currently selected markable's annotation, and if something is not displayed, it does not currently exist!

New in Version 1.0 beta 4:

From version 1.0 beta 4 on, MMAX2 contains an option for doing so-called*One-click annotation*. This option allows to modify markable attributes in a very efficient way, without having to use the attribute window. One-click annotation works as follows:

The attribute window contains a menu *One-click annotation*[8]. This menu contains one sub-menu for each annotation level in the currently opened MMAX2 document. Each of these sub-menus, in turn, contains a list of all *nominal* attributes (i.e. of type *NOMINAL_LIST* and *NOMINAL_BUTTON*) defined for the current level. By default, the initial item <*none*> is selected. If you select some attribute, this attribute will be used for one-click annotation. In effect, this means that for every markable on the respective level, you can access and modify this attribute directly, i.e. without having to move the mouse to the attribute window. Instead, do the following:

- Select the markable by left-clicking it.
- Right-click the markable.[9]
- A popup menu appears, which has as its first item the name of the attribute, followed by all possible values defined for it. The value currently selected for the current markable is disabled so it cannot be selected.
- Select the new value for the attribute.[10]

3.4 Relations

Apart from carrying annotations in the form of attribute-value pairs, a markable can also be associated with (one or more) other markables to form markable ***relations***. While markable relations are also attributes in the sense that their availability is controlled by the attribute window, they are visualized graphically in the main window. Selecting a markable that participates in one (or more) relations causes these relation(s) to be graphically rendered by means of colored lines. Two types of markable relations are currently supported: Relations of type *MARKABLE_SET* associate arbitrarily many markables with each other in a transitive, undirected relation. In the HTC corpus, the *MARKABLE_SET*-type **coref_class** relation is used to represent coreference. Figure 5 shows how a coreference set can be visualized. Note that although all markables in

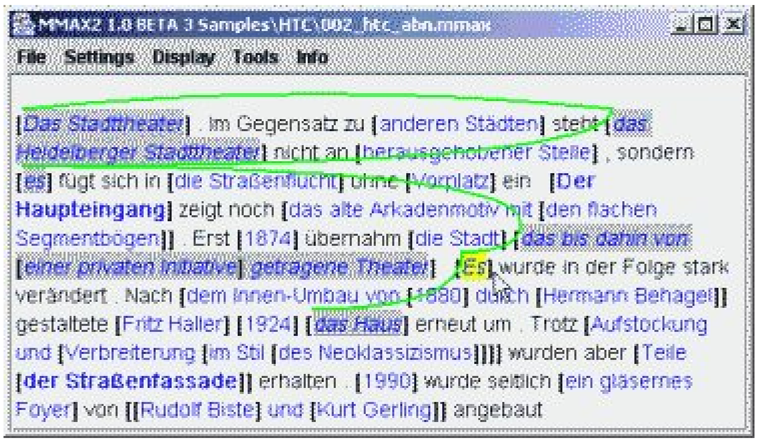
[6]Or if *Auto-apply* is active.

[7]I.e. if the *Apply* button is disabled.

[8]Not yet shown in the screen shots in this version of the documentation!

[9]Unless there is only only one markable level and at least only one markable at every position, it is recommended that you use markable handles to allow for unambiguous markable selection. Consult the MMAX2 Style Sheet Guide to find out how to use markable handles.

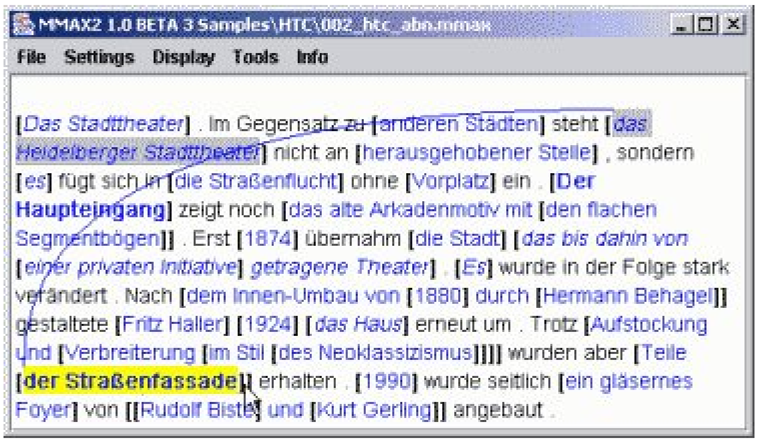
[10]In order for changes to take effect immediately, *Auto-Apply* should be activated in the attribute window.


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax
File Settings Display Tools Info

[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern
[es] fügt sich in [die Straßenflucht] ohne [Vorplatz] ein [Der
Haupteingang] zeigt noch [das alte Arkadenmotiv mit [den flachen
Segmentbögen]] . Erst [1874] übernahm [die Stadt] [das bis dahin von
[einer privaten Initiative] getragene Theater] [Es] wurde in der Folge stark
verändert . Nach [dem Innen-Umbau von [1880] durch [Hermann Behagel]]
gestaltete [Fritz Haller] [1924] [das Haus] erneut um . Trotz [Aufstockung
und [Verbreiterung [im Stil [des Neoklassizismus]]]] wurden aber [Teile
[der Straßenfassade]] erhalten . [1990] wurde seitlich [ein gläsernes
Foyer] von [[Rudolf Biste] und [Kurt Gerling]] angebaut

Figure 5: Selected Coreference Set

a *MARKABLE_SET*-type relation are unordered, the markables' document order is used to linearize the set for visualization.
Another type of markable relation currently supported is *MARKABLE_POINTER*. Relations of this type associate with one markable (the *source*) one or more *target* markables in an intransitive, directed fashion. In the HTC corpus, bridging relations are represented by means of the many-to-one[11] *MARKABLE_POINTER*-type **bridging_antecedent** relation. Figure 6 shows how a pair of bridging expression and bridging antecedent is visualized.


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax
File Settings Display Tools Info

[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern
[es] fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der
Haupteingang] zeigt noch [das alte Arkadenmotiv mit [den flachen
Segmentbögen]] . Erst [1874] übernahm [die Stadt] [das bis dahin von
[einer privaten Initiative] getragene Theater] . [Es] wurde in der Folge stark
verändert . Nach [dem Innen-Umbau von [1880] durch [Hermann Behagel]]
gestaltete [Fritz Haller] [1924] [das Haus] erneut um . Trotz [Aufstockung
und [Verbreiterung [im Stil [des Neoklassizismus]]]] wurden aber [Teile
[der Straßenfassade]] erhalten . [1990] wurde seitlich [ein gläsernes
Foyer] von [[Rudolf Biste] und [Kurt Gerling]] angebaut .

Figure 6: Selected Bridging Expression with Associated Antecedent

The appearance of a relation is controlled by a number of attributes in the scheme file in which the relation itself is defined. The `color` and `width` attributes specify the color and width of the line that is drawn, while the `style` attribute specifies its outline. Possible values for the `style` attribute are `lcurve`, `rcurve`, and `straight` (default).

[11]The relation is many-to-one because although each markable in the HTC corpus annotation can have at most *one* bridging antecedent, one markable can be bridging antecedent to several *source* markables.

3.5 Saving the Annotation

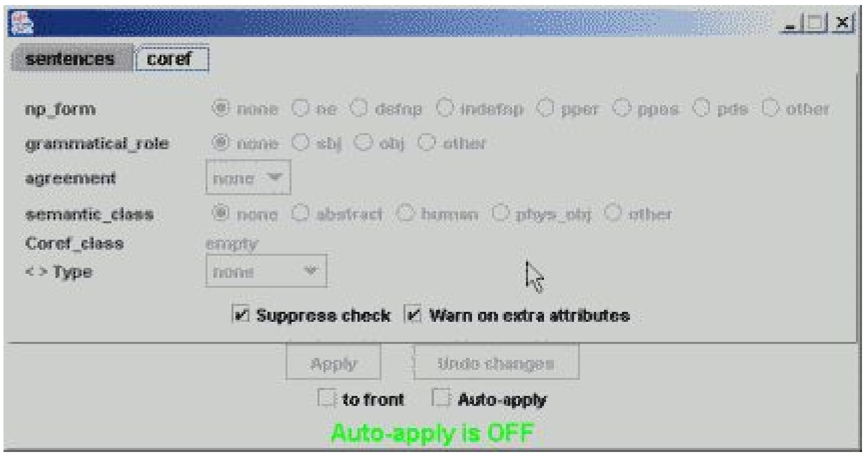
If the annotation has been changed, i.e. after markables or their attributes or relations have been modified, they can be saved by means of the **Save** menu item in the **File** menu. Via the **Levels** submenu, each level can be saved separately. The **All** menu item can be used if more than one level has been modified. Only those markable levels will be saved that actually were modified. A backup copy of the previous version will always be created, but *no more than one backup copy* will be maintained!

4 Modifying the Annotation

The main purpose of an annotation tool is to create and delete markables and to set, modify and remove their attributes and relations. This section describes how to do this in MMAX2.

4.1 Creating a Markable

If you want to create a new markable, left-click somewhere in the first word, hold the mouse button down and drag the mouse until it is somewhere in the last word . Note that this will only work if no other markable is currently selected! If some other markable should be currently selected, first unselect it by *left*-clicking on some non-markable or empty space in the display. Upon releasing the mouse button, the selection will automatically be expanded from the beginning of the first to the end of the last word. Also, a popup menu will appear with one *Create Markable* menu item for each currently active markable level . Select *Create Markable on level 'coref'* by left-clicking it, and a new markable will be created. The new markable will immediately be rendered in blue, according to the rendering style defined for markables on this level[12] . Markable handles, however, will ***not*** appear automatically! This is because markable handles are inserted by means of the XSL style sheet responsible for creating the display. Making the markable handles appear on the newly created markable requires to reapply the current style sheet. In order to do this, open the **Display** menu in the main window and select **Reapply current style sheet**. The entire display will be rebuilt and the markable handles become visible on the new markable . Note that markable handles are not *required* to select a markable,[13] but that they simply offer a convenient alternative. Thus, reapplying the style sheet for *every single* new markable is not necessary. Instead, it might be good practice (and more convenient) to rebuild the display only once after several new markables have been created.
A newly created markable will only have the *default* attributes and values defined for its respective markable level. Default attributes are those attributes that are visible in the markable level's tab panel when no markable is currently selected (Figure 7). What counts as a default attribute is determined by the annotation scheme.



np_form [✓ none] ne defnp indefnp pper ppos pds other
grammatical_role [✓ none] sbj obj other
agreement none
semantic_class [✓ none] abstract human phys_obj other
Coref_class empty
< > Type none

[✓] Suppress check [✓] Warn on extra attributes

[ ] to front [ ] Auto-apply
Auto-apply is OFF

Figure 7: Default Attributes and Values for the *coref* Level

[12]Cf. Section 3.1
[13]If no markable handles are available, a left-clicked markable is either selected directly, or, in case of enbedding, the desired markable can be selected from a popup menu.

4.2 Deleting a Markable

If you want to delete an existing markable, select it with the *right* mouse button. This will cause a popup menu to appear . From this menu, select the *Delete this Markable* menu item by left-clicking it. Any markable-related rendering styles will immediately be removed from the markable, causing it to be rendered in plain black text.[14] Also, the deleted markable's handles will be rendered *disabled* (i.e. in a light gray, strike-through font) . With the next style sheet reapplication, they will be removed from the display. Note that deleting a markable will only work if no other markable is currently selected! In particular, this means that you cannot delete the currently selected markable itself. If some markable should be currently selected, first unselect it by *left*-clicking on some non-markable or empty space in the display (cf. Section 4.1).

It is important to realize that deleting a markable can have an effect on other markables as well: If a markable is the second but last in a coreference set (or in some other *MARKABLE_SET*-type relation), deleting it will also remove the **Coref_class** attribute of the remaining markable, thus removing the entire set. Similarly, if a markable is a *target* markable of some *MARKABLE_POINTER*-type relation (like **bridging_antecedent**), deleting it will also remove its reference from the relation's *source* markable.

4.3 Resizing a Markable (Updated for version 1.0 beta 4)

Resizing a markable means changing the span of words that the markable covers. Words can be added to or removed anywhere in the markable. This means that *discontinuous* markables are also supported. In order to resize a markable, it has to be the currently selected one!

To **add** words to the currently selected markable, left-click somewhere in the first word you want to add, hold the mouse button down and drag the mouse until it is somewhere in the last word. Upon releasing the mouse button, the selection will automatically be expanded from the beginning of the first to the end of the last word. Also, a popup menu with an *Add to this Markable* menu item will appear. Select this menu item by left-clicking it, and the selected words will immediately be added to the markable. As a result, the added word(s) will be rendered according to the rendering style defined for markables on this level (i.e. in case of the *coref* level, in blue). The markable handle, however, will not be moved to reflect the new markable size until the next style sheet reapplication.

To **remove** words from the currently selected markable, left-click somewhere in the first word you want to remove, hold the mouse button down and drag the mouse until it is somewhere in the last word. Upon releasing the mouse button, the selection will automatically be expanded from the beginning of the first to the end of the last word. Also, a popup menu will appear with a *Remove from this Markable* menu item. Select this menu item by left-clicking it, and the selected word(s) will immediately be removed from the markable. As a result, any rendering styles related to the currently selected markable will disappear from the words that have been removed. The markable handle, however, will not be moved to reflect the new markable size until the next style sheet reapplication. Note that removing *all* words from a markable is not possible!

4.4 Modifying Markable Relations

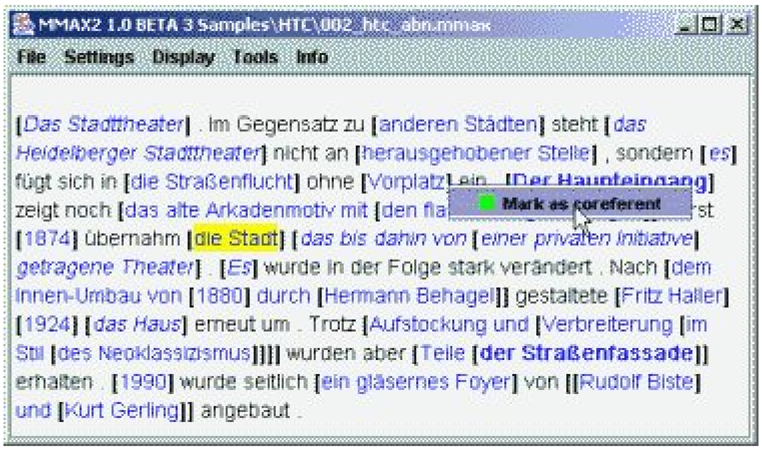
While markable attributes are modified via the attribute window (cf. Section 3.3), markable relations are added and removed by means of mouse actions in the main display, using the *right* mouse button.

[14] Unless the deleted markable was embedded in some other markable, in which case the remaining markable's font attributes may prevail.

Markable relations are always seen with respect to the currently selected markable: if no markable is currently selected, clicking the right mouse button on a markable will not give access to any relation-specific menu items.

4.4.1 Adding to and Removing from a *MARKABLE_SET*-type Relation

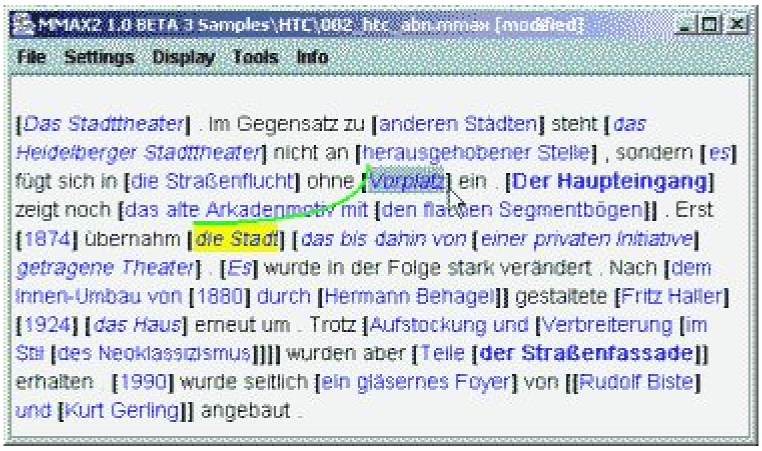
If you want to **add** a markable to a markable set, select it with the *right* mouse button. If the markable is not yet participating in a markable set (cf. below) and if the annotation scheme allows for this markable and the currently selected one to be in a markable set, a popup menu with the corresponding menu item will appear. The text of this menu item can be customized (in the annotation scheme) to reflect the semantics associated with this action. In the sample HTC annotation, the menu item will be *Mark as coreferent*. In addition to the text, the menu item will also contain a small box in the same color as used for graphically rendering relations of the respective type (Figure 8). Select this menu item by left-clicking it, and the markable


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax
File Settings Display Tools Info
Mark as coreferent

[*Das Stadttheater*] . Im Gegensatz zu [anderen Städten] steht [*das Heidelberger Stadttheater*] nicht an [herausgehobener Stelle] , sondern [*es*] fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [**Der Haupteingang**] zeigt noch [das alte Arkadenmotiv mit [den fla st [1874] übernahm [die Stadt] [*das bis dahin von* [*einer privaten Initiative*] *getragene Theater*] . [*Es*] wurde in der Folge stark verändert . Nach [dem Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller] [1924] [*das Haus*] erneut um . Trotz [Aufstockung und [Verbreiterung [im Stil [des Neoklassizismus]]]] wurden aber [Teile [**der Straßenfassade**]] erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste] und [Kurt Gerling]] angebaut .

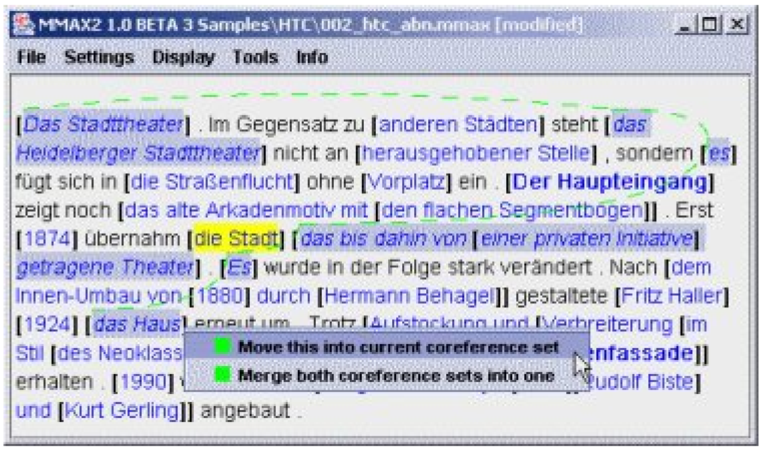
Figure 8: Relation Modification: Adding a Markable to a Markable Set

will be added to the markable set. As a result, the newly added markable will be graphically linked to its most recent document-order predecessor and successor (unless it is the first or the last markable in its set, respectively). Also, the newly added markable will be rendered according to its new status with respect to the relation: since in the HTC sample annotation, italic font is defined for coreference-level markables participating in coreference sets, the markable will be rendered in italics (Figure 9). Finally, the attribute window is also affected by the operation: Since adding a markable to a markable set basically means setting the markable's corresponding attribute value to the ID of the markable set, the value for this attribute (here: **Coref_class**) changes . If the currently selected markable was not previously in a markable set and it was only through the addition of a markable that a set came into existence (as in Figure 9), the currently selected markable's rendering style and **Coref_class** attribute will also be changed.
The procedure described above is the most simple case of adding a markable to a markable set. Things are more complex if the markable to be added is *already participating in a another markable set* ***from the same relation***. If this is the case, you can decide to *adopt* the selected markable, or to *merge* both sets. The set of which the selected markable is part is displayed in a dashed line style. In addition, a popup menu with (at least) two menu items will appear (Figure 10). The texts of both items can be customized (in the annotation scheme) to reflect the semantics associated with the respective action. In the sample HTC annotation, the first menu item will be *Move this into current coreference set*. Selecting this item will *adopt*



[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern [es]
fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der Haupteingang]
zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst
[1874] übernahm [die Stadt] [das bis dahin von [einer privaten Initiative]
getragene Theater] . [Es] wurde in der Folge stark verändert . Nach [dem
Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller]
[1924] [das Haus] erneut um . Trotz [Aufstockung und [Verbreiterung [im
Stil [des Neoklassizismus]]]] wurden aber [Teile [der Straßenfassade]]
erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste]
und [Kurt Gerling]] angebaut .

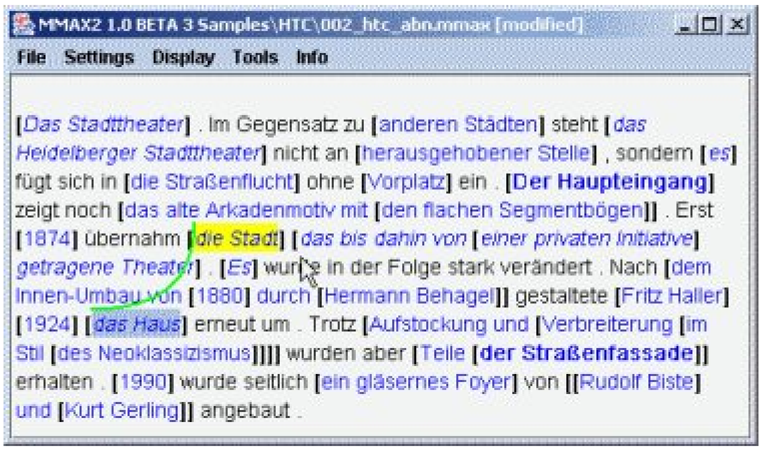
Figure 9: Relation Modification: Newly Created (Two-Element) Markable Set


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax [modified]
File
Settings
Display
Tools
Info
Move this into current coreference set
Merge both coreference sets into one

[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern [es]
fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der Haupteingang]
zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst
[1874] übernahm [die Stadt] [das bis dahin von [einer privaten Initiative]
getragene Theater] . [Es] wurde in der Folge stark verändert . Nach [dem
Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller]
[1924] [das Haus] erneut um . Trotz [Aufstockung und [Verbreiterung [im
Stil [des Neoklass nfassade]]
erhalten . [1990] udolf Biste]
und [Kurt Gerling]] angebaut .

Figure 10: Relation Modification: Adding a Set-Member to another Set

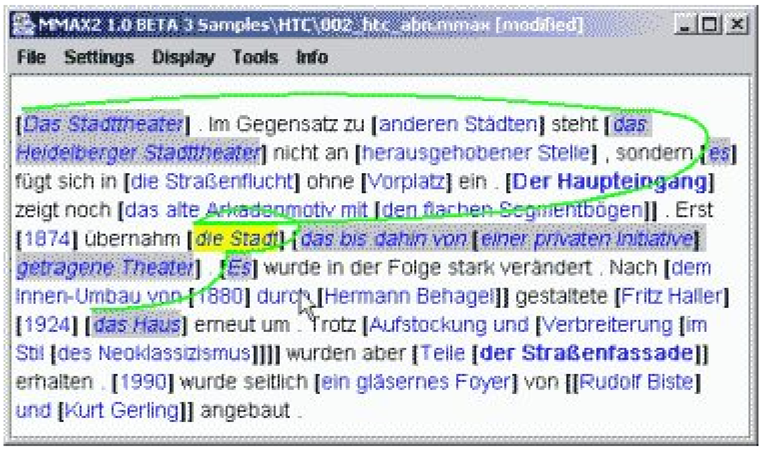
the selected markable, i.e. it will be removed from its current and added to the new markable set (Figure 11). If the markable set that the ’adoptee’ markable was part of ceases to exist as a result of the markable’s


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax [modified]
File Settings Display Tools Info

[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern [es]
fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der Haupteingang]
zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst
[1874] übernahm [die Stadt] [das bis dahin von [einer privaten Initiative]
getragene Theater] . [Es] wurde in der Folge stark verändert . Nach [dem
Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller]
[1924] [das Haus] erneut um . Trotz [Aufstockung und [Verbreiterung [im
Stil [des Neoklassizismus]]]] wurden aber [Teile [der Straßenfassade]]
erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste]
und [Kurt Gerling]] angebaut .

Figure 11: Relation Modification: Result of Markable Adoption

removal, all set-related attributes and rendering styles will be removed from the left-over markable as well. The second menu item will be *Merge both coreference sets into one*. Selecting this item will *merge* the sets of the markable to be added and the set the currently selected markable participates is (if any) (Figure 12).


MMAX2 1.0 BETA 3 Samples\HTC\002_htc_abn.mmax [modified]
File Settings Display Tools Info

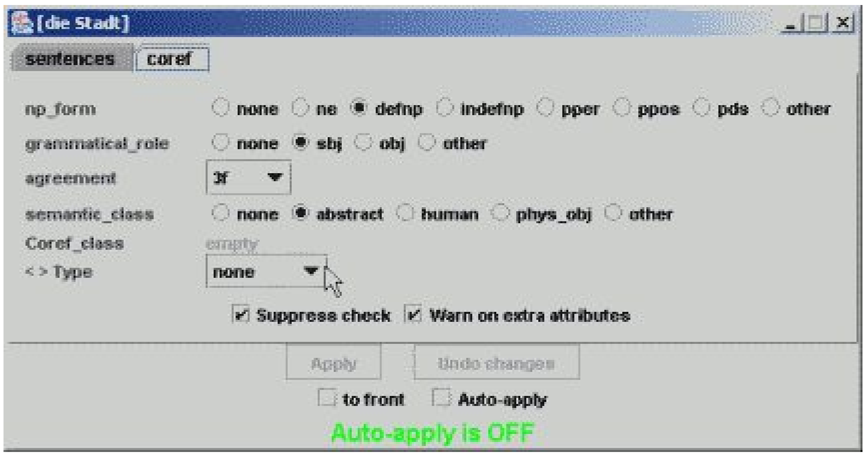
[Das Stadttheater] . Im Gegensatz zu [anderen Städten] steht [das
Heidelberger Stadttheater] nicht an [herausgehobener Stelle] , sondern [es]
fügt sich in [die Straßenflucht] ohne [Vorplatz] ein . [Der Haupteingang]
zeigt noch [das alte Arkadenmotiv mit [den flachen Segmentbögen]] . Erst
[1874] übernahm [die Stadt] [das bis dahin von [einer privaten Initiative]
getragene Theater] . [Es] wurde in der Folge stark verändert . Nach [dem
Innen-Umbau von [1880] durch [Hermann Behagel]] gestaltete [Fritz Haller]
[1924] [das Haus] erneut um . Trotz [Aufstockung und [Verbreiterung [im
Stil [des Neoklassizismus]]]] wurden aber [Teile [der Straßenfassade]]
erhalten . [1990] wurde seitlich [ein gläsernes Foyer] von [[Rudolf Biste]
und [Kurt Gerling]] angebaut .

Figure 12: Relation Modification: Result of Markable Set Merge

You can **remove** any markable except the currently selected one from a markable set. If you want to remove a markable from a markable set, select it with the *right* mouse button. A popup menu with the corresponding menu item will appear. The text of this menu item can be customized (in the annotation scheme) to reflect the semantics associated with this action. In the sample HTC annotation, the menu item will be *Unmark as coreferent*. In addition to the text, the menu item will also contain a small box in the same color as used for graphically rendering relations of the respective type. Select this menu item by left-clicking it, and the markable will be removed from the markable set. Its set-related attributes and rendering styles will be removed, and the graphical links to other members of the left set will disappear. If the removed markable was the second but last in the set, the set ceases to exist, and set-related attributes and rendering styles will be removed from the left-over currently selected markable as well.

4.4.2 Adding to and Removing from a *MARKABLE_POINTER*-type Relation

Due to their non-transitivity, *MARKABLE_POINTER*-type relations are quite simple to manage. To **add** a pointer relation from the currently selected markable (the *source* markable) to some other markable (a *target*), select the latter with the *right* mouse button. Whether the currently selected markable can be the source of a pointer relation, and whether the selected target markable is allowed depends on whether the markables meet certain conditions defined in the annotation scheme. In order to be able to point to a bridging antecedent, a markable has to have the value *bridging* in its **Type** attribute. If **Type** has some other value, the **Bridging_antecedent** attribute will not be visible in the attribute window, and the relation thus not allowed for the markable (Figure 13). Changing the value of **Type** from *none* to *bridging* will cause

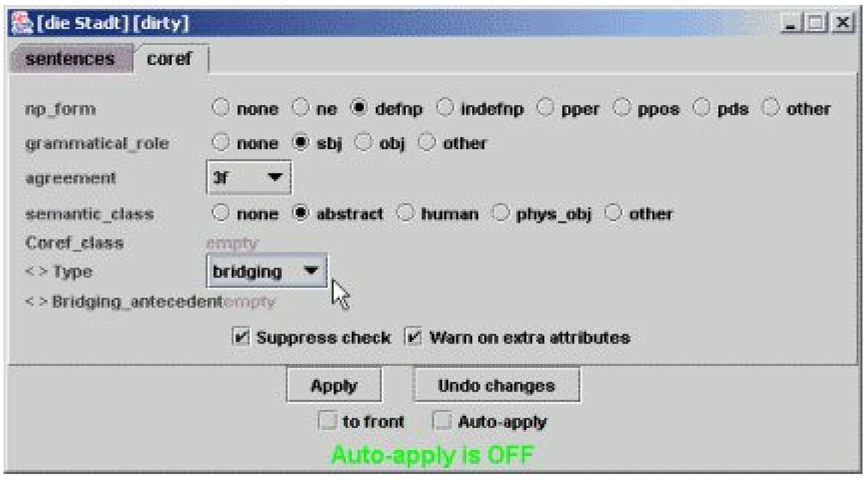


np_form: none ne [✓ defnp] indefnp pper ppos pds other
grammatical_role: none [✓ sbj] obj other
agreement: 3f
semantic_class: none [✓ abstract] human phys_obj other
Coref_class: empty
< > Type: none
[✓ Suppress check] [✓ Warn on extra attributes]

Figure 13: Relation Modification: **Bridging_antecedent** not accessible

an additional attributes to appear in the attribute window (Figure 14). After clicking the *Apply* button, the currently selected markable will be annotated as *bridging*, and will be a valid source markable for the **Bridging_antecedent** pointer relation. For potential target markables, the annotation scheme only defines that they have to be markables from the *coref* level.[15] If source and satellite markable fulfill the respective conditions, a popup menu with the corresponding menu item will appear. The text of this menu item can be customized (in the annotation scheme) to reflect the semantics associated with this action. In the sample HTC annotation, the menu item will be *Mark as bridging antecedent* . In addition to the text, the menu item will also contain a small box in the same color as used for graphically rendering relations of the respective type. In the sample HTC annotation, blue is used for pointers to bridging antecedents. Select the menu item by left-clicking it, and a pointer relation from source to satellite markable will be added. As result, a blue line from the source to the satellite markable will be drawn . Also, the ID of the satellite markable will be added to the **Bridging_antecedent** attribute of the source markable .[16]
The following things have to be noted: For the HTC sample annotation, the annotation scheme defines that a markable can have at most *one* brigding antecedent. If a markable already has a bridging antecedent, adding another one is thus not possible. The size limitation, however, is optional for the annotation scheme,

[15]The annotation scheme can also define that markables from *other* levels can be target markables.
[16]Note that the attribute window will only show the number part of the ID, and not the *markable* name space.


[die Stadt] [dirty]

sentences | coref

np_form: none ne [✓ defnp] indefnp pper ppos pds other

grammatical_role: none [✓ sbj] obj other

agreement: 3f

semantic_class: none [✓ abstract] human phys_obj other

Coref_class: empty

< > Type: bridging

< > Bridging_antecedent: empty

[✓ Suppress check] [✓ Warn on extra attributes]

Auto-apply is OFF

Figure 14: Relation Modification: **Bridging_antecedent** accessible after Attribute Modification

so that in principle pointer relations with arbitrarily many target markables are allowed. Also, since *MARKABLE_POINTER*-type relations are directed, targets themselves do not have any clue that they are being pointed at; consequently, adding a pointer from some markable to a target markable will *not* alter the latter's attributes.

To **remove** a pointer to a certain target markable, select it with the *right* mouse button. A popup menu with the corresponding menu item will appear. The text of this menu item can be customized (in the annotation scheme) to reflect the semantics associated with this action. In the sample HTC annotation, the menu item will be *Unmark as bridging antecedent*. In addition to the text, the menu item will also contain a small box in the same color as used for graphically rendering relations of the respective type . Select this menu item by left-clicking it, and the pointing relation will be removed. As a result, the satellite markable's ID is removed from the source markable's **Bridging_antecedent** attribute, and the blue line disappears.

5 Modifying Base Data

The term *base data* refers to that part of a MMAX2 project which underlies the actual annotation. i.e. the data *to which* annotations in the form of markables are added. In most cases, the base data for a single project will consist of one file containing the individual words in a simple XML format. Although *in principle* base data should be read-only, there are situations in which it becomes necessary to modify the base data. These situations include

- correction of spelling errors in transcribed text
- correction of tokenization errors
- insertion of specially marked *empty* elements as reference elements for markables
- splitting of incorporated clitics
- ...

In order to allow for these modifications, MMAX2 (from version 1.0 beta 3 on) has been improved to support *basic actions* for addition, deletion and modification of base data elements via the GUI. By default, base data editing is *disabled*. In order to enable it, check the item **Enable base data editing** in the **Settings** menu in the main MMAX2 window. Once base data editing is enabled, elements can be modified by holding the **Control** key and at the same time right-clicking on a base data element in the display. The mouse pointer will change to a *cursor* type as long as the *Control* key is pressed.[17] After right-clicking a base data element, a popup menu with a series of options will appear. The individual options will be described below. After each modification, the currently selected style sheet is automatically reapplied in order to make the modifications visible. Also, the base date is marked as 'modified', and the **Base data** menu item in the **Save** menu (under **File**) is enabled. Use this menu item to save the modified base data. A backup copy of the current file will be created before it is overwritten, but note that only *one* backup copy is kept!

5.1 Modify an Element

This option allows to modify the text and (word-level!) attributes of a base data element. Upon selecting it, a small *Edit base data* window appears. This window contains in its upper part a text field with the selected base data element's *text*, and in its lower part a text field with the selected base data element's *attributes*[18]. The upper text field can be edited to reflect the modifications that you want to make to the element's text. **Note:** It is not possible to split an element by putting a space character into a word. Even though the element will appear as 'two' words in the display, neither part can be selected separately! Spliting an element into two (or more) must be done by modyfing the existing element and adding new ones (cf. below). In the lower text field, space-separated attribute-value pairs can be added or removed. Both fields have an associated list box that contains text that has recently been entered in the respective fields. Selecting an entry from one box will set the text of the associated text field accordingly. If you are satisfied with your modificatins, click the **OK** button to apply the modifications. Otherwise, click **Cancel** to leave the base data unaltered.

[17]If this does not happen, make sure that the display can recognize key events. Do this by left-clicking once somewhere in the display! This is necessary only once for each MMAX2 session.

[18]Note that these attributes have nothing to do with *markable* attributes! Base data element attributes are only used to store information about individual base data elements, e.g. that an element is a separator or an empty element.

5.2 Delete an Element

This option allows to completely delete a base data element from the project. In contrast to mere base data element *modification* (cf. above), element deletion can affect the integrity of existing annotations: If the element to be deleted is the first, last or only element in a markable, deleting it requires to adapt or delete the respective markable(s) as well. Therefore, a check is performed prior to deletion in which potentially affected markables are determined. If at least one such markable is found, the user is prompted to either explicitly acknowledge the modification of the affected markables, or to cancel the deletion process. If no affected markables are found, or if the user acknowledges the markable modification, the element is deleted. Note that base data element deletion does not affect the annotation if the base data element in question is somewhere *in the middle* of one or more markables, since markable spans are defined by their first and last elements only, and the are resolved by simply retrieving all intermediate base data elements.

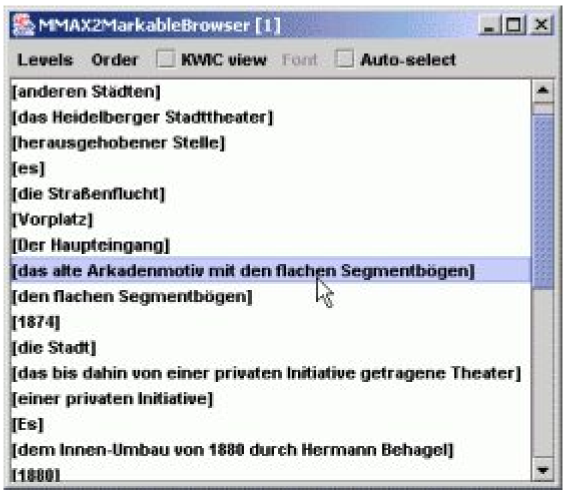
5.3 Insert an Element

This option, finally, allows to insert a new base data element to the left or right of the selected element. Upon selecting this option, the small *Edit base data* window appears. This window contains in its upper part a empty text field into which the new base data element's *text*, can be entered, and in its lower part a text field for the new base data element's *attributes*. Both fields have an associated list box that contains text that has recently been entered in the respective fields. Selecting an entry from one box will set the text of the associated text field accordingly. After entering the new element's text and / or attributes, click the **OK** button to insert the new element. Otherwise, click **Cancel** to not insert anything. It is worth noting how IDs for manually added base data elements are created: First, the base data elements to the immediate left and right of the insertion position are determined. Then, the numerical part of the left neighbour's ID is subtracted from the numerical part of the right neighbour's ID. This difference is then divided by two and added to the left neighbour's numerical part. The resulting number is then used as the numerical part of the new ID to be created. In effect, this will produce base data element IDs whose numerical parts are not integers but doubles.

6 Tools

6.1 Markable Browser

The ***markable browser*** is a tool for visualizing and browsing markables on a certain level. A new instance of a markable browser can be opened by means of the respective menu item in the **Tools** menu. The browser will then be opened with default setting, displaying the markables from the top markable level[19] in alphabetic order. It can also be opened by right-clicking a markable in the display and choosing the initial order .[20] A markable browser consists of a scrollable list of markables. If it was opened by means of a right-click on a markable, this markable will initially be selected (Figure 15). The markable that is currently



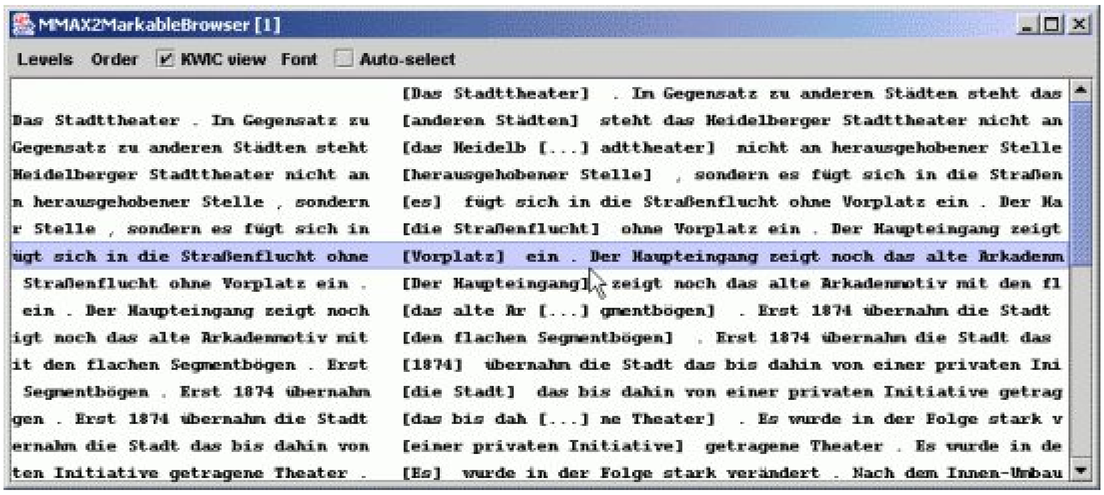
[anderen Städten]
[das Heidelberger Stadttheater]
[herausgehobener Stelle]
[es]
[die Straßenflucht]
[Vorplatz]
[Der Haupteingang]
[das alte Arkadenmotiv mit den flachen Segmentbögen]
[den flachen Segmentbögen]
[1874]
[die Stadt]
[das bis dahin von einer privaten Initiative getragene Theater]
[einer privaten Initiative]
[Es]
[dem Innen-Umbau von 1880 durch Hermann Behagel]
[1880]

Figure 15: Normal Markable Browser View

selected in the list appears shaded in the MMAX2 display. Moving the selection in the list (by means of the cursor keys or the mouse) moves the shaded markable selection in the display. Double-clicking a markable in the markable browser has the same effect as selecting it in the display: its attributes are displayed in the attribute window, and any relations it participates in are rendered graphically. If the *Auto-select* box in the markable browser's menu bar is checked, a single mouse click or list cursor movement suffices to select the markable. This is particularly useful for stepping through the entire annotation without having to select individual markables with the mouse. The displayed markable level and the order of display can be changed by means of the **Levels** and **Order** menu, respectively. Note that several markable browsers (with different levels and/or display orders) can be open simultaneously! A special feature is the KWIC view: By checking the *KWIC view* box in the markable browser's menu bar, each markable will be displayed as a keyword within context (Figure 16). This view is available for both document and alphabetic order (Figure 17). If the KWIC view is selected, the **Font** menu becomes available. This menu allows to select the font used for the KWIC view. The default font is a fixed-size courier font, which will suffice in most cases. However, if e.g. Korean data is displayed, this menu item must be used to select some (at least more or less) fixed-size font. Without a fixed-size (i.e. non-proportional) font, the KWIC view will not work correctly.
Each markable browser monitors the markables of the level it is currently displaying. Relevant changes (i.e. creation and deletion of markables) cause the markable browser to automatically refresh itself.

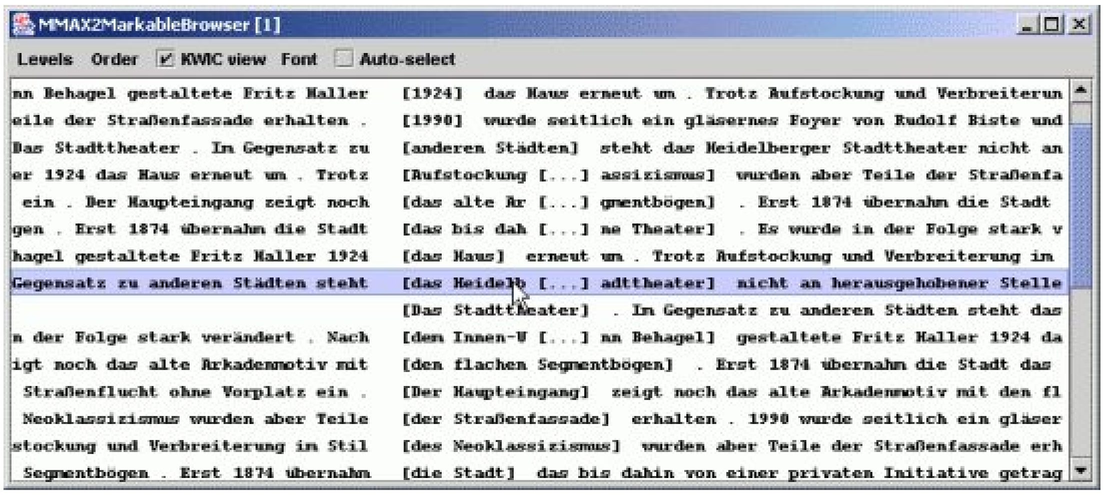
[19]As defined in the markable level control panel

[20]Note that this will only work if no other markable is currently selected.



```
                                    [Das Stadttheater]  . In Gegensatz zu anderen Städten steht das
Das Stadttheater . In Gegensatz zu  [anderen Städten]  steht das Heidelberger Stadttheater nicht an
Gegensatz zu anderen Städten steht  [das Heidelb [...] adttheater]  nicht an herausgehobener Stelle
Heidelberger Stadttheater nicht an  [herausgehobener Stelle]  , sondern es fügt sich in die Straßen
n herausgehobener Stelle , sondern  [es]  fügt sich in die Straßenflucht ohne Vorplatz ein . Der Ha
r Stelle , sondern es fügt sich in  [die Straßenflucht]  ohne Vorplatz ein . Der Haupteingang zeigt
ügt sich in die Straßenflucht ohne  [Vorplatz]  ein . Der Haupteingang zeigt noch das alte Arkadenm
 Straßenflucht ohne Vorplatz ein .  [Der Haupteingang]  zeigt noch das alte Arkadenmotiv mit den fl
 ein . Der Haupteingang zeigt noch  [das alte Ar [...] gmentbögen]  . Erst 1874 übernahm die Stadt
igt noch das alte Arkadenmotiv mit  [den flachen Segmentbögen]  . Erst 1874 übernahm die Stadt das
it den flachen Segmentbögen . Erst  [1874]  übernahm die Stadt das bis dahin von einer privaten Ini
 Segmentbögen . Erst 1874 übernahm  [die Stadt]  das bis dahin von einer privaten Initiative getrag
gen . Erst 1874 übernahm die Stadt  [das bis dah [...] ne Theater]  . Es wurde in der Folge stark v
ernahm die Stadt das bis dahin von  [einer privaten Initiative]  getragene Theater . Es wurde in de
ten Initiative getragene Theater .  [Es]  wurde in der Folge stark verändert . Nach dem Innen-Umbau
```

Figure 16: Markable Browser KWIC View: Document Order



```
mn Behagel gestaltete Fritz Haller  [1924]  das Haus erneut um . Trotz Aufstockung und Verbreiterun
eile der Straßenfassade erhalten .  [1990]  wurde seitlich ein gläsernes Foyer von Rudolf Biste und
Das Stadttheater . In Gegensatz zu  [anderen Städten]  steht das Heidelberger Stadttheater nicht an
er 1924 das Haus erneut um . Trotz  [Aufstockung [...] assizismus]  wurden aber Teile der Straßenfa
 ein . Der Haupteingang zeigt noch  [das alte Ar [...] gmentbögen]  . Erst 1874 übernahm die Stadt
gen . Erst 1874 übernahm die Stadt  [das bis dah [...] ne Theater]  . Es wurde in der Folge stark v
hagel gestaltete Fritz Haller 1924  [das Haus]  erneut um . Trotz Aufstockung und Verbreiterung im
Gegensatz zu anderen Städten steht  [das Heidelb [...] adttheater]  nicht an herausgehobener Stelle
                                    [Das Stadttheater]  . In Gegensatz zu anderen Städten steht das
n der Folge stark verändert . Nach  [dem Innen-U [...] mn Behagel]  gestaltete Fritz Haller 1924 da
igt noch das alte Arkadenmotiv mit  [den flachen Segmentbögen]  . Erst 1874 übernahm die Stadt das
 Straßenflucht ohne Vorplatz ein .  [Der Haupteingang]  zeigt noch das alte Arkadenmotiv mit den fl
 Neoklassizismus wurden aber Teile  [der Straßenfassade]  erhalten . 1990 wurde seitlich ein gläser
stockung und Verbreiterung im Stil  [des Neoklassizismus]  wurden aber Teile der Straßenfassade erh
 Segmentbögen . Erst 1874 übernahm  [die Stadt]  das bis dahin von einer privaten Initiative getrag
```

Figure 17: Markable Browser KWIC View: Alphabetic Order

6.2 Project Wizard (updated for version 1.0 beta 4)

The MMAX2 Project Wizard (included in MMAX2 1.0 beta 3 and later) can be used to create MMAX2 annotation projects from raw text files and XML files. The wizard can be opened by selecting the *Project Wizard* item in the *Tools* menu in the main application window.

Overview Each MMAX2 project consists of several files:

- one *base data* file containing the individual tokens (mostly words) in a simple XML format
- for each markable level defined in the project
  - one *markable* file containing references to elements in the base data file and the associated attributes in a simple XML format
  - one *scheme* file containing the specification which attributes and which possible values can be applied to markables on the respective level
  - one *customization* file containing the specification of how markables are to be displayed depending on their attributes
- at least one XSL *style* file specifying the layout of tokens and markables in the MMAX2 display (see document mmax2stylesheets.pdf in the Doc directory).
- a file named `common_paths.xml` containing references to the directories where the above files can be found, and a list of all defined style sheets
- a `.mmax` project file containing references to all files comprising the project

The purpose of the MMAX2 Project Wizard is to assist you in the creation of a MMAX2 project, given that you have a raw text file or XML file that you want to annotate. In its current version, the wizard does

- create the *base data* file by applying a simple tokenizer to your raw text or XML input file
- create one or more markable levels, optionally also creating markables on the basis of structural information in the input file, or from XML tags
- create customization files, default scheme files, and a (customizable) style file
- create the `common_paths.xml` and the `.mmax` project file

In a nut shell, the whole process consists of the following steps:

1. Open the MMAX2 Project Wizard.
2. Select the raw text or XML input file and its character encoding.
3. Specify tokenization parameters (or leave the default), and tokenize the input text.
4. Create *at least* one markable level by specifying its name and basic display properties.
5. Specify the paths to which the project is to be written.
6. Create the project.

Using the Wizard After opening the wizard (by selecting the *Project Wizard* item in the *Tools* menu in the main application window), you will see a window containing four different sections. Each section contains the controls required for a particular step in the project creation process. These steps will be described in more detail in the following.

6.2.1 Input File Selection

The top window section (**Text Input File**) lets you select the input file that you want to base your annotation project on. To select a file, click the small *Pick* button. A dialog window will open, and you can click your way to the desired file. Note that although files of all types are shown in the dialog window, only raw text files (in various character encodings, though) and XML files, are supported in the current version. You can then specify the character encoding that you know (or assume) the input file to be in. For plain text files, the default setting US-ASCII is correct. For other (e.g. UNICODE formats), a different encoding has to be selected. You can use the button labeled *Analyse File* to read a portion of the text in the encoding specified. Clicking this button will show a window with some input file statistics and the beginnings of the first 15 lines. Empty lines in the input are replaced by the special <EMPTY> tag. If the text is rendered correctly, the selected encoding can be assumed to be correct. Note that, if unsure, you can try several encodings by using the *Analyse File* button more than once. Each change to either the input file or the encoding requires that you re-analyze the file. Note also that you *must* click the *Analyse File* button at least once in order to be able to perform the next processing step.

XML Input Files From version 1.0 beta 4 on, the Project Wizard also supports the import of XML files. XML input files can be selected and previewed just like normal plain text files. As the wizard does not automatically recognize the file type, the option *XML* MUST be checked if XML input is used. After modifying this option, the *Analyze File* button has to be clicked again. Failure to check the *XML* option will cause XML tags in the input to be broken by the tokenizer in the next step.
Important note: The XML import capability of the project wizard is still limited in that embedded elements of the same tag name (e.g. <line><line></line></line>) are currently not treated correctly!

6.2.2 Tokenization

The next window section (**Tokenization**) contains controls for setting the tokenization parameters for the input file. *Tokenization* refers to the process of splitting the input text into individual words and interpunction. Each token created in this process is assigned a unique ID and is then written to the project's *base data* file. The tokenization process is important because it defines the *granularity* of the annotation, i.e. which base data elements will be individually accessible for annotation.
By default, input *plain* text is first roughly pre-tokenized by splitting everything separated by white space. The following, more fine-grained tokenization is controlled by the parameters specified in this Project Wizard window section. The text field labeled *Split leading* contains individual characters (separated by space) that, when found at the beginning of a token, you want to be separated to constitute a token themselves. You can edit the tokens to be cut off by adding or deleting individual characters in the text field. As long as the text field contains the " character, the option *Convert " to _oq_* is available. Checking this option (default) will cause a " character that is found at the beginning of a word (i.e. an *opening quote*) to be converted into _oq_. The text field labeled *Split trailing* works similarly for characters that, when found at the end of a token, you want to be treated as individual tokens. The period character (.), however, has a special meaning in this text field. As long as the *Split trailing* text field contains the period character,

the two options *Use abbrev. list* and *Use abbrev. heuristics* will be available. Checking the first option causes the tokenizer to consult the file `abbrevs.txt` (in the MMAX2 root directory) before cutting off a trailing period character: If the current token is found in this (user-editable) abbreviation list, the period is *not* cut off. Checking the second option will apply a very simple heuristic for abbreviation recognition. The heuristic causes a trailing period *not* to be cut off when the current token contains another period character in non-final position. This is able to recognize abbreviations like *U.S.A* or *I.T.* In addition to the above options, the option *Use global replacement list* is also available. If this option is checked, the tokenizer will consult the file `replacements.txt` (in the MMAX2 root directory). This (user-editable) file contains patterns that tell the tokenizer how to treat certain strings encountered in the input. The patterns have to be specified in the form `match:::result`. E.g., in order to make the tokenizer split off negation suffixes from their stem, the pattern

```
n't::: n't
```

can be used. It tells the tokenizer to replace every occurrence of ”*n't*” with a white space followed by ”*n't*”. Since a white space is a default token separator, this will cause the suffixes to be treated as individual tokens.

Important Note Obviously, the tokenizer in its current form is pretty simple, as it does only know some simple rules and cannot handle exceptions or more complex rules. In addition, it is inherently language-dependent. However, adding a more powerful *generic* or at least highly configurable tokenizer is definitely beyond the scope the project wizard, since that would result in an independent non-trivial application. Therefore, the project wizard has an additional option, which allows to *read a pre-tokenized file as input*. This file can be produced by whatever external tokenizer is considered the best for the current text, as long as it produces a file with one token per line. The built-in tokenizer can be skipped by simply checking the *Input file is one token per line* option. In effect, this will let the input file pass through unaltered. Note that using this option will prevent *any* modifications of the input file, including the pre-tokenization where lines are split at white space.
Click the *Tokenize* button to tokenize the selected input text file using the specified parameters (or none if the input is already tokenized). This will tokenize the entire text, and create a temporary `.tokens` file. In addition, a *Token preview* window containing a list of the first 5000 tokens will be displayed. If applicable, this list will contain opening and closing <EMPTY> and <EOL> meta-tokens that are automatically inserted by the tokenizer. These will *not* be included in the base data, but can be useful for automatic markable creation (cf. below). You can experiment with different settings by changing parameters and inspecting the tokenization result in the *Token preview* window. Note that the following steps (cf. below) will always use the result of the *last* tokenization process. Note also that changing any tokenization parameters requires a re-application of the tokenizer.

Tokenizing XML For XML input files, tokenization is slightly different. XML tags are recognized in the input by looking for lines beginning and ending with < and > respectively. If a line has been recognized as an XML tag, it is *not* tokenized in any way: Neither the default tokenization on white space nor any other modification is performed. Tokenization *is* performed, however, on any textual children a tag may have. If a tag is empty, i.e. has no textual content (like e.g. <`pause/`>), the name of the tag is treated as if it was its textual content, i.e. as if the tag was <`pause`>`pause`< `/pause`>. This has to be done because markables need to be anchored to textual elements, so such an element must exist if the <pause/> element is to be preserved in the converted file. If the empty element has one or more attributes, the user is prompted during tokenization to select the value of which attribute is to be taken as the elements textual content. Since the value selected here is the one that will be displayed in the MMAX2 display, it is advised to select an attribute that describes the content of the tag, and not e.g. an *ID* attribute. In the base data file, elements introduced in this way are tagged with the attribute `meta='true'`, in order to signal that they are 'different' than normal textual content elements.[21]

6.2.3 Markable Level Creation

Markable levels and the markables existing on them are of major importance in a MMAX2 project because the markables are the carriers of the actual annotation information. The third window section (**Markable Levels**) contains the means to create markable levels and to (at least partly) populate them with markables based on structural or XML-tag information in the input file (cf. below).
Arbitrarily many levels can be added by clicking the *Add level* button. New levels will be added at the bottom of the list. The position of a level can be modified by using the arrow buttons associated with it. Clicking the *X* button on the right will delete a level.
A markable level is defined by specifying the following (partly optional) parameters.

- **Name**: A unique name must be specified for each level. The name must not contain any white space or other special characters, and should describe the type of annotation that the level is to contain.
- **Source**:[22] This (optional) parameter can be used to automatically create markables on the respective level, based on structural information or XML tags in the input file. At present, the following values are supported:
  - **NONE** (default): No markables will be automatically created.
  - **WORD**: One markable will be created for each word, i.e. for each token.
  - **EOL**: One markable will be created for each token sequence ending with a new-line character. If your input data contains e.g. one *sentence* per line, use this value to create a markable level with one markable per sentence. Note that this value is equivalent to the *WORD* value (cf. above) if you use a pre-tokenised input file.
  - **EMPTY**: One markable will be created for each token sequence ending with an empty line. Similar to the *EOL* value, this value can be used to create a markable level with e.g. one markable per *paragraph*. Alternatively, if you use a pre-tokenized input file containing sentence breaks, empty lines can be used to represent these sentence breaks.
  - <**XML tag name**>: If the input file is in XML, the list will also contain one value for each XML tag found in the input file. Selecting one of them will cause one markable to be inserted for each XML element of the selected name.[23] XML *attributes* will automatically be copied to the created markable, thus preserving all the information from the original XML file.
  - **specify ...** This option will be available only if the input file is in XML. It can be used if markables for different XML tags are to be added on the same level. Selecting this value will enable the text field to the right. This text field contains a comma-separated list of the names of all XML tags found in the input file. You can specify for which tags markables are to be

[21] In the tokenization preview list, these elements have a double tilde prepended to them. This will be removed before the elements are written to the base data file.
[22] The range of values for this attribute will be improved in later versions, including support for *user-defined* meta-tags and ways to directly include external pre-processing components.
[23] XML headers are ignored.

created by editing the list and removing all names you don't want on the level. Note that the remaining names must still be comma-separated. If more than one tag name remains in the list (which should be the normal case), the markables created for each will have a `type` attribute specifying the name of the XML tag from which they were created.

- **Handles**: This (optional) parameter can be used to specify the type of *markable handles* used for markables on this level, if any. By default, no handles will be supplied.
- **Color**: This (optional) parameter can be used to specify the color in which markables on this level are to be displayed. Select a color by clicking in the white field and choosing a color. The default color is black.
- **Style**: This (optional) parameter can be used to specify the font attributes in which markables on this level are to be displayed. The default style is *plain*.
- **CR**: This (optional) parameter can be used to insert a new-line *after* each markable on this level. If markable handles are also specified for this level, the new-line will be inserted after the closing handle. If no handles are specified, the new-line will be inserted after the last token of the markable.

Several things are to be noted here: As mentioned above, the order of markable levels can be modified by means of the arrow buttons. The order of levels has a non-trivial effect on the MMAX2 main display, and on the way markable handles are visualized. As a rule of thumb, levels should be ordered in such a way that those with *higher-level*, i.e. *longer* markables are *below* those with shorter markables. Thus, e.g. a *sentence* level could be at the bottom, a *phrase* level on top of it and finally a *pos* level on top of that. Even without markable handles, this is the only reasonable ordering because level-dependent markable customizations are applied from bottom to top as well: Having, e.g. the *sentence* level as the top-most level would mean that this level's customizations override the customizations of the two lower levels, rendering them potentially invisible.
In addition, it is strongly recommended that for at least one level the *CR* feature (cf. above) be used. Adding occasional new-lines has a positive effect on the MMAX2 main display speed. Put differently, having the entire text of a project in one large paragraph slows down the display *dramatically*. The most natural level to be used for inserting new-lines is the level *sentence*/*turn* or *paragraph*.

6.2.4 Project Creation

The last window section (**.MMAX Project**) contains mainly controls for specifying output file names and paths for the project to be created. The text field labeled *Project File Name* contains the name suggested by the wizard for the `.mmax` project file. It is created on the basis of the input file name, and can be modified by the user. The same is true for the text field labeled *WORDS File Name*, which contains the name for the base data file to be created. The two options *Create customizations* and *Create default scheme files* control if additional project files are created. Checking the first one (default) will create a customization file for those levels that have a non-default value in their *Color* and *Style* attributes. Note that these two attributes are not available if *Create customizations* is not checked. Checking the *Create default scheme files* option (default) will create an (empty) default scheme file for each level. Uncheck this option only if appropriate scheme files (named *level*_`scheme.xml`) are available at the scheme path location (cf. below).
The text field labeled *Project Path* contains the main project path, i.e. the directory to which the `.mmax` project file will be written. Specify a project path by clicking the small *Pick* button and selecting the desired path from your file system. **Important note:** Due to a requirement of the XML and XSL support used in

MMAX2, this path must not contain any white space! Therefore, the MMAX2 Project Wizard will not accept a path if it contains white space. Apart from the project path, five other paths have to be set that point to special directories containing base data, scheme, style, customization and markable files. Each of these paths can be set to a different location in your file system by clicking the associated *Pick* button. It is recommended that these paths point to different directories, so that the files are separated from each other, and are not all in the same directory as the project file. However, if you want to use the same path for each of the five subdirectory paths, you can click the *Use for all* button. Make sure that these paths do not contain any white space either! When all paths have been set, click the *Create project* button to create the MMAX2 project. After creation, you are prompted to load the newly created project. Note that the *Create project* button will not be accessible if, e.g. an unnamed markable level exists in the *Markable Levels* window section. If you do not like the current appearance, you can simply modify some wizard settings and create and load the project anew. Check the *Overwrite without asking* option to prevent the wizard from asking before an existing file is overwritten.
Note that from version 1.0 beta 4 on, references to markable levels will be written to the file `common_paths.xml`, and no longer to the individual .mmax files (cf. 2).