A USER'S GUIDE TO SIGNSTREAM® 3

Carol Neidle

With contributions from Joan Nash, Jessica Scott, Amelia Wisniewski-Barker, Yuliya Labkovskaia, Iryna Zhuravlova, Indya Oliver, Emma Preston, Rebecca Lopez, Blaze Travis, Aimee Aylward, Amanda Gaber, and Chelsea Hammond.

Boston University, Boston, MA

© August 2017

Contents

1   Introduction

SignStream® is a software tool designed to facilitate the linguistic annotation of video language data. A Table of Contents for this document can be found starting on p. 83.

1.1   History and Features New to Version 3

The first incarnation of this program resulted from a collaborative venture involving Boston University (Carol Neidle, Robert G. Lee, and Dawn MacLaughlin), Dartmouth College (David Greenfield, application developer, and Otmar Foelsche, Director of the Department of Humanities Resources), Gallaudet University (Ben Bahan), and Rutgers University (Judy Kegl). David Greenfield was responsible for development of the program from the first beta version released in 1997 through version 2.2.2, released in 2003. At that point, SignStream® was a Mac Classic application (which ran on Mac OS 8.1 through OS X and required QuickTime 4 or later). Further information is available from [1-4, 6, 9-11]. The documentation of annotation conventions is still, by and large, applicable to the current version: see [5, 7] and Sections 15 and 1516 of this document.

SignStream® 3 is a Java application that builds heavily on this earlier work, but it is different in many ways and incorporates a considerable number of new features. Development of this latest version has been carried out since July 2015 by application developer Gregory Dimitriadis, under the supervision of Augustine Opoku (through January 2016) and Douglas Motto (thereafter) in the Rutgers Laboratory for Computer Science Research.[1]

Some of the principal differences between versions 2 and 3 include the following:

- The organization is significantly changed. In version 2, it was possible to annotate multiple (non-temporally synchronized) videos within a single SignStream file. In version 3, however, a separate "Collection" (aka file) needs to be created for each unique video timeline. Note that multiple synchronized videos are still supported.

- In version 3, there is a level of representation for segmentation of utterances (the "Database View"), as well as a separate level for detailed annotations of those utterances (the "Utterance View").

- In addition, in version 3, multiple annotation tiers can be set up in the Database View (and then displayed, individually or in temporally aligned combination, at the utterance level). It is possible to cut up the video timeline into utterances in different ways (e.g., in a dialog, dividing up the utterances of each of the two signers into distinct Temporal Partitions, but keeping them aligned relative to one another), and/or to have multiple tiers for a given temporal segmentation, so as to allow annotations from different annotators, for example, to be viewed together and compared. (Ultimately, this capability will also allow importation of data from computer-based tracking, for use by or comparison with annotations of human annotators.)

---

[1] Developers who have contributed to this effort in past years include Jason Boyd and Iryna Zhuravlova.

- Along with the information about the video files to be annotated, information is stored about Participant(s) and Annotator(s); the data associated with the video clip are contained in what is referred to as the "Macro Unit." This includes the set of Participants that will be available to be associated with annotations in the given collection (i.e., file).

- Representation of gloss information on the two hands has changed significantly. Previously, gloss labels were inserted solely on the upper tier of the 2-handed display, with annotation on the second tier only in case the non-dominant hand was doing something unexpected, or something independent of what was being produced by the dominant hand. So, for a regular two-handed sign, we would only have included a gloss label in the main gloss tier, with nothing annotated for the second gloss tier. In version 3, however, labels appear in the non-dominant tier for all signs that involve use of the non-dominant hand; thus all 2-handed signs include gloss information on both of the gloss tiers.

- Version 3 makes it possible to encode morpho-phonological information about manual signs, including sign type (lexical, fingerspelled, etc.) and other properties, e.g., 1-handed vs. 2-handed. Handshape information is annotated through use of a handshape palette (specifically for ASL handshapes).

- There are tools to control the relationships between the annotations of the two hands, as well. So, for example, the two hands 'locked' by default (such that adjusting the start or end point of one automatically makes the same adjustment for the other) can also be unlocked, so that temporal differences in the activities of the two hands can be indicated.

- A new ASLLRP Sign Bank in version 3 makes it possible for the annotator to look up a lexical or number sign in the set of existing signs and potentially copy the relevant stored morpho-phonological information (subject to further editing), to save time and promote consistency in labeling. New items can be added to the Sign Bank, as well; these additions are stored locally.

- In version 3, visual display space for items is proportional to temporal duration (rather than, as in the previous version, adjusted as necessary to maintain alignments but minimize display space).

- Other new features include display of duration through tooltips (i.e., these appear when the user holds the cursor over the labeled item).

- An *Utterance Index* is available in the left-hand portion of the *Utterance window;* navigation can be accomplished by clicking on an utterance, or choosing **Next** or **Previous Utterance**. It is also possible to scroll or play straight through from one utterance to the next.

- A new Search module is also incorporated into the application; other kinds of searching through our existing corpora can be carried out via our new Data Access Interface (DAI 2); a link to the DAI 2 is available from http://www.bu.edu/asllrp/ .

1.2 System Requirements for SignStream® 3

SignStream® 3 requires Mac OS 10.8 (Mountain Lion) or above. You must also have Java 1.6 or later installed. If you do not have Java installed, you can find the latest version of Java at the following URL:

https://www.java.com/en/download/ .

For installation instructions, see Section 11.2.

1.3 Video Files

SignStream® relies on links to movie files provided by the user. The application accepts .mov and .mpg files for videos. Also, videos must be the same frame rate (otherwise SignStream will not play the videos in sync). If the relative location of the Collection and the video files changes, the user will need to relocate the movie files, as explained in Section 4.2.

1.4 Feedback, Comments, and Bug Reporting

See Section 12 for a partial list of known issues, and for a list of features that have not yet been implemented.

Comments and questions are very welcome and should be sent to **carol@bu.edu**. Ongoing development will benefit from any issues that may be reported (other than those listed in Section 12), but see the important caveats in the next section.

2   Licensing and Terms of Use

2.1   *Software*

The **SignStream® software** is being released under the terms of the MIT License:

External libraries Used by SignStream®

- Xuggler - Arthur Clarke   http://www.xuggle.com/
- Swingx - Sun Microsystems   https://mvnrepository.com/artifact/org.swinglabs/swingx
- Logback - Ceki Gulcu   https://logback.qos.ch/
- SLF4J - Ceki Gulcu   https://www.slf4j.org/
- Commons CLI - Apache Software Foundation   http://commons.apache.org/proper/commons-cli/

For details, see LICENSES-3RD-PARTY.txt, NOTICES.txt, and dep/ in the SignStream® distribution.

2.2   *SignStream-Related Data Files and Sign Bank Files Distributed by ASLLRP*

The **ASLLRP Sign Bank data files**, available for optional download, can be used in conjunction with the above software. However, all of the SignStream® data and video files distributed by the ASLLRP can be used only as stated here; users who download these materials are agreeing to the following *terms of use*:

These data can be used for research and education purposes, but cannot be redistributed without permission.

Commercial use, without explicit permission, is not allowed, nor are any patents and copyrights based on this material.

2.3   Acknowledging Use of Software and ASLLRP-distributed Data

Those who use the above software and data in research that is published or presented publicly are asked to acknowledge that use and to cite the appropriate references, including:

- o For SignStream® software
    - ▪ American Sign Language Linguistic Research Project (ASLLRP) [2017] SignStream® 3, available from http://www.bu.edu/asllrp/SignStream/3/download-newSS.html
    - ▪ This document: Carol Neidle (2017): A User's Guide to SignStream® 3. Boston, MA: American Sign Language Linguistic Research Project Report No. 15, Boston University. available from http://www.bu.edu/asllrp/reports.html
- o For other aspects of the ASLLRP Sign Bank and annotation conventions, the appropriate documents listed in the References at the end of this document and/or available from http://www.bu.edu/asllrp/talks.html, http://www.bu.edu/asllrp/reports.html, and http://www.bu.edu/asllrp/publications.html.

3 Essential Terminology and Overall Structure

3.1 Collections and Macro Units

A *Collection* (replacing what was formerly called a *file* in earlier versions of SignStream®) is assigned a Name by default (which includes the date of creation). However it is possible to save it with a different name by choosing [Save As…] from the Collection menu shown in Figure 1. A Collection can be saved (and users should save work frequently) by choosing [Save] from the Collection menu or typing ⌘S.
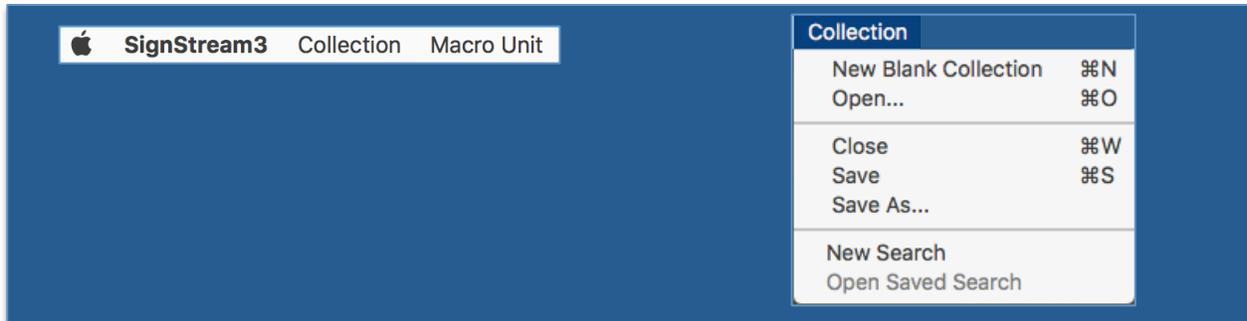

Figure 1. Menus at the top of the screen (left); Collection Menu Options (right)

A Macro Unit (MU) contains all the information associated with a single video file—plus up to three additional synchronized video files; it encompasses the video timeline and all associated annotations and meta-data. In the current implementation, there can be only one MU per Collection.[2]

3.2 Hierarchical Organization

3.2.1 *Database View* and *Video windows*

The *Database View window,* illustrated in Figure 2, displays a **Temporal Partition** tier for the selected **Macro Unit**. It is here that each Macro Unit is divided into smaller, non-overlapping, time units, each of which gets annotated separately. These **Utterances** (as they are called, because they often correspond to individual sentences, although they need not) are represented by **Utterance Bars** within the Temporal Partition. The user establishes the start and end points thereof and has an option to assign labels to them (otherwise they are labeled sequentially by default as U1, U2, etc.).

---

[2] Functionality for multiple Macro Units has yet to be implemented. Once that functionality becomes available, additional video files for different time periods will be able to be included within the same **Collection**, but these will have to be annotated within separate **Macro Units**.
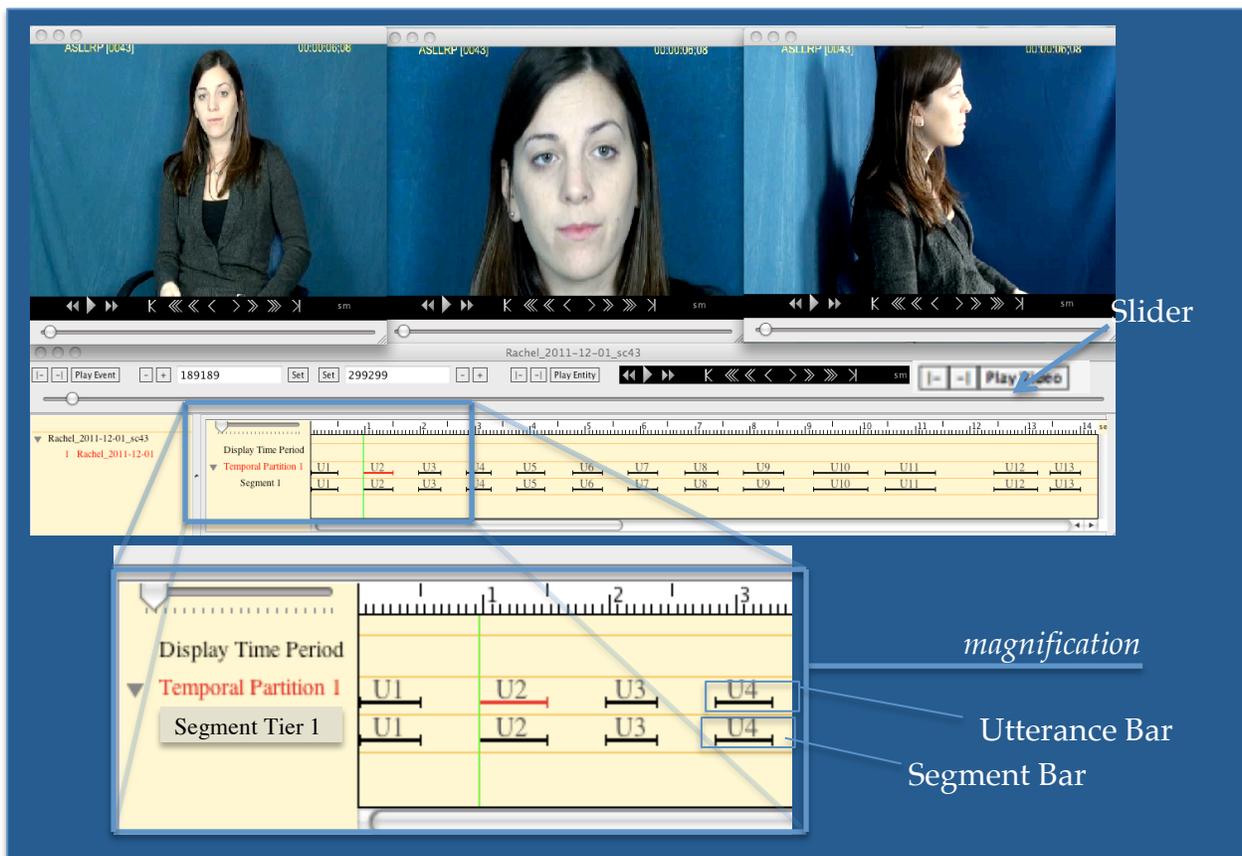
Figure 2. A portion of the *Database View window*, with the *Video windows* above

The **Macro Unit** video is temporally partitioned into smaller utterance-length units (here labeled "U1", "U2," etc.) to facilitate annotation. This is done within the **Temporal Partition**.

A **Segment Tier** is shown below the Temporal Partition (TP) in Figure 2. Each Segment Tier is associated with a unique Participant, from among those associated with the Macro Unit as a whole. The Participant for the selected Segment Tier is set via [(Re)name Participant] from within the Segment Tier sub-menu of the Macro Unit menu; see Figure 3.[3]
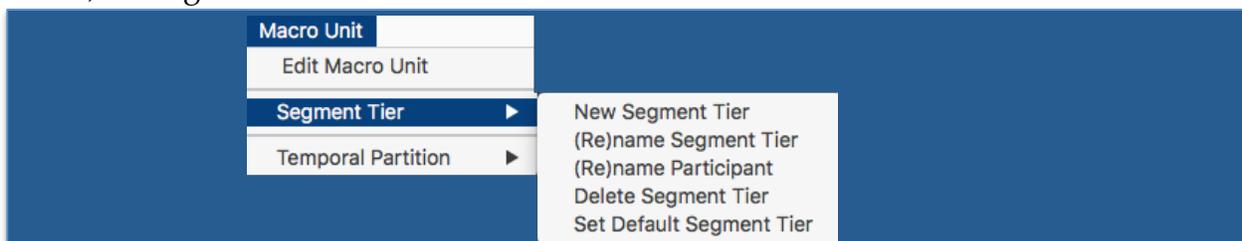

Figure 3. Segment Tier Sub-Menu

---

[3] Note that the Participant must be set explicitly, in this way, even if there is only 1 Participant that has been set up to be associated with the Macro Unit.

Segments are represented by bars within the Segment Tier, each of which has the same temporal boundaries as the corresponding Utterance Bar in the Temporal Partition. The linguistic annotations are carried out separately for each Segment. The possibility of having multiple Segment Tiers provides the potential (e.g.) for more than one distinct annotation for any given time slice of the video(s). A new Segment Tier can be created within a selected temporal partition from the sub-menu shown in Figure 3. For example, two different annotators could provide annotations separately for the same utterances by utilizing two different segments tiers for their annotations. These can be viewed separately, or together, as will be discussed later.

Segments can be created, deleted, or renamed; a Temporal Partition with two Segment Tiers (labeled here to reflect that Rachel is the Participant in both, with Bob as Annotator for one, and Sue as Annotator for the other) is shown in Figure 4. When creating a new Segment Tier, the user will be asked to identify the Participant associated with that Tier, which then will, by default, be included in the Segment Tier name. The user can include any additional terms or information in the label by renaming the segment tier (cf. Figure 3).
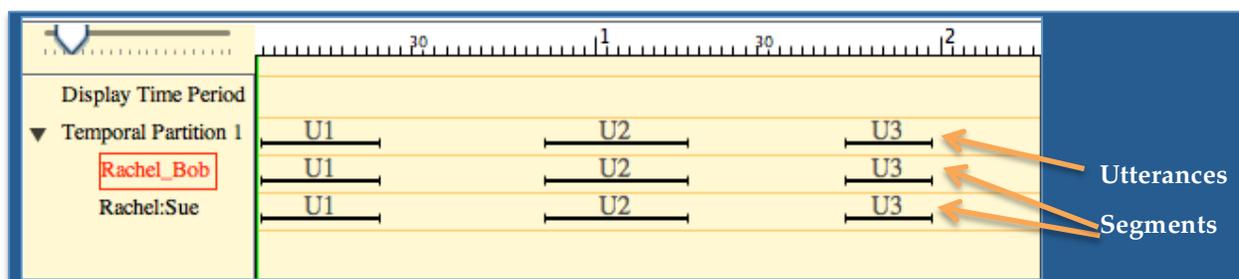

Figure 4. Two Segment Tiers shown here, labeled for each of 2 Participants

Additional **Temporal Partitions** can likewise be added through the Temporal Partition sub-menu (shown in Figure 5), each of which will be associated with one or more **Segment Tiers**. Although for many purposes, a single **Temporal Partition** is sufficient, it is possible to have more than one **Temporal Partition** for a given video file, which allows it to be viewed and annotated based on different temporal chunking. For example, in a dialog with two signers, 2 **Temporal Partitions** would be useful, since the 2 signers' productions may be partitioned in distinct ways (and the utterances of the two signers may be partially overlapping, as illustrated in Figure 6). It is now possible to view all temporally synchronized annotations for a given time period together (i.e., all **Segments** from all **Temporal Partitions**), in different panes of the *Utterance window*.
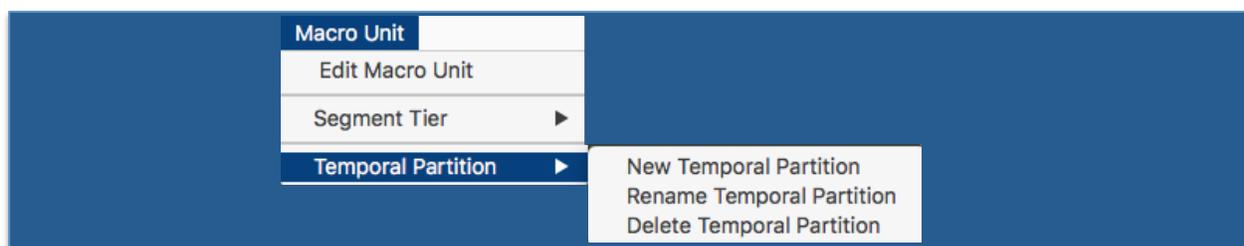

Figure 5. Temporal Partition Sub-Menu

10
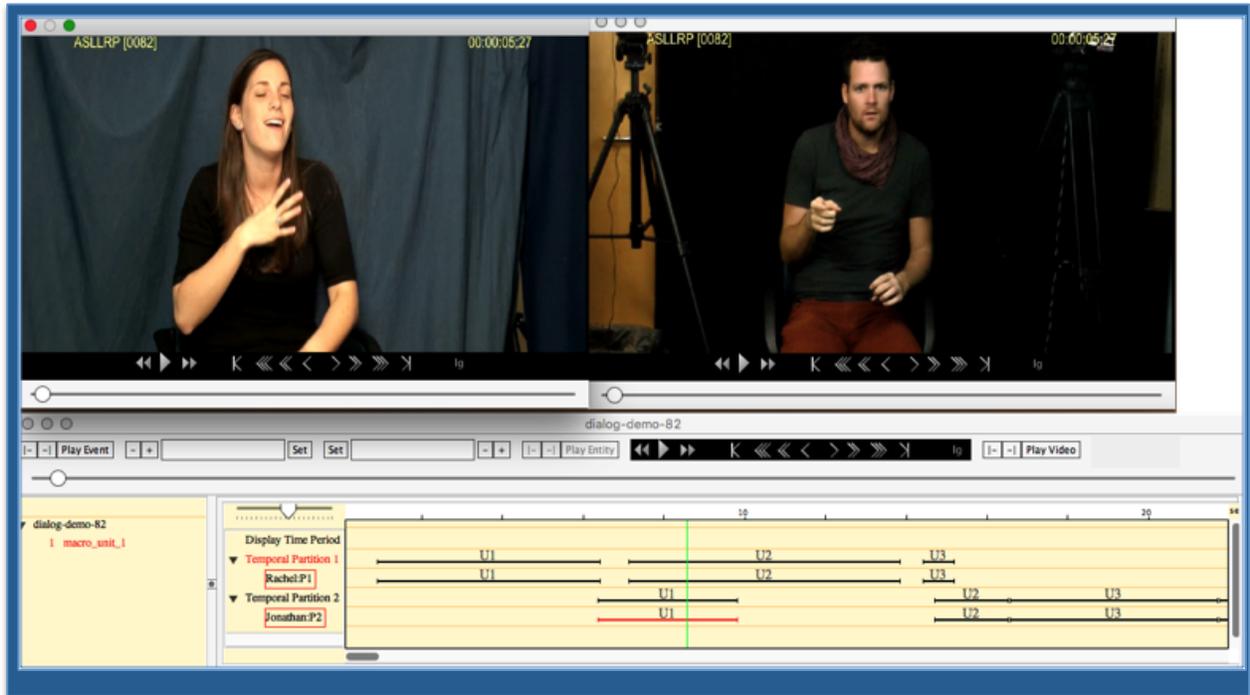
Figure 6. Database View with 2 Temporal Partitions

Please disregard the "Display Time Period" line, which is for a functionality to be implemented in the future.

3.2.2   Utterance window

Annotations for each Segment are carried out in a separate window, as seen in Figure 7.
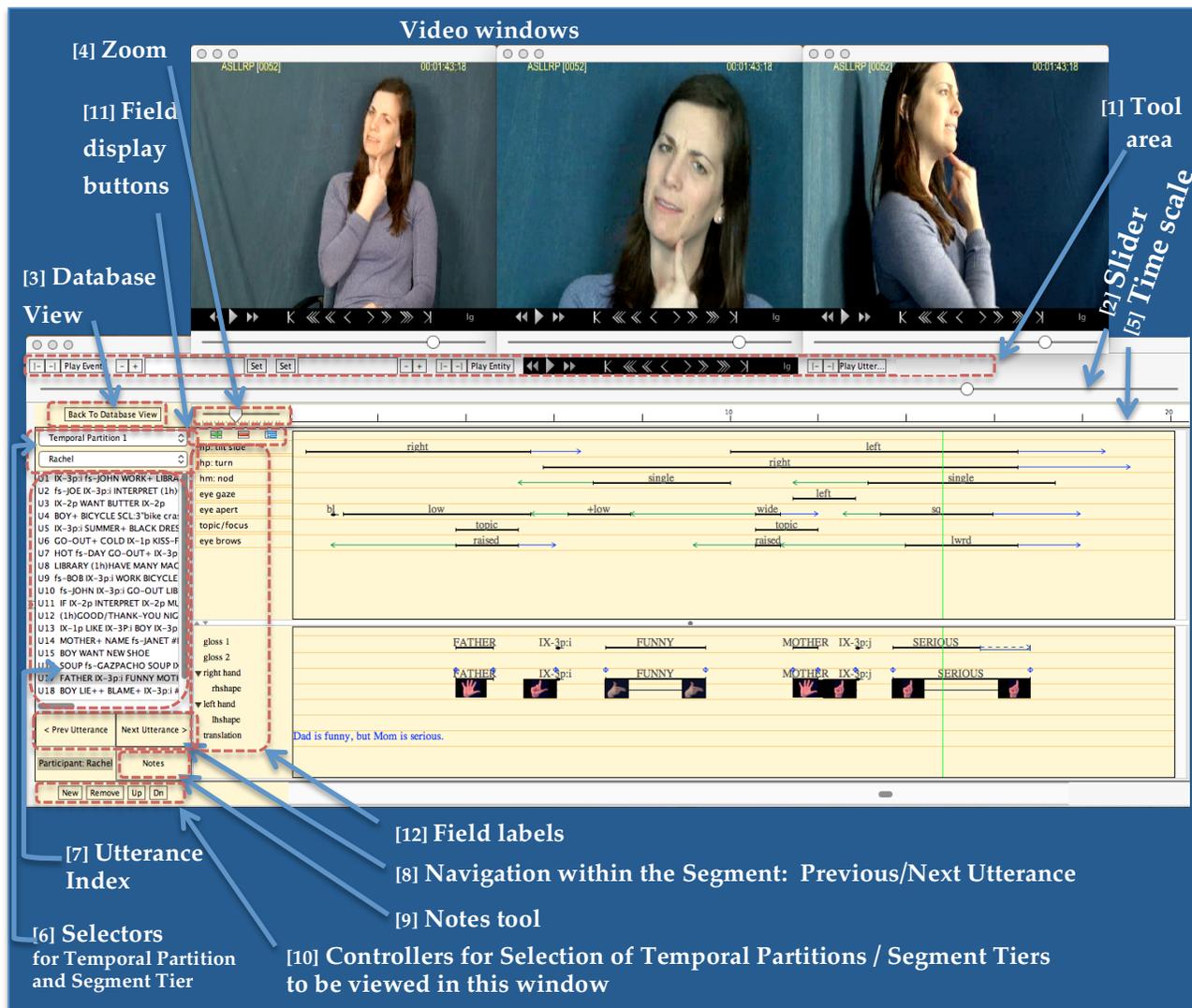
Figure 7. The *Utterance window*. Example of annotations for a Segment

The figure is labeled with the following callouts:

- [4] Zoom
- [11] Field display buttons
- [3] Database View
- [1] Tool area
- [2] Slider
- [5] Time scale
- [12] Field labels
- [8] Navigation within the Segment: Previous/Next Utterance
- [9] Notes tool
- [10] Controllers for Selection of Temporal Partitions / Segment Tiers to be viewed in this window
- [7] Utterance Index
- [6] Selectors for Temporal Partition and Segment Tier

What is visible in the *Utterance window*:

There are several important parts of the window.

- In the upper region, extending across the whole window, starting at the top and descending, we have: [1] the Tool Area (see Section 5.1); [2] the Slider, for advancing the video; [3] a button for returning to the Database View, [4] the Zoom tool, and [5] a time scale. Each tick represents 2 seconds. The smaller numbers above the ticks indicate the number of seconds elapsed since the last minute and the larger number marks the start of every new minute.

- Below that, in the left-hand column, there are [6] tools for selection of the Temporal Partition and Segment Tier to be viewed in this window, [7] an *Utterance Index* for the Segment Tier (showing the dominant-hand glosses for all

utterances); [8] Navigation tools, for moving to the Previous or Next utterance; and [9] a Notes tool (which opens up a text box for storing notes).

- At the very bottom on the left are [10] Controllers for opening up additional Temporal Partition/Segment Tiers. See Figure 8 for an illustration. This is from a dialog, and thus there are two different temporal partitions being displayed in separate panes. The tools for opening and closing Temporal Partition/Segment Tiers, and for modifying the order in which they are displayed, are included at the very bottom on the left.

The remainder of the window is used for displaying the content of the Temporal Partition/Segment Tier(s) selected for display. The second, relatively narrow, column is used for information about the Fields.

- The upper portion of the window is reserved for non-manual and grammatical fields. A large set of pre-defined fields and values exists, and new fields and values can be added by the user.

- [11] Tools for to display or hide fields are available at the top of the second column.

  o To open the *Field Selector and Editor window*, illustrated in Figure 33, use the button ⊞. As discussed in detail in 7.2, the Field Selector allows the user to add new fields and values, or edit existing fields and values; to select which fields to display; and to determine the display color for individual fields.

  o To hide a selected field, use the ⊟ button.

  o To display all and only those fields that contain data (i.e., are non-empty) for the utterance being displayed, use the ⊟ button.

- [12] Field labels are shown below those field buttons.

The field display region in the *Utterance window* is scrollable; fields can be reordered on screen by the user (and, as just discussed, specific fields can be displayed or hidden).

Manual events are represented in the lower portion of the *Utterance window* in the two gloss fields ("gloss 1" for the dominant hand, "gloss 2" for the non-dominant hand), using somewhat conventional English-based glosses. Further morpho-phonological information (including start and end handshapes for the two hands) can be entered, displayed, and manipulated. The tool used to accomplish these annotations is described in Section 7.6.
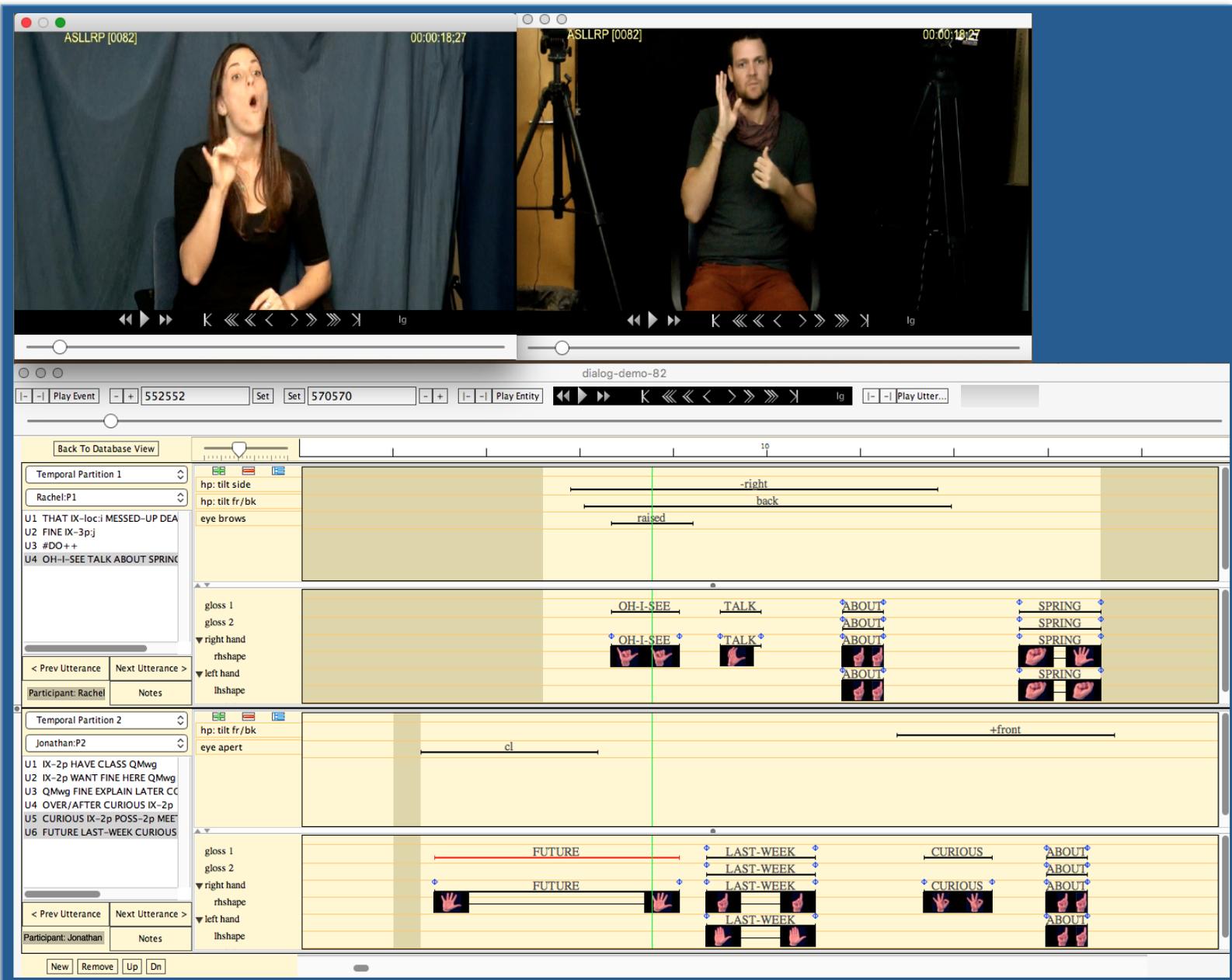
Actions that can be performed within the **Utterance window:**

Manual and non-manual events[4] can be set up and labeled, as described in later sections of this document. The start and end points of each event are set (as described in Section 5.4). Where appropriate, an onset, an initial or final hold, and/or an offset can be added to manual or non-manual events. These temporal phases are easy to add and time-align (see 7.3.3), giving rise to **chained events.** An **entity** is defined as the entirety of a simple or chained event (i.e., including any temporal phases).
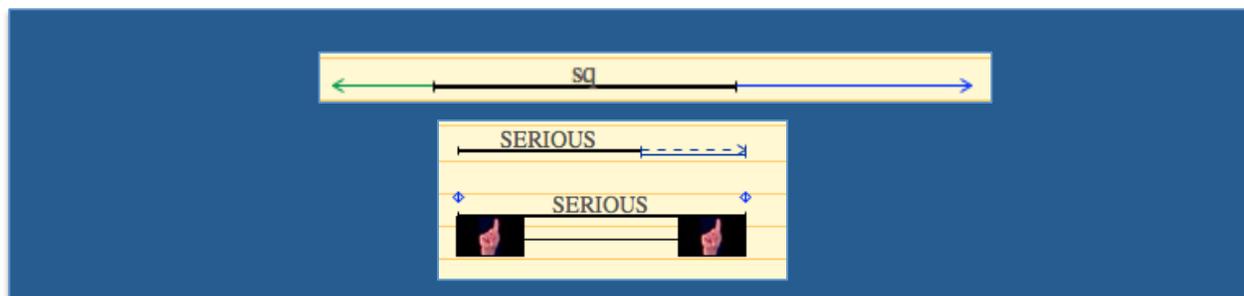
Figure 9. Example of chained event (Eye aperture: squinted), with onset and offset (top), and of a gloss with a final hold (bottom)

3.2.3   Navigating between *Database View* and *Utterance windows*

Once an Utterance has been created (see Section 5.5), double-click directly on a Segment Bar to open that Segment in the *Utterance window.* These bars are shown in Figure 2. If there is more than one Segment Tier within a Temporal Partition, one is designated as the Default Segment Tier, and is highlighted by a red rectangle around it, as shown in Figure 10.
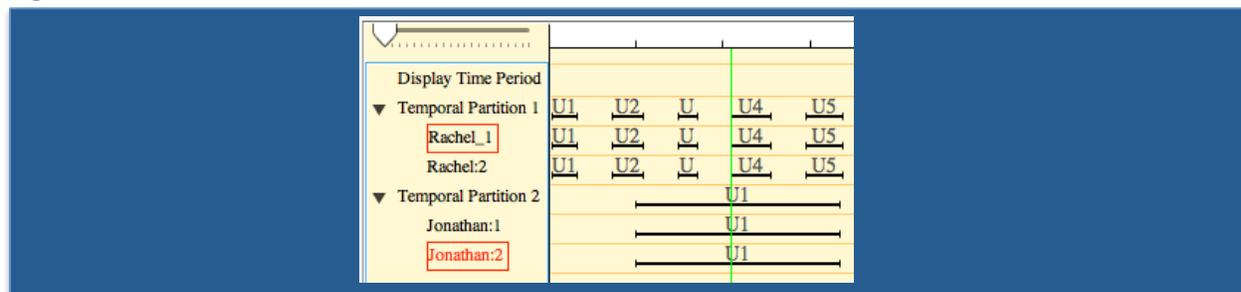
Figure 10.   Default Segment Tier displayed within a red rectangle; clicking on the Utterance Bar will display the Segment from that tier

If you click on the Utterance Bar, the Segment from the Default Segment Tier will open in the *Utterance window.* You can designate a selected Segment Tier to be the Default by choosing [Set Default Segment Tier] from the menu shown in Figure 3.

To return to the *Database View window* from the *Utterance window,* click the "Back to Database View" button in the upper left (to the left of the Field buttons), [3] in Figure 7.

---

[4] An "event" is defined to be any annotation for which there is a start point and an end point.

4 Working with Collections and Macro Units

4.1 Opening the Application

To open SignStream® 3, double-click on the SignStream application icon. Two windows will appear, with the *Macro Unit Information window* front-most, and the *Database View window* behind it, as illustrated in Figure 11. If this is your first time opening SignStream, continue to section 4.3 below.
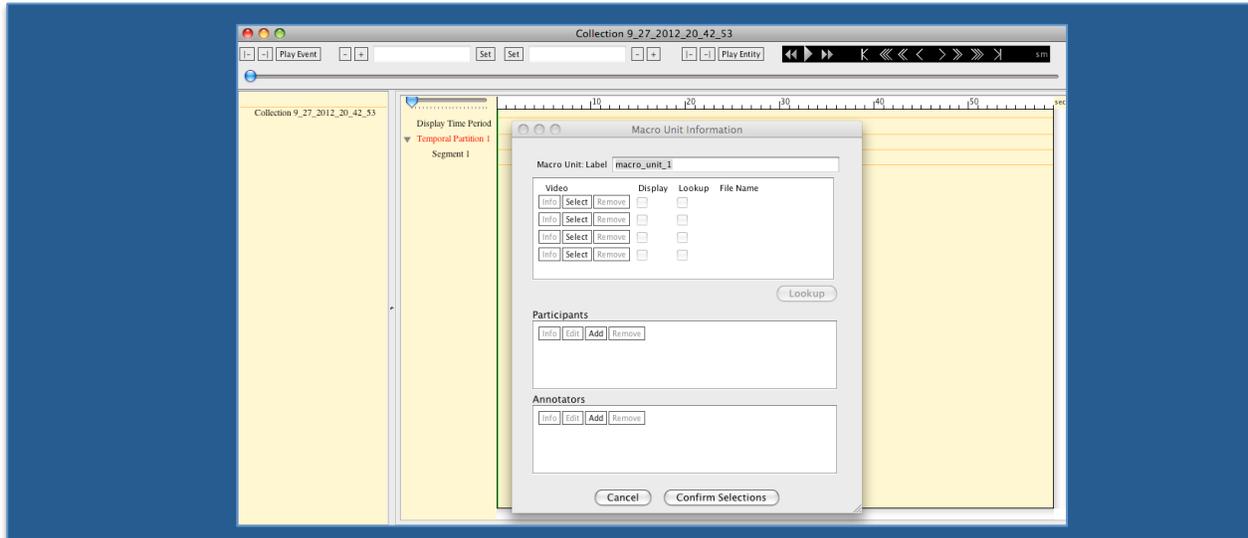

Figure 11. What you see when you first launch SignStream®

4.2 Opening a Pre-existing Collection from within SignStream®

Only one Collection can be open at a time. To open a pre-existing Collection, choose [Open…] from the Collection menu shown in Figure 1 and select it from the standard File Selection dialog box. What you will see at that point is shown in Figure 12.
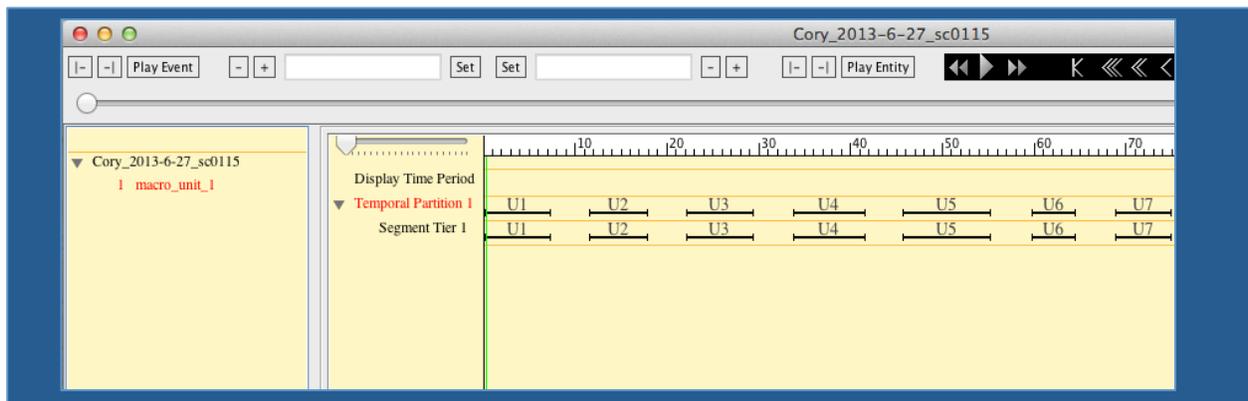
Figure 12. Opening up an existing Collection within SignStream®

At this point, the associated video windows should also open. You then will be prompted to select an Annotator. Once the Annotator is selected, click *Confirm Selection.* If you add an Annotator not previously associated with this Macro Unit, that Annotator

will also become visible in the Macro Unit Information window (shown in Figure 15), where the sets of all Annotators and Participants associated with the MU are shown.

Troubleshooting: If videos do not appear, they may have been moved since you last worked on the Collection. Choose [Edit Macro Unit] from the Macro Unit menu (shown in Figure 13), and the *Macro Unit Information window* will appear, as shown in Figure 15. You will then need to locate and reselect the videos as detailed in section 4.3.2.

Figure 13. Macro Unit Menu: Edit

4.3   Creating a New Collection

4.3.1   Naming the New Macro Unit

When the program launches, a blank Collection is created; see Figure 11. Before anything else, a Macro Unit (MU) must be created via the *Macro Unit Information window,* which is also opened upon launch (and which can be resized, by dragging the bottom right corner). The data associated with a Macro Unit include:

- Video files (up to 4 synchronized files)
- Participants (signers)
- Annotators

At a minimum, a Macro Unit should have a label name (one is provided by default), at least one video file, at least 1 Annotator, and at least 1 Participant. To label the Macro Unit with something other than the default, type the name in the top field (shown in Figure 14).

4.3.2   Selecting Video Files

You should then associate the Macro Unit with at least 1 video file. A maximum of 4 synchronized video files, extending over the same time period, can be selected. The Video buttons in the *Macro Unit Information window* are explained here:

- **Select** – to locate (or relocate) a file on your computer, using the standard dialog box.

- **Info** – to see additional information about the video file (title, location, description).

- **Remove** – to disassociate a video file from the Macro Unit.

- The **Display** boxes control whether the video file is seen while editing the Macro Unit.

17

Note that the Lookup function (to help in relocating video files) has not yet been implemented.
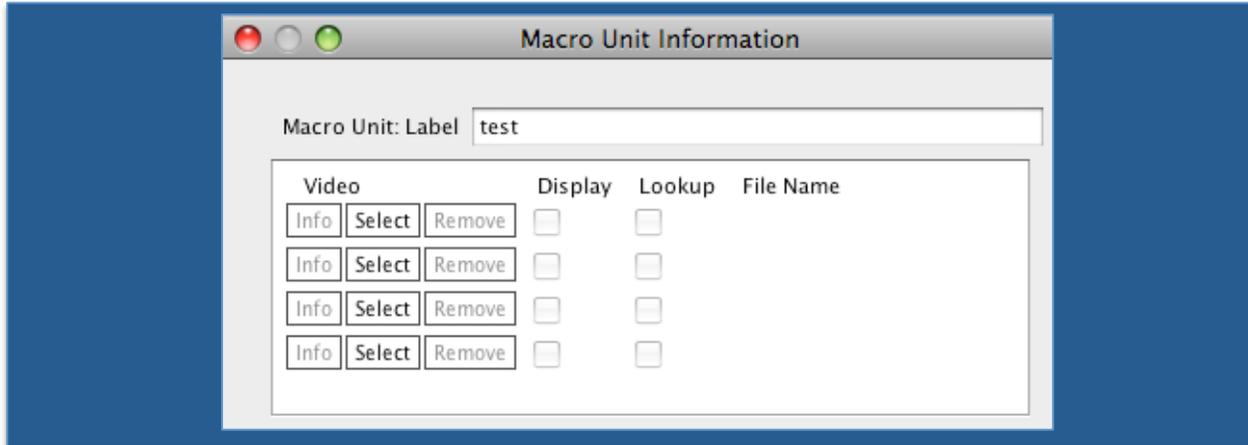
**Figure 14. Labeling the Macro Unit "test"**
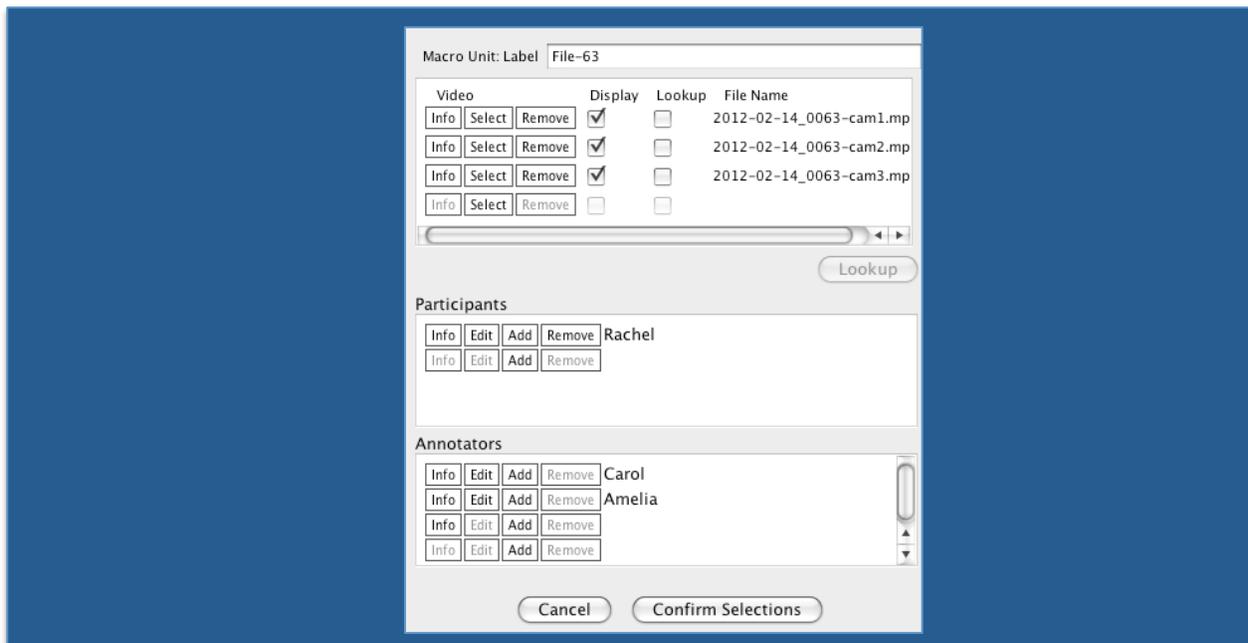
Figure 15. Display of the *Macro Unit Information window* once Label, video files, Participants, and Annotators have been entered and video files have been selected

4.3.3   Specifying Participants and Annotators

4.3.3.1   List of Participants and Annotators for this Macro Unit

The Participants and Annotators section of the *Macro Unit Information window,* shown in Figure 15, should include all the Participants shown in the video, and all the individuals who will be providing annotations. Participants and Annotators can be added—and information about them can be entered and edited—from this window, which can be opened at any time via the [Edit Macro Unit] selection in the Macro Unit menu (see Figure 13).

There is a distinction between Global and Local Annotators and Participants. In the initial release, included among Global Participants and Annotators are those that correspond with sample files being distributed by the American Sign Language Linguistic Research Project (ASLLRP). When other working groups add an Annotator or Participant, these will be added to the Local sets of Annotators and Participants. This will help to ensure consistency of information across multiple files, but this information is only available *locally*. Local Participants are stored in <Signstream3 directory>/newXMLfiles/localParticipants.xml. At the moment, Sign-Stream® can only read the localParticipants.xml file from that location (relative to its own directory). So all users of the same application file can read the same local Participants. If you share the Collection with users working with SignStream from a different computer, the label will remain, but the more detailed information about the Annotator or Participant will not be available to the other user. See Section 9.

4.3.3.2   Adding, Editing, and Selecting an Annotator/Participant

To add a new Participant or Annotator to this Macro Unit, click the "**Add New**" button in the appropriate region of the *Macro Unit Information window*. This will open the *Participant* or *Annotator Selection windows,* as shown in Figure 16, from which you can edit or select an existing Participant or Annotator, or create a new one, to add. Once you have (created, edited, and) selected a Participant or Annotator, Click **Add Selection** to add them to the Macro Unit and return to the *Macro Unit Information window*.

Each Participant or Annotator line has several buttons available:

- • Info – show the information pertaining to the listed Participant
- • Add – to add or change the selection
- • Edit – to change information about the Participant
- • Remove – Disassociate a Participant or Annotator (just created) from the Macro Unit[5]

Once the *Participant Selection window* opens, you can select a Participant from the list, edit existing Participants, or create a new one and enter the relevant information about the new Participant, who can then be selected via the "Add Selection" button.

---

[5] At present, the ability to remove Participants and Annotators is only available for those that have just been added. Once the *Participant Selection window* is closed, it is no longer possible to remove Participants and Annotators from the set of Local Participants and Annotators, although they can be dissociated from the Macro Unit by removal within the *Macro Unit Information window*.
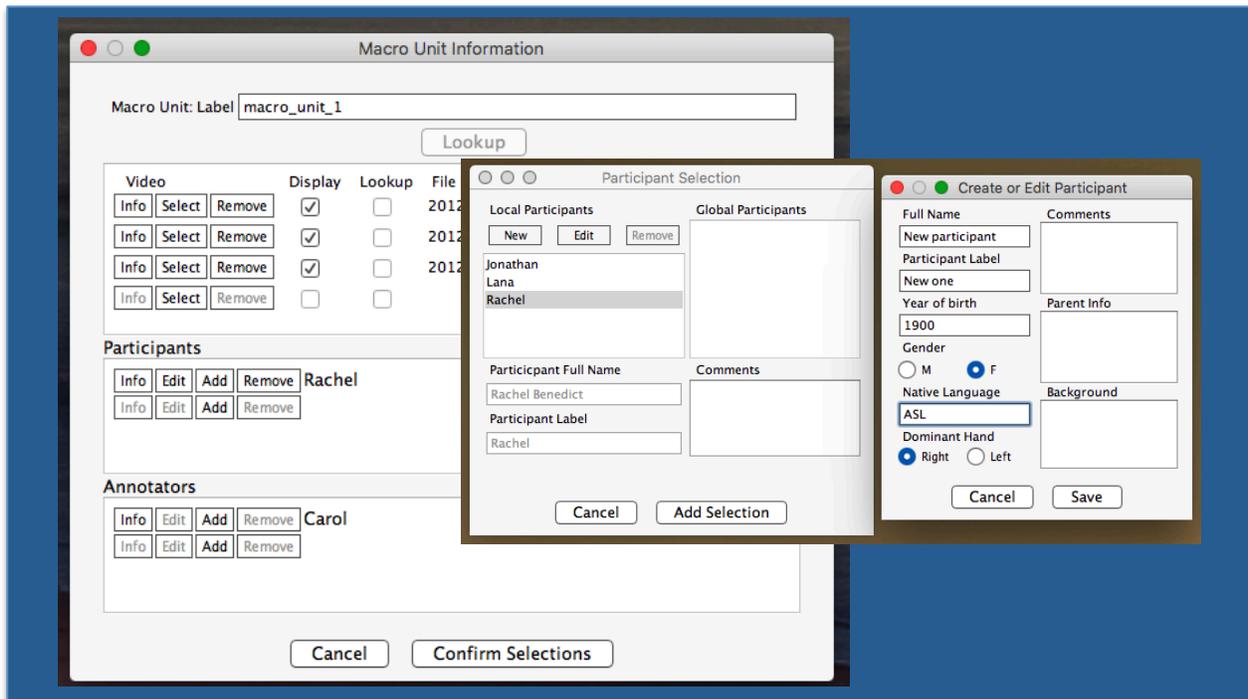
Figure 16. Entering information about Participant or Annotator

4.4 *Closing the* Macro Unit Information window

Warning: Please do not attempt to save the Collection until you have clicked on "Confirm Selections." If you do, you will get an error message.

In order to "Confirm Selections," you must have at least one video file selected and at least one Annotator added. Please also add the Participant(s) contained in the video file (although the program does not (yet) enforce this selection).

After you have confirmed the selections, you will then be asked to select an Annotator for the current session, after which you will be taken to the *Database View window*. Instructions for proceeding there are contained in Section 6. If you don't see the Video windows, it is possible that they have come up **behind** the *Database View window.*

4.5 *Returning to the* Macro Unit Information window

To return to edit the *Macro Unit Information window* later (to relocate the videos or to associate additional video files, or to add or change information about Participants or Annotators), choose [Edit Macro Unit] from the Macro Unit menu shown in Figure 5.

5   Tools for Navigation and Annotation

This section describes the tools that can be used for video navigation and annotation, beginning with those available for use within the *Database View window*, and then considering those used within the *Utterance window*.

The left hand portion of the *Database View window*, Figure 17, has the name of the Collection on top and the name of the Macro Unit underneath. The right-hand portion

Figure 17. *Database View window* **(top),** *Utterance window* **(middle), with focus just on the top toolbar found at both levels (bottom)**

of the screen represents the work area for the selected Macro Unit; this is shown in Figure 2. At the top is a line showing the time scale.

Time is represented along the horizontal axis, with the green Video Alignment indicator marking the current frame (i.e., the current point in time). The Video Alignment indicator can be dragged forward (rightward) or backward (leftward) to go to a different frame (i.e., different point in time of the video). See Figure 18. The arrow keys from the keyboard will also cause go forward or backward by a frame at a time in the video.
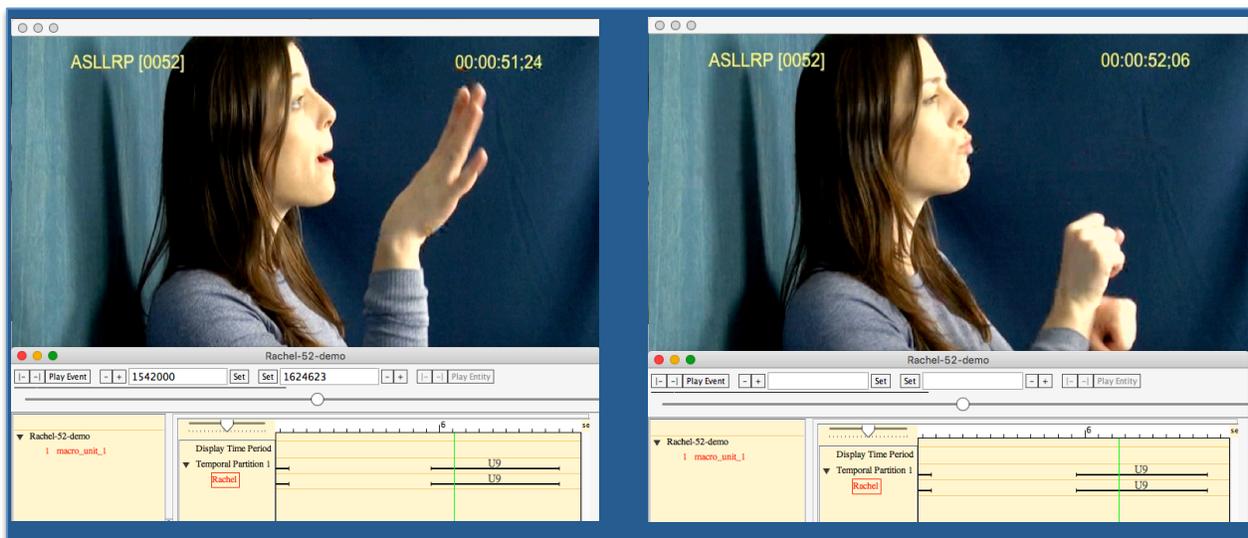
Figure 18. Time is represented along the horizontal axis, with the green Video Alignment indicator showing the current frame; here are two positions in the video, less than a second apart.

The **Zoom** tool (the slider to the left of the time scale in Figure 2, shown close-up in Figure 19) allows modification of the time scale used for the display.

Figure 19. Zoom Tool

The work area of the *Database View window* allows for representation of Utterances within the Temporal Partition(s)—and, by extension, of the corresponding Segments within the Segment Tiers. The first step for each Temporal Partition is temporally partitioning the movie file(s) into distinct, non-overlapping units referred to as Utterances (which can, in fact, correspond to units of whatever size and type the user chooses), which are to be annotated. The start and end points of these Utterances are set and modified in the ways described below in Section 5.5. Several tools to be used for this purpose will be described first.

5.1 Tool Area

On the top of the screen is a set of tools to manipulate the objects in the work area, as shown in Figure 17. In order for the tools to be applied, an object in the work area (such as a Segment, Utterance, or an event within the *Utterance window* as described in Section 5.5) must be selected. To select an item, click once on an event label or on an event marker represented as a horizontal line. When selected, this will be visible because it will then be displayed in red. The tools described below can then be use to make modifications, to navigate to the beginning or end of the selected item, or to play the video associated with the item. These actions are described in further detail in 4.2.

5.2 Navigation/Play tools

These tools, shown at the bottom of the above figure and described below, are applicable at both the *Database View window* and the *Utterance window* levels. The basic navigation tools allow you to go to the beginning or end of a selected event, or to play a selected item. For example, to go to the beginning or end of an "event," or to play an event, select it (by clicking on it; it will be highlighted) and then use the **Event** group of tools at the left of the Tools area:

Figure 20. Event tools group

To be precise:

 This button moves the video to the start point of the selected item.

 This button advances the video to the end point of the selected item.

The "**Play Event"** button plays only the part of the video that corresponds with the selected item.

In some cases, manual and non-manual events can have associated temporal phases, such as an onset, initial or final hold, or offset. These subparts can be selected individually and acted upon directly by these tools. For example, to play the onset portion of the video, select it with the mouse, and click on "Play Event". However, it is also possible to act upon the *entirety* of the chained event, beginning with the first temporal phase (e.g., an onset, if there is one) and ending with the last one (e.g., on offset, if there is one). For these purposes, the "Entity tools" are used, shown in Figure 21 and located just to the left of the Video Navigation tools in the top toolbar (shown at the bottom of Figure 17). For simple events, i.e., events without any onsets, holds, or offsets, the "Event tools" and "Entity tools" can be used with the same effect. Since this is not relevant at the level of utterances, "Play Entity" is grayed out at this level.
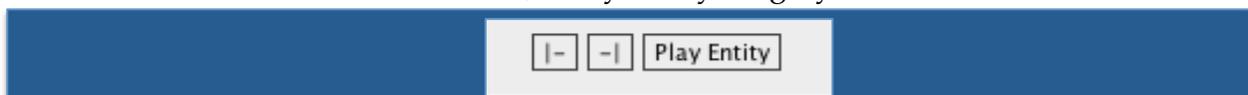
Figure 21. Entity tools group (not relevant for the Database View)

5.3 Video Navigation tools

As seen in Figure 17, the Video Navigation tools (Figure 22) appear on the right side of the Tools bar. These controls are similar to those found at the bottom of the *Video windows*. The right-facing triangle "**Play**" button (*2*) will play the video at standard speed. Using the "**Fast**er" (*3*) and "**Slower**" (*1*) buttons, to the right and left respectively of the "**Play**" button, you can speed up or slow down the video as it plays. Speed can be increased in increments: 2x, 4x and 8x (increasing the speed by a factor of 2, 4, or 8, respectively, although in reality these increases may not be exact), while slowing down by using the left-facing button allows for decreasing the speed by a factor of 2, 4, etc.: /2, /4.

Figure 22. Video Navigation tools

Buttons *5-10* allow the user to advance or retreat the video by a small number of frames. A single caret advances (*8*) or retreats (*7*) by 1 frame, two carets by .5 seconds (*9, 6*), three carets (*10, 5*) by 1 second.

Buttons *4* and *11* advances the video to its start or end point. They are analogous to those in Figure 20 and Figure 21, but pertain to the entirety of the video rather than a specific selected item.

The button in position *12* of Figure 22 which toggles between "sm" and "lg", controls the size of the *Video window(s)*. The video is displayed by default at a large size, and thus the "sm" button appears (which enables reducing the size of the *Video windows* to a standard, smaller, size). Clicking on this button in the top of the toolbar (see Figure 17)—or in any of the analogous displays in any of the Video windows —will switch all active Video windows to a default small size. The "sm" button will now automatically switch to be displayed as "lg". Clicking again will now scale all the videos to a default larger size. It is also possible to click on the corner of each of the videos and drag the video to any size desired.

As previously mentioned, the green Video Alignment indicator appearing, e.g., in Figure 24, marks the position of the current frame of the video. Dragging it through the work area allows the user to move through the utterance. Its movements are linked to the grey round slider above the work area in both the *Database View* and *Utterance windows* (pointed out on Figure 2 and Figure 9). The sliders and the Video Alignment indicator move in sync; either may be used to scan through the video. These functions are described in more detail in Section 5.5.

Figure 24. Green Video Alignment indicator, marking the current video frame

5.4   Set or Adjust the Start and End Frame of an Item

Sections 7.3 and 7.6 explain how to create events of different kinds. Here we first discuss how to set or adjust the start and end frames of the events that have already been created at either the Database View or Utterance levels. All actions will apply to the item that has been selected, with the selection reflected by visible highlighting.

The second set of tools from the left in the toolbar shown in Figure 17 adjusts the start and end points of a selected item. The "**set**" buttons shown in Figure 25 can be used to set -- or reset -- the start (or end) point of a selected item to become the current video frame (as displayed, e.g., with the Video Alignment indicator illustrated in Figure 24). The "+" (or "−") buttons will cause the start (or end) frame of the selected item to be increased (or decremented) by one frame, making it possible to modify the start (or end) point of a selected item one frame at a time. These tools will be discussed again in later sections.

Figure 25. Tools to (re)set or adjust start and end frames of a selected item

5.5 *Play Utterance tools in the* Utterance window

Near the right of the tool area in the *Utterance window* is one last set of tools, just like the Event or Entity tool groups but applying to Utterances. These buttons, within the red rectangle in Figure 26, apply instead to the full utterance. The left and right facing buttons will navigate to the end and beginning of the utterance respectively. The "**Play Utterance**" button will play the entire utterance.
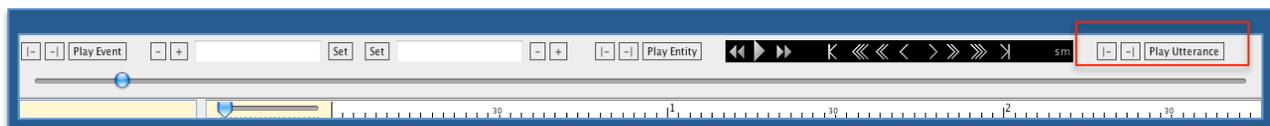
Figure 26. Play Utterance Tool Group, in the toolbar of the *Utterance window*

Figure 27. Play Utterance tool

5.6 *Navigation at the Utterance Level*

The dominant-hand glosses of the Default Segment Tier (which can be selected from the menu in Figure 3, if the Temporal Partition contains more than one Segment Tier) are shown in the *Utterance Index*, in the left-hand portion of the *Utterance window*. Clicking on an Utterance will display that utterance. (Depending on the Zoom level, more than one utterance may be visible; visible utterances will be highlighted in the list.)

Clicking on Play Utterance (as shown in Figure 26) will play the currently selected utterance (which is also visually highlighted in the Utterance Index list at the left). If the zoom level is such that more than one utterance is visible, and therefore, highlighted, it will play the first one. To pick a specific utterance from among multiple utterances that are visible, click on the one you are interested from the Utterance Index list to select that one specifically before clicking Play Utterance.

In case there is more than one Segment Tier (potentially from more than one Temporal Partition) being displayed, the active one will determine which utterance will play when Play Utterance is clicked. To establish a particular Segment Tier as active, select some item within the display for that Segment Tier (e.g., click on some gloss item).

One can also click on the "**Next**" or "**Previous**" buttons to move to the next or previous utterance, shown at the bottom left [8] in Figure 7.

6   Working with the *Database View window*

6.1   *Partitioning a Video File into Utterances and Labeling Them*

The general principles outlined above for video navigation, setting and adjusting the start and end points of events, and playing events are precisely those that are relevant for working with Utterances. In this section, we will go through the process of setting up and time-aligning Utterances. The next section will discuss establishing the start and end points of utterances and editing the label associated with a given utterance.

First, if the Participant for the Segment Tier has not yet been set, choose the Participant from among those already associated with the Macro Unit from the menu, as shown in Figure 3.

The video file must next be divided up into smaller chunks, to facilitate annotation. Within a single temporal partition in the *Database View window*, these utterances cannot overlap temporally, and each must include more than a single frame. Here are instructions for defining a portion of the video as an Utterance, within the row in the work area identified as the Temporal Partition:

1. Advance the video to the approximate frame where you would like the Utterance to begin. You can do this in one of three ways: use the video controller tools (described in 5.3), drag the green Video Alignment indicator to the appropriate start frame, or use the keyboard's right and left arrow keys.

2. Hold down the Option key and click the mouse on the green Video Alignment indicator within the horizontal temporal partition row; drag the mouse and release at the approximate frame where you would like the utterance to end. Note that you can adjust both start and end points later to make sure that they are exactly where you want them.
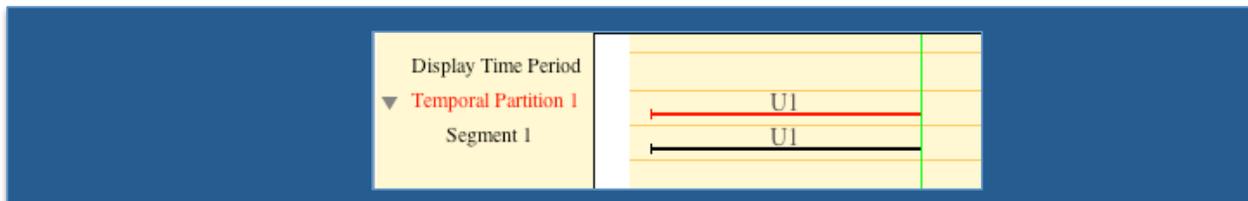
Figure 28. Option-Click and Drag to set up Utterance with desired start /end points

3. The program will automatically assign a label to the partition: U1 for the 1st utterance, U2 for the second, and so on.

4. To edit the label (i.e., assign or change the name of Utterance), click on the label in the Utterance Bar of the Temporal Partition and hold the mouse down until the text becomes editable (just as you would edit a filename in the Finder in Mac OS). A visible text box for the label will appear. Edit the text of the label, and hit Return. The label will also change for all associated Segment Bars, as illustrated in Figure 29.
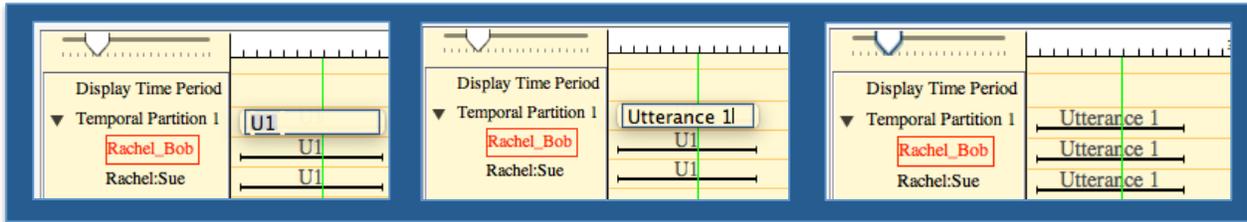
Figure 29. Editing the Utterance Label. Example: Change "U1" to "Utterance 1"

5. To delete an Utterance, hold down the Control key and click (or right-click) on the Utterance Bar or label. A drop-down menu will appear. Choose Delete and click "Proceed" when prompted. (Warning: The dialog box to confirm the deletion may appear in some random part of the screen.   Sorry about that!)
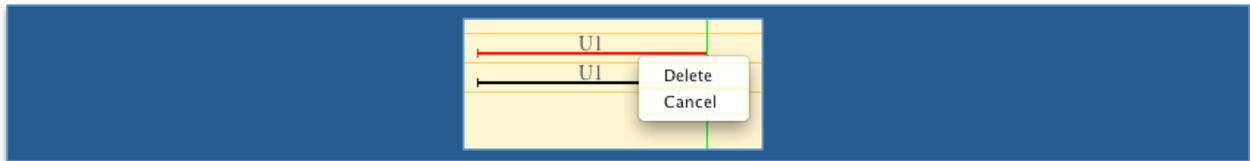
Figure 30. Delete an Utterance

6.2   Setting or Adjusting the Start and End Points of Utterances

Important note: Segments take their start and end points from the associated Utterances. To adjust the start or end time of a Segment, you must modify the settings for the corresponding Utterance, by using any of the techniques described in this section and in Section 4.4. In other words, within a single Temporal Partition, each Utterance Bar is temporally aligned with the corresponding segments; it is not possible to change the start or end frame of a single segment independently; any adjustment to a start or end frame will apply to the Utterance Bar and all corresponding Segment Bars.

The basic principles, just presented in Section 4.4, allow for adjusting the Utterances in the Temporal Partition within the *Database View window*, as well as for glosses or non-manual events within the *Utterance window* (to be discussed in Section 7.6.1).

Section 6.1 describes the steps for setting up an utterance. (This will also be the same way to set up non-manual events**.)**

Once an utterance (or event in the *Utterance window*) has been set up, there are several ways to adjust the start/end points. Before choosing any of the options below, make sure that the item is selected; click on it and confirm that it is highlighted.

6.2.1   Using "**+**" or "**−**" buttons (for all items)

Use the ⊟ or ⊞ button in the Event Start or End group of tools to make or the start or end point of the selected item one earlier or later.

28

Figure 31. Adjust start or end frames with the + or − buttons

Please note that the frame numbers appearing in the boxes are for reference only and cannot be manipulated directly.

6.2.2 Using the "Set start" or "Set end" Buttons (for all items)

Navigate to the desired start video frame. Click the leftmost "**Set**" button. Then navigate to the end frame of the selected item and click the rightmost "**Set**" button. (You can, of course, do this in either order.) You can navigate to the desired video frames: (1) by using the keyboard arrows, or (2) by using the video controls in the toolbar or *Video window*.

6.2.3 Dragging the Endpoints to Adjust Start or End Frame

Less precise, but useful for larger approximate adjustments, is the function that allows the user to drag the endpoints. Highlight an Utterance Bar, hold down Option key, click on the start or end point of an event marker, drag the mouse to the desired point (you will see the video advance as you do), and release. This also works for non-manual events in the *Utterance window*.

7   Working with the *Utterance window*

7.1   *Areas of this Window*

Figure 32 shows the *Utterance window*.
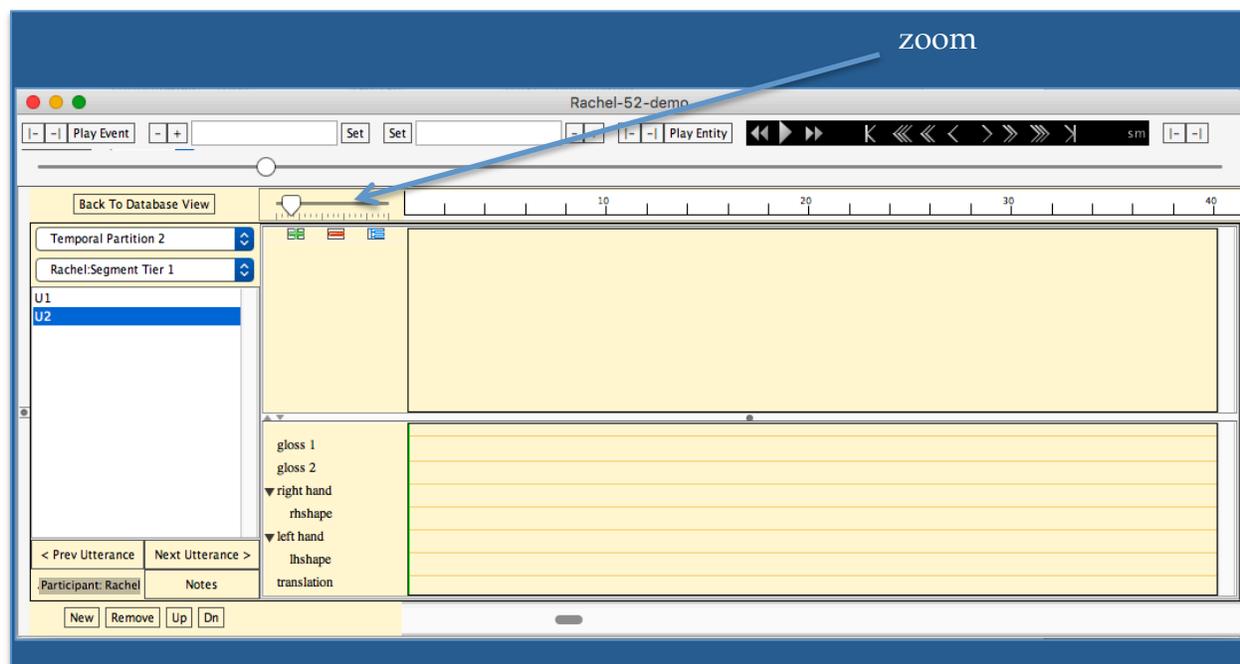
Figure 32. *Utterance window*

You can zoom in and out of the work area using the zoom slider displayed Figure 32. The work area in the *Utterance window* differs from the *Database View window* in one significant way: the separation of the workspace into two parts. The bottom section corresponds primarily to manual information (including gloss-based labels for signs), while the top section holds additional fields that are primarily non-manual, but that also include additional grammatical information. The annotator may approach the two sections similarly, barring some small differences that will be addressed as they arise.

Note that you can resize the window by clicking and dragging the bottom right corner, or the line that separates the two main parts of the window.

7.2   *Available Fields and Values*

Multiple fields are available for annotation of different types of events, occurring in parallel. Linguistic information is annotated by setting the start and end points of appropriately labeled events within each field. This includes establishing events and entities in both the bottom partition of the workspace, primarily manual signs, and the top section, primarily non-manual features.

Fields can be displayed (with some options for display properties) or hidden. It should be noted that the bottom four categories, for manual information, are shown by default in the *Utterance window*. None of the Fields appearing in the top section of the

work field are automatically selected, but they can be added as needed. Clicking on the "**Fields**" button ▦ shown in Figure 7 will call up a *Field Selector and Editor window*, as shown in Figure 33.
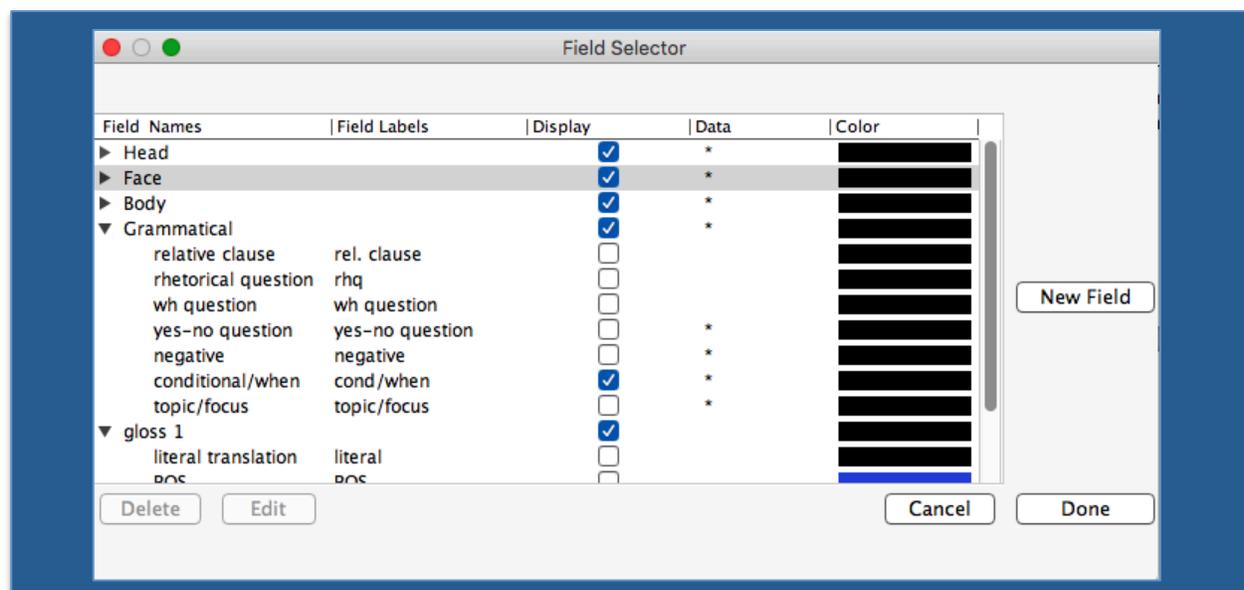
Figure 33. *The Field Selector and Editor window*

- The fields are grouped by categories (Head, Face, Body, and so on), with subcategories that can be viewed by clicking on the triangle to the left of the category label. To select the whole category, select the corresponding checkbox. The top four categories correspond to the top partition of the *Utterance window* work area and are generally associated with non-manual characteristics, while the bottom four categories appear in the lower section of the work area and correspond primarily to manual glosses.
- Select the checkboxes corresponding to the categories and/or subcategories you want to make visible, to work with, in this segment.
- Fields and field labels are displayed in black, by default, but the color can be changed by clicking on the rectangle in the "Color" column shown in in Figure 33; this results in opening the *Pick a Color* palette, as shown in Figure 34.

New fields can be added – to the upper portion of the Utterance display; new values can be added to existing fields. Fields and values can be edited. For these tasks, the *Field Specifications Editor*, shown in Figure 35 is used. It opens when a field is selected and the "**Edit**" button is clicked, or when the "**New Field**" button (on the right in Figure 33) is clicked. **Note**, however, that the functionalities for editing field types (with respect to potential prefix, as for Role Shift ("rs:"), alignment, menu vs. free-text entry, etc.) has not yet been implemented.
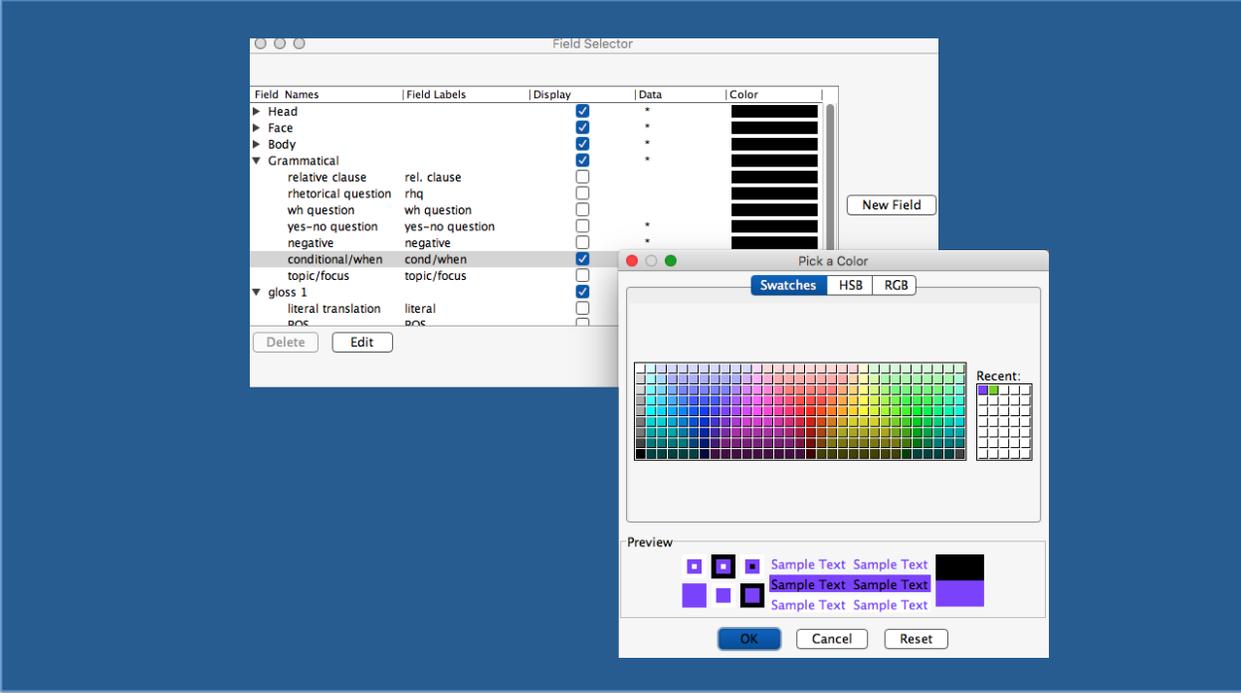
Figure 34. *Pick a Color* **for Fields from within the** *Field Selector Window*
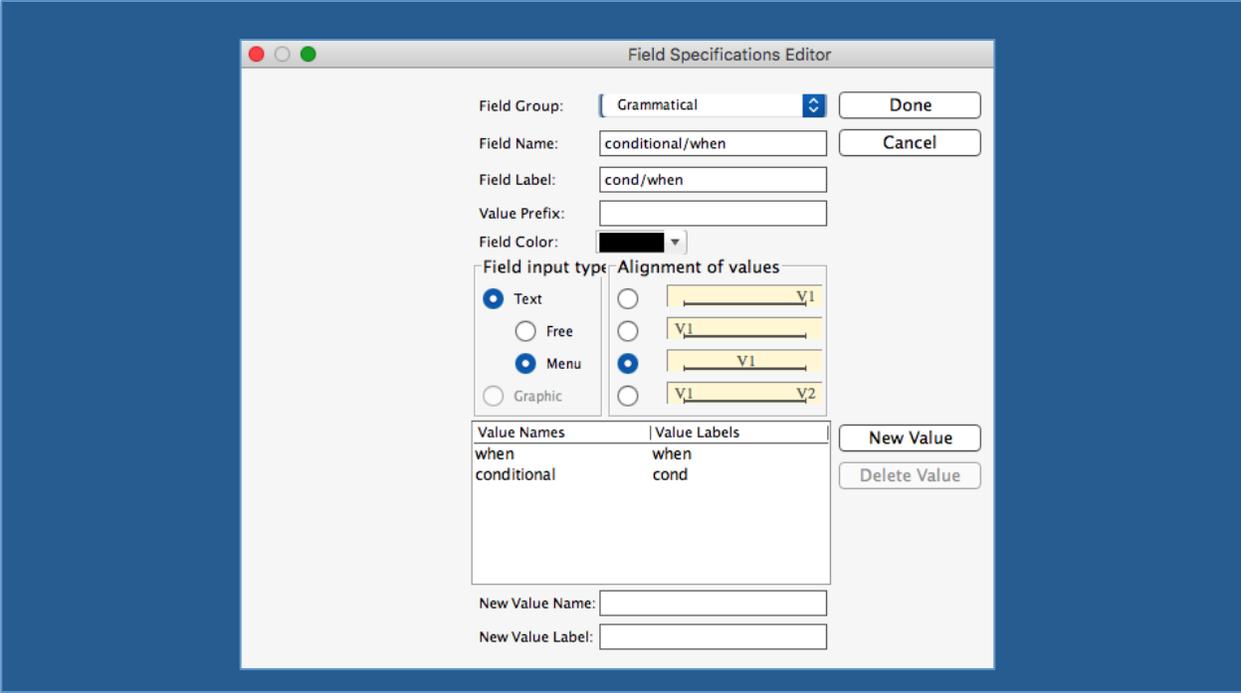
Figure 35. Fields can be added or edited using the *Field Specifications Editor*
[Note: Field property settings are not yet implemented]

7.3   Data Entry for Non-manual and Grammatical Information

7.3.1   Non-manual Events

To add an event to a field that is displayed, Option-click in the corresponding field area, (that is, the row) and drag the mouse. The initial and end frames will be determined by the frame on which you first option-click and the frame on which release the mouse, respectively. When you release the mouse, a menu will appear. To assign a value to a Field event, choose one from this menu. This value may be changed any time by double-clicking the event and changing the selection (see Figure 36). To change the value that was selected, double-click and the menu will reappear to allow a different selection.
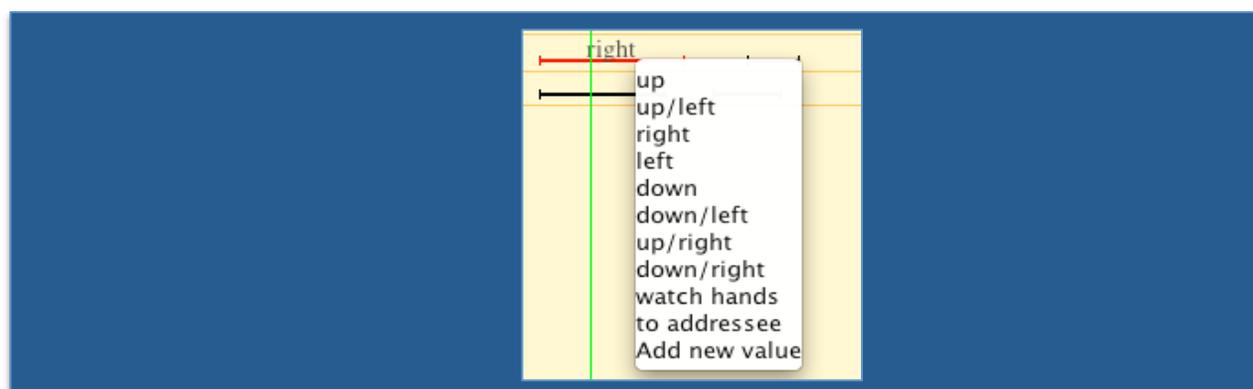
Figure 36. Assigning a value to a Non-Manual event

You can modify the start or end point of this event using "Start/End point" groups of buttons (see Section 5.4 and 6.2), or by Option-clicking on the start or end point and dragging it, as was described for Utterances in the Database view (Section 6.2.3).

To delete a an event, click on its marker while holding down Control key (see Figure 37). You will be asked to confirm that (although the dialog box may show up in another part of the screen – you may have to hunt for it (sorry)).
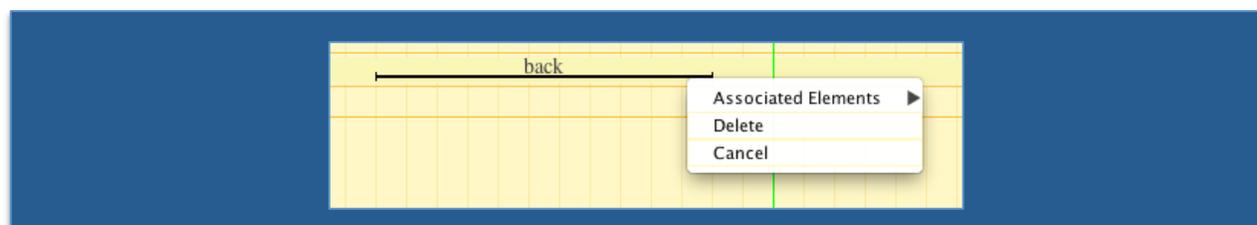
Figure 37. Deleting a field value

7.3.2   Chained Events and Associated Elements

An *onset* is the anticipatory articulation that precedes the start of the event. For manual signs, the start of the sign is the point at which the handshape is fully formed and the hands and arms are completely in position to begin the articulation of the sign. For non-manual events like raised (or lowered) eyebrows, the *onset* occurs as the eyebrows are

moving from neutral to raised (or lowered) position. For periodic head movements, like nods and shakes, the onset typically involves the head rotating upwards or sideways to prepare for the initiation of the nod or shake. See further details in Section 15.

In some cases the handshape and position may be held before the sign actually begins; this would be identified as an *initial hold*. Similarly, the final position and handshape may be held briefly in the case of a *final hold*.

An *offset* generally occurs when the non-manual configurations are disintegrating and returning to neutral (e.g., as eye brows return to neutral position from being raised or lowered). Further details about conventions are available in Sections 15 and 16.

These elements, when present, are represented in the display as shown in Figure 38.
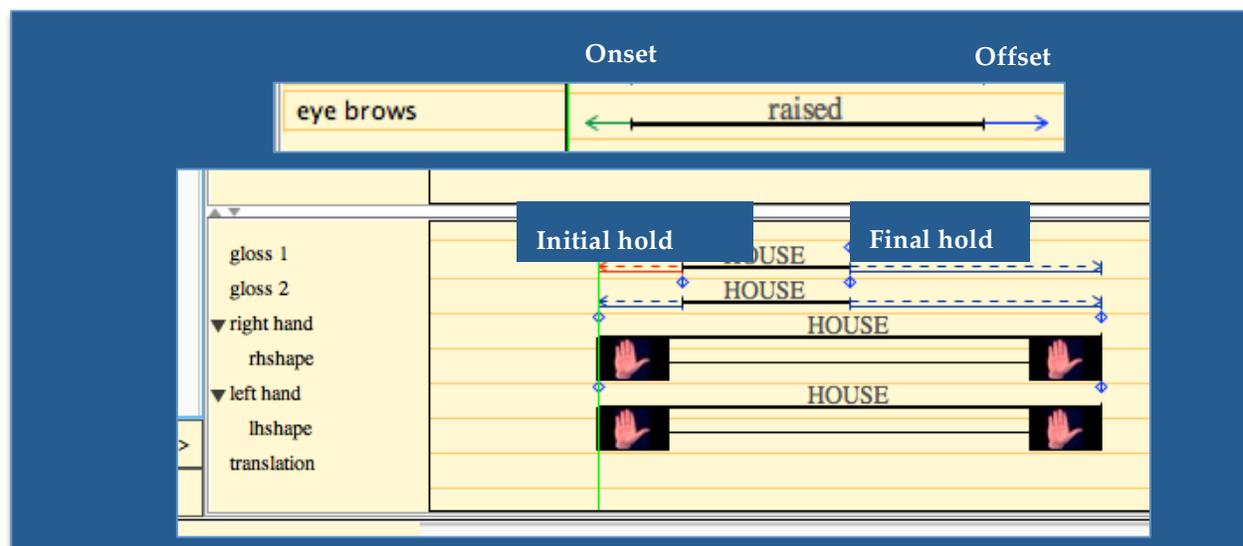
Figure 38. Display of chained events

7.3.3 How to Add Onsets, Offsets, and Holds

Use the Associated Elements sub-menu shown in Figure 37 to add an onset, offset, or initial or final hold, as shown below.
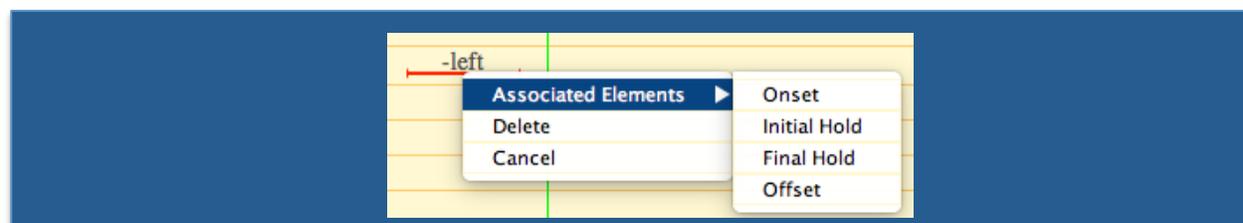
Figure 39. Adding an onset, offset, or initial or final hold

This will automatically append these elements to the beginning or end of the event, as appropriate, and you will be able to set the start and end frames (which are not already defined by the temporal information for the main event). In other words, if you were to add an onset, the end point would be taken from the start point of the event,

but you would need to adjust the start point using the standard tools (see Section 5.4). This is illustrated below in Figure 40.
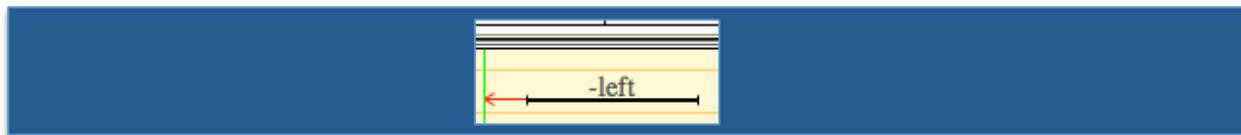
Figure 40. After adding an onset, the user needs to set the start point appropriately; the end point is taken to be the start point of the event to which it is added.

If the user were to then reset the start point of the event, the end point of the onset would adjust automatically.

7.3.4   Definition of an Entity (equivalent to a 'chained event')

An *Entity* includes the main event (its value is represented by a label) plus any associated elements that are tied to it. The maximum chain of associated elements that can occur, and the order they appear in relative to the *Event* is shown below:

Entity   =   [Onset < Initial Hold < Event < Final Hold < Offset]

Thus, in some cases, where no associated items are connected to an event, the event and entity are identical. However, if there are chained items, then the entity could also be thought of as a 'chained event': the event plus all associated elements. In the case of a compound (discussed in 7.6.6), it would include the entirety of the compound. The "event" and "entity" tools thus apply either to the event itself or to the entire chained event, respectively.

7.4   Tools for Display of Fields in the Utterance window

As presented previously:

- To hide a selected field, use the button.
- To display all and only those fields that contain data (i.e., are non-empty) for the utterance being displayed, use the button.

The non-manual and grammatical fields displayed in the upper portion of the *Utterance window* can also be reordered by dragging. Furthermore, the *Field Specifications Editor* (see Figure 34) allows the user to select a color for the display of any given field.

7.5   Setting or Adjusting the Start and End Points of Events in the Utterance window

For description of the navigation tools at the top of the window, please refer to Section 4.4. One additional tool is available at this level, shown in Figure 27. This tool works similarly to the Play Event and Play Entity tools described in Section 5.2, but applies to the entire utterance demarcated in the *Database View window*. See Section 5.6 for further details about what counts as the selected utterance.

Similarly, the Play Entity group of tools is activated on this level. An entity was just defined in Section 7.3.4

7.6   Data Entry for Information about Manual Signing

There is a new feature within SignStream® that integrates a Sign Bank (a repertoire of previously annotated *lexical* signs, along with their relevant gloss labels and morpho-phonological properties). If the lexical sign already exists in the Sign Bank, then the user can copy it into the utterance with its properties (and make any edits if there is small a deviation, e.g., in handshape, from the form in the Sign Bank). If the sign in question is a *fingerspelled sign*, a *loan sign*, a *classifier*, or a *gesture*, the Sign Bank is not accessed as part of the annotation process. (For further information about these classifications, see the documentation on annotation conventions: [5].)

So, the normal process for annotating a *lexical* sign is that the user would search the Sign Bank to see if the sign already exists. If it does, the information can be copied. If not, the user can provide the relevant information using the available tools, and add the new sign to the Sign Bank (with the new additions stored locally, so that the added items are available to the local workgroup).

We describe first the process for adding a sign in general. For purposes of exposition, we will illustrate this as if the ASLLRP Sign Bank did not exist. The steps described below would apply in any case for lexical or number signs that don't already exist in the Sign Bank or for signs of other types. The procedures described here would also be those that would be used by annotators who choose to use different annotation conventions (and thus who choose not to employ the ASLLRP Sign Bank at all; see Section 7.6.5.2).

Later, in Section 7.6.5, we will introduce the Sign Bank and show how this affects the way lexical signs get annotated, as information about signs already in the Sign Bank can be copied in directly.

7.6.1   Explanation and Description of Gloss Fields for Annotation of Manual Signs

Notice that there are two separate gloss fields: **gloss 1** (which represents the dominant hand; this will correspond to the right hand field for Participants who are right-handed) and **gloss 2** (representing the non-dominant hand, the left hand, for Participants who are right-handed). In cases where both hands are involved in the signing, the gloss information for the sign only needs to be entered in one of the gloss fields. The subsequent categorization of the sign as 2-handed through the morpho-phonological data entry will cause the appropriate information to be inserted into the gloss fields for both hands. For signs that are produced by one hand, gloss information be entered into only the appropriate field for the relevant hand (gloss 1 or gloss 2). This allows for the possibility that independent signs produced on the two hands may be overlapping, as in the following example:
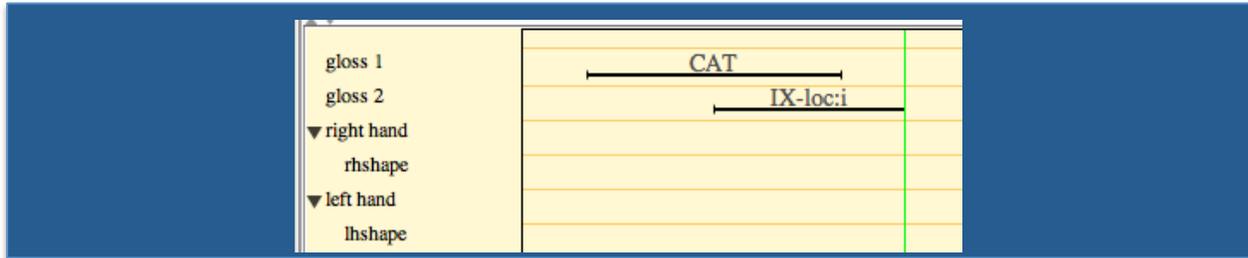
Figure 41. Example where the signs produced on the right and left hands are independent but overlapping

7.6.2 Entering Text into Gloss Fields

Start entering information about a manual sign by typing the name of a gloss: hold down Option (or Control) key and click within the *gloss 1* or *gloss 2* field. Be sure you do not click directly on the green navigation bar when creating a gloss label; instead, click within the field and to one side or the other of that bar. In the text field, type the gloss and hit the Return key, or simply click outside the field.
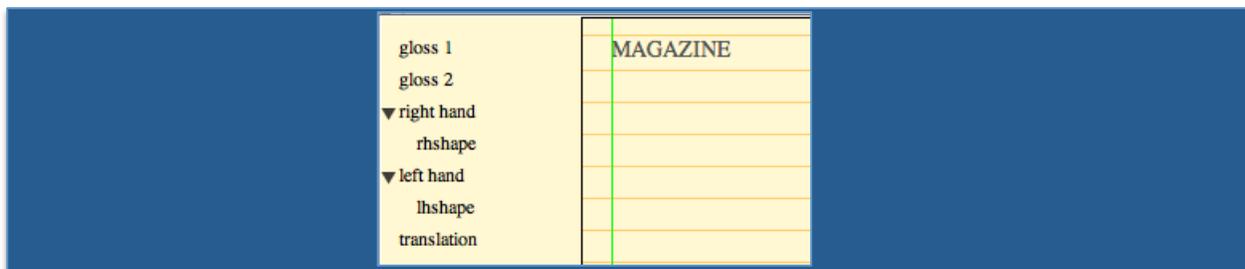
Figure 42. Option-click in the gloss field, and then type in the gloss label.

Then, set start and end points for the gloss (as described for Utterances in Section 6.2). To do this: (1) highlight the gloss by clicking on it; (2) drag the green Video Alignment indicator or use the slider or keyboard arrows to move to the point in the video where the gloss begins; (3) press **Set** in the "**Event Start Point**" group of buttons on the main menu. Repeat these steps to set the end point, using the "**Event End Point**" group of buttons. Once the start and end points are set, this will be visually apparent because a line will appear under the gloss.
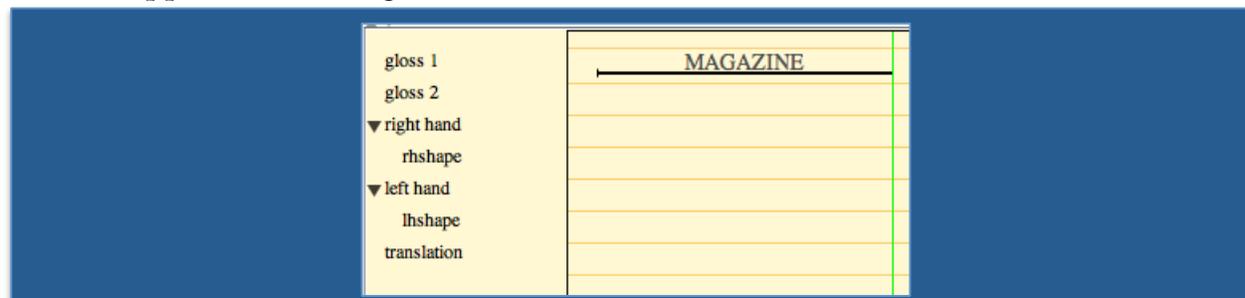
Figure 43. Set the start and end points of a gloss; a line will then appear.

You can adjust the start and end points of the gloss with "–" and "+" buttons in either Event Start or Event End groups. Use the zoom feature if needed.

7.6.3   Contextual Menu

Control-clicking on a gloss item will give you a number of options and sub-menus, as shown in Figure 44.

> Note: This User Guide provides instructions to Control-click to bring up contextual menus. FYI: In these cases, Option-click will have the same effect. See Section 13 for an overview of Keyboard Actions.
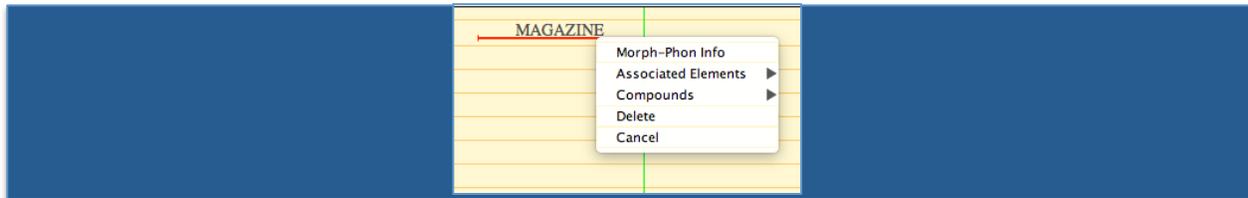
Figure 44. Control- (or right-) click on a gloss item to bring up options and sub-menus

The **Associated Elements** sub-menu allows you to add onsets, offsets, or initial or final holds, as was previously explained in Section 7.3.3. Associated elements, when highlighted, can be time-aligned, played, and adjusted using the usual sets of tools that apply to events. Adjusting the Onset end point will automatically adjust the Initial Hold start point so as to not to allow overlapping or gapping. Similarly, altering the Initial Hold start point will automatically affect the Onset end point. The same mechanism applies to the Final Hold/Offset group. Once temporal phrases have been created for an event, the whole group will be treated by the program as an entity (i.e., even if only one element of the entity is highlighted, the "**Play Entity**" group of buttons will control the entire chained event.)
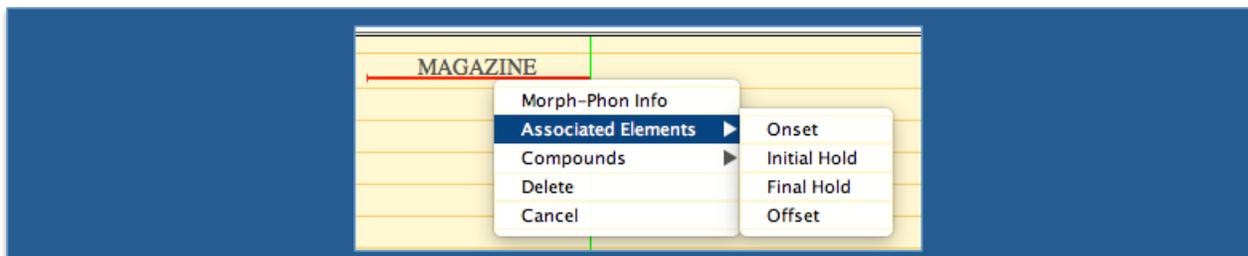
Figure 45. Adding Onset, Offset, or Initial or Final Hold

- **Delete** is self-explanatory; Control- (or right-) click on the item to be deleted—whether the main event or any of the associated elements—and choose [Delete]; the user will be asked to confirm. An example of deletion of an offset is illustrated in Figure 46.
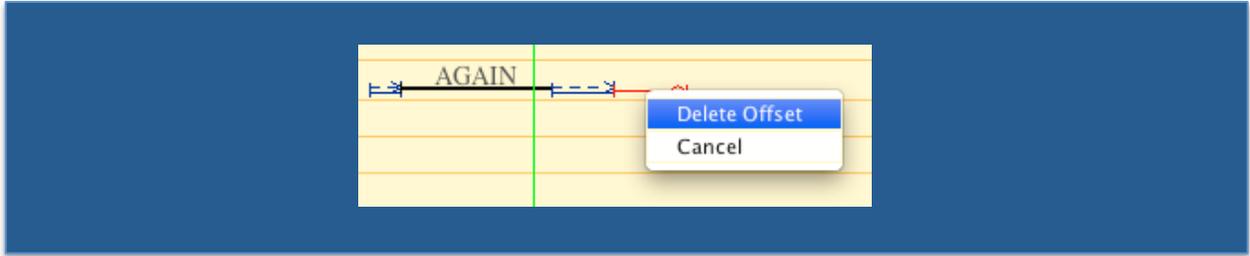
Figure 46. Deleting an Associated Element

- **Compounds** will be discussed in Section 7.6.6.

Selecting [**Morph-phon Info**], or just double-clicking on the gloss itself, will take you to the window shown in Figure 47. The text entered in the *Utterance window* will appear, but this can be edited. Once all the information has been entered via this window, clicking the "**Enter**" button will result in the window closing, with the start and end handshape information aligned with the gloss(es) and displayed in the main portion of the *Utterance window*, immediately underneath gloss fields: in the fields for right and left hands. This window can be reopened by double-clicking on the gloss.
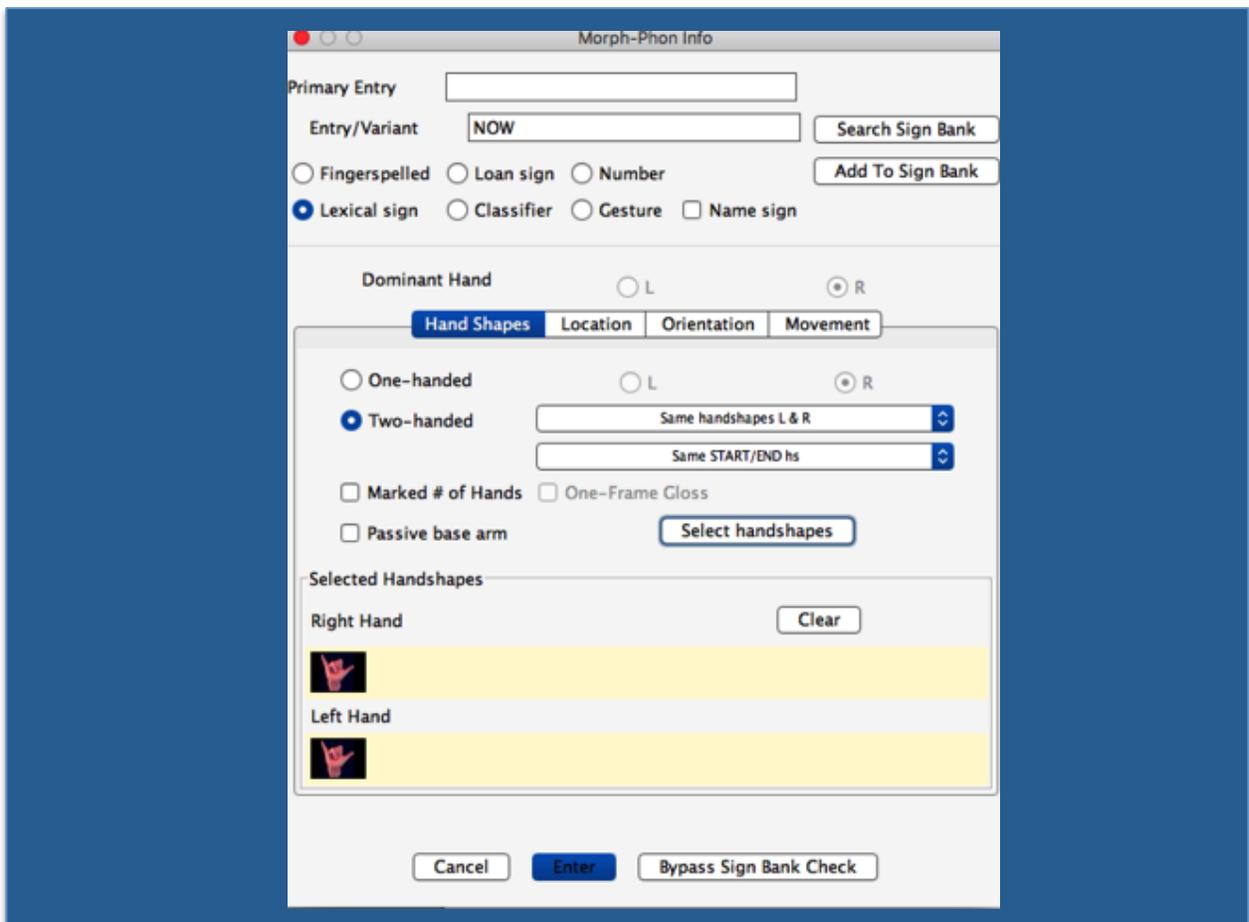
Figure 47. The *Morph-Phon Info window*

Ignoring for the moment the Sign Bank buttons (we will return to this in Section 7.6.5), there are various categorizations to be made within this window:

1) **Type of sign** (Fingerspelled, Loan sign, Number, Lexical Sign, Classifier, or Gesture), for which radio buttons are provided; there is also a checkbox to identify name signs (of whatever type). When selecting "**Fingerspelled**," "**Loan Sign**," or "**Number**," the program will automatically choose the "**One-handed**" button (see below) as the default value. Similarly, selecting "**Lexical sign**," "**Classifier**," or "**Gesture**" make "**Two-handed**" the default, though for any of these categories it is possible to manually adjust for number of hands.

2) **Sign parameters**; Only **Hand Shape** has been implemented to date; **Location**, **Orientation**, and **Movement** tabs are there as placeholders for future development.
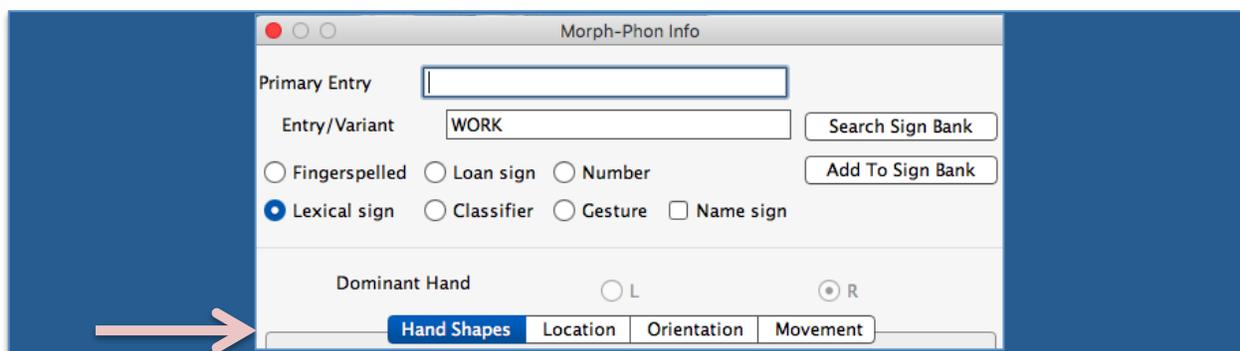
Figure 48. Only Handshape parameter information has been implemented to date.

The user will specify:

    a) Whether the sign is 1-handed or 2-handed

        • If 1-handed: Same or Different start and end handshapes?

        Note: The Dominant Hand is checked to be L(eft) or R(ight) based on the information that has previously been entered about the Participant being left- or right-handed. If the signer is right-handed, then the dominant hand will correspond to the *right hand* field when the handshapes are entered into the *Utterance window*. It there is a 1-handed sign, the gloss should be entered in the appropriate gloss field from *the Utterance window*: the *gloss 1* if the sign is produced with the dominant hand, and otherwise *gloss 2.*

        • If 2-handed, choice of values:

            • Same handshapes on left and right hands

            • Same handshapes on left and right hands (but in alternation, so the 2 hands don't have the handshapes at the same time)

        • Different handshapes on left and right hands

        • And Same or Different start and end handshapes?

b) Checkboxes are also provided so that the user can indicate:

- That there is a marked number of hands, i.e., either a sign that is normally 2-handed but is produced with only 1 hand, or the reverse, a sign that is normally 1-handed but is produced with 2 hands.[6]
- That the sign is produced using a Passive Base Arm.[7]

c) After identifying the properties listed in (1) and in (2)-a, clicking on the "**Select handshape**" button will open the appropriate handshape palettes for the type of sign in question, although the user always has the option to display any of the available palettes. The handshapes in the palette are grouped, but the triangles can be expanded to show all of the options.

- A single Handshape palette will appear if the sign is 1-handed or 2-handed with the same handshapes.
- If there are 2 handshapes and they are different, then the full handshape palette will appear by default for the dominant hand, and the set of unmarked handshapes will be displayed for the non-dominant hand.
- For same start and end handshapes, the handshape only needs to be selected once.
- For fingerspelled signs, the letters will be displayed in the handshape palette, but the user can alternatively type them in with the keyboard.
- For numbers, the number palette will open.

Some of the above palettes and options are shown in Figure 49.

The selected handshapes will appear at the bottom of the *Palette window* as shown in Figure 52; clicking on the "**Bypass Sign Bank Check**" button will close that window and display the handshapes within the *Morph-Phon Info window*, as shown in Figure 52. The "Clear" button clears the selection and start anew. The "**Cancel**" button returns you to the previous screen.

---

[6] This is also normally encoded in the glossing conventions, by a prefix of (1h) or (2h) for signs produced with a marked number of hands.

[7] *Passive Base Arm* should be selected for a two-handed sign where the non-dominant hand presents with an unmarked handshape and provides a base for the dominant arm.
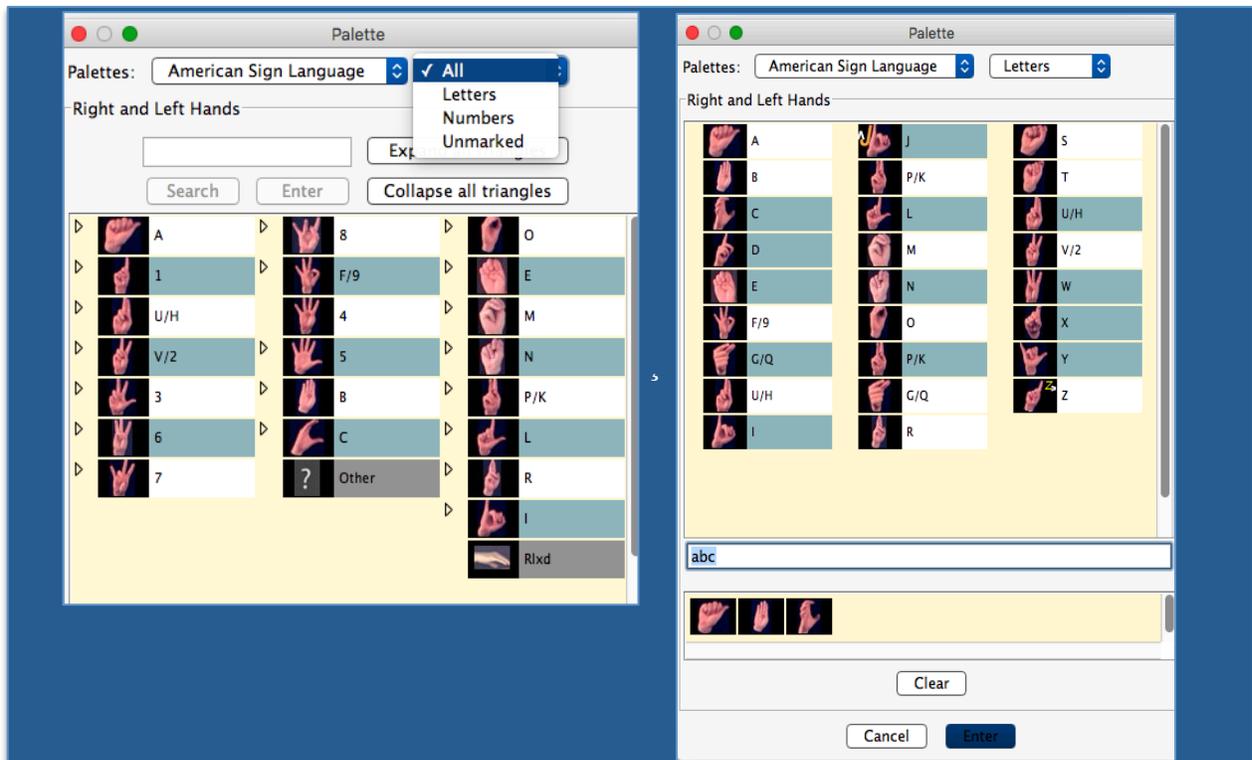
Figure 49. Default palettes are displayed based on sign properties; this can be changed by the user. On the right is the palette for fingerspelling; the user can alternatively type in letters in this case.
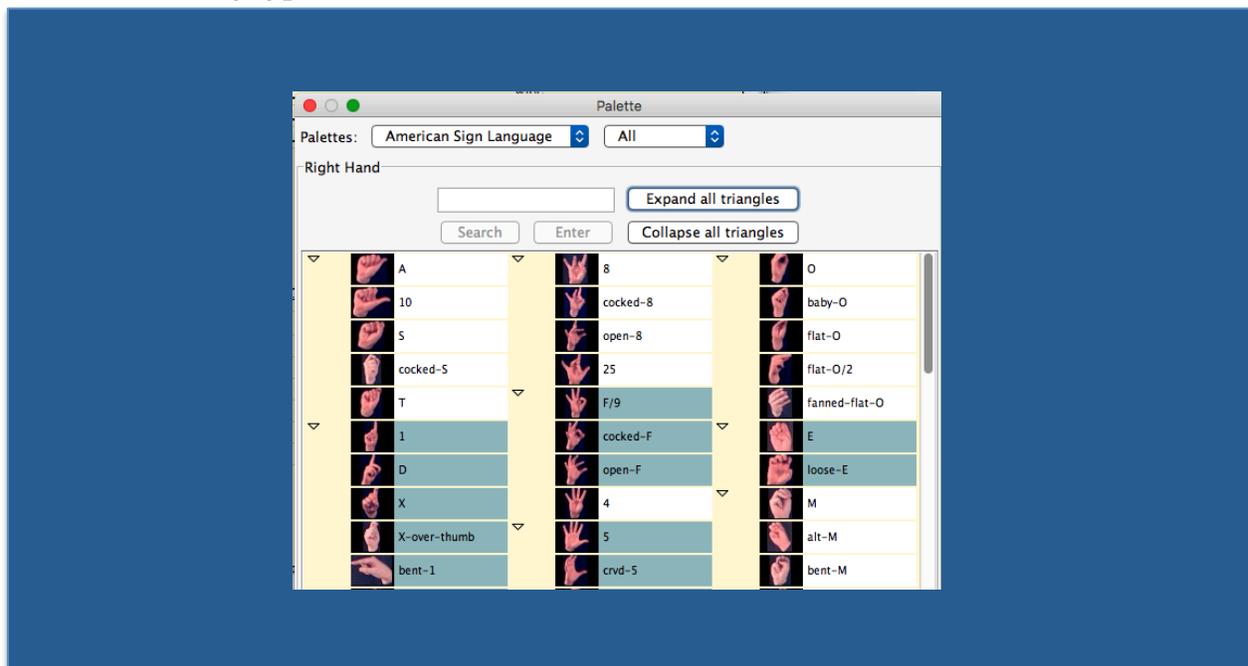
Figure 50. The triangles can be expanded to display similar handshapes (groups share highlighting color)
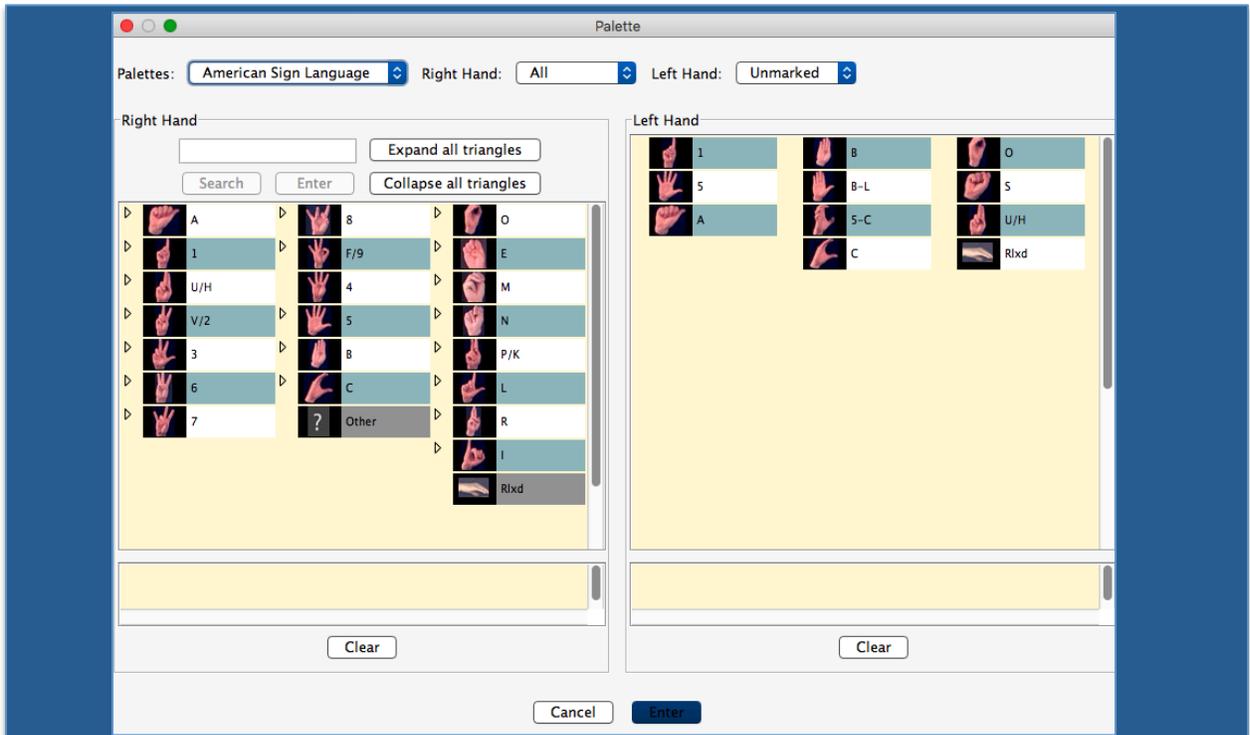
Figure 51. Data entry for 2-handed lexical signs with different handshapes on the 2 hands
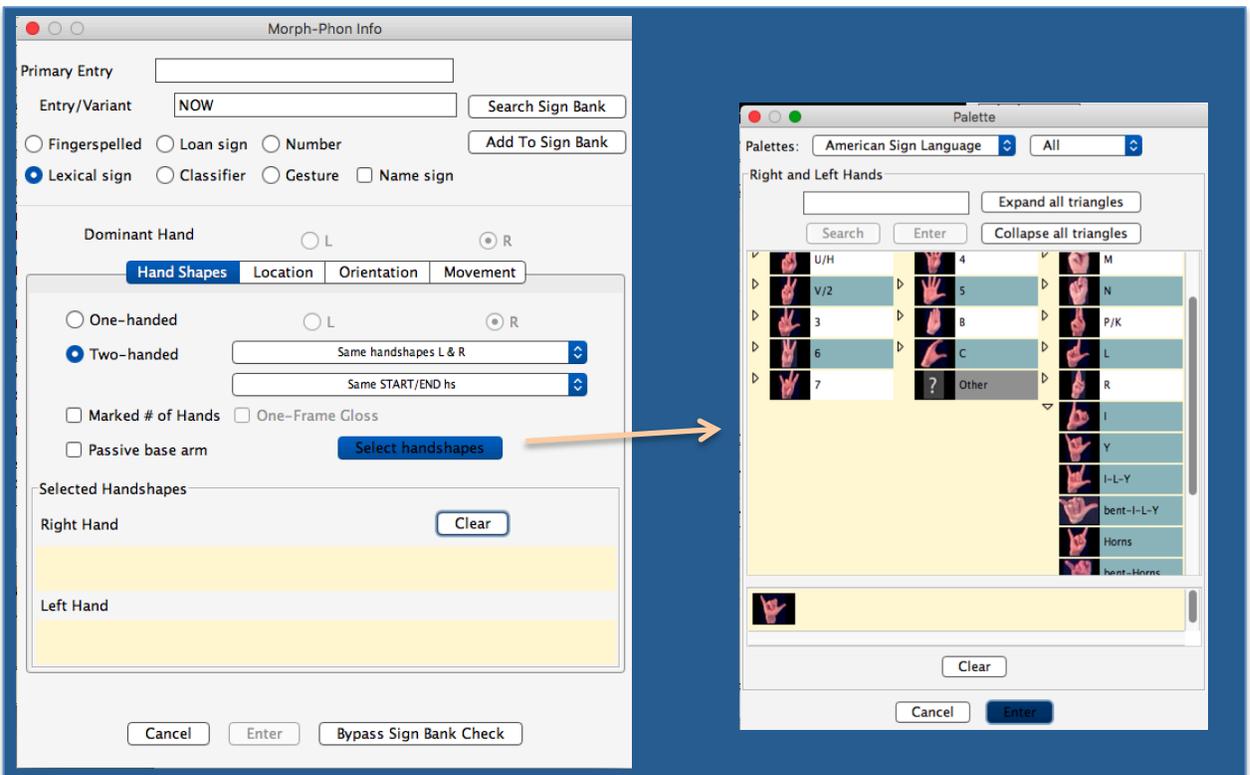
Figure 52. Selection of handshapes in the *Morph-Phon Info window*, prior to entry to the *Utterance window*.
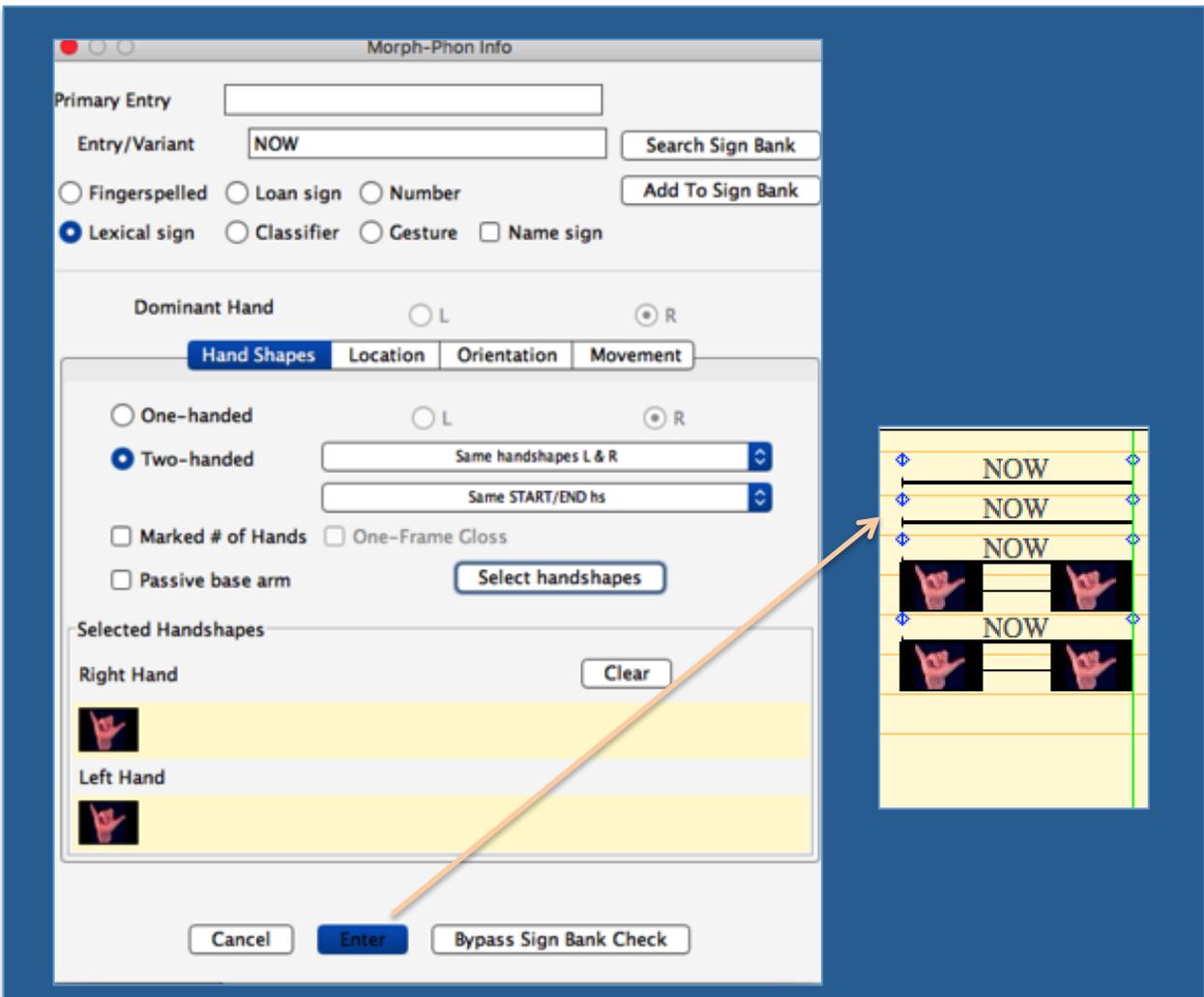
Figure 53. Handshapes selected in the *Morph-Phon Info window* will be entered into the *Utterance window*.

7.6.4 Important Background Information about Conventions for Gloss Labels

The ASLLRP conventions for assigning English-based gloss labels discussed in more detail in [5, 12], [12], and [7]. Prefixes identify particular sign types (e.g., "fs-" for fingerspelled signs, "#" for loan signs) and the presence of a marked number of hands (e.g., "(1h)" for a sign that is normally 2-handed but is produced with only 1 hand, or "(2h)" for the reverse case). A plus sign at the end of a gloss indicates a (partial) reduplication. For present purposes, we are not considering, e.g., COP and COP+, to be distinct signs; they have the same gloss label (not including the +), but we are including the + sign to indicate when partial reduplication occurs.

These conventions are designed to ensure that a unique gloss label is associated with a unique sign production. So every time the gloss CAT is found, this correlates with the same sign. Of course, no two productions are truly identical. There may be differences in production that are not lexically significant. For example, there may be a slight dif-

44

ference in the realization of a handshape. We do not assign a different gloss label, however, unless there is something linguistically significant (and relevant to that particular lexical item) that is different. When variations occur that are specific to the options available for a given lexical item, we use distinct gloss labels to represent the distinct variants. For example, the sign meaning "to pray" has productions involving distinct handshapes, illustrated in Figure 54. In this case, the possible variation in handshape does not occur generally, with large numbers of other signs in ASL, but rather is specific to this sign. Thus we have distinct glosses for the two variants (in this case, marking the handshape as part of the gloss, but this might have alternatively been labeled as "PRAY_2"; the handshape does not always figure in the gloss label in such cases).
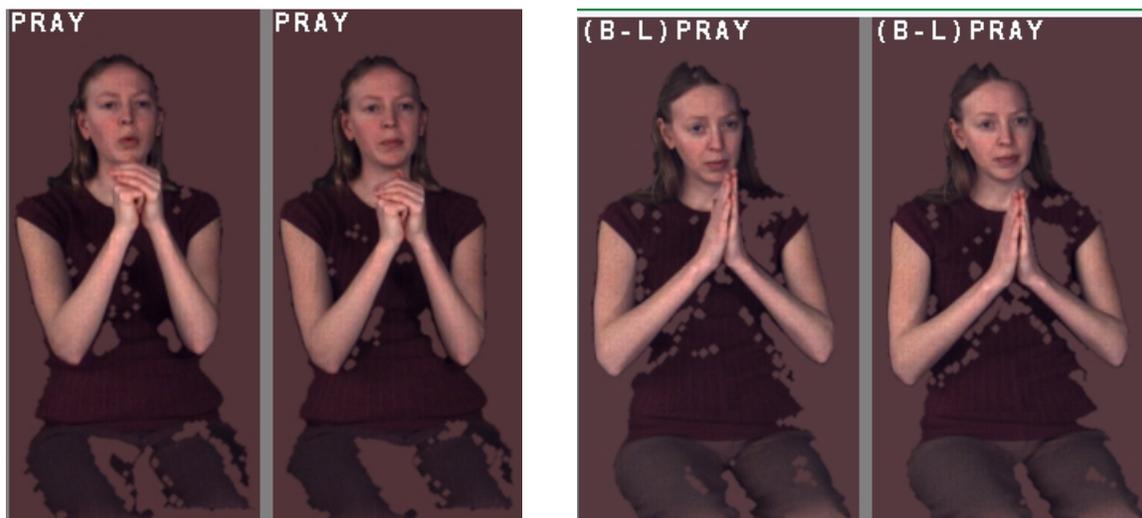
Figure 54. Distinct Entry/Variants – with Distinct Gloss Labels:
PRAY (left) vs. (B-L)PRAY (right)

For convenience, we have grouped signs that have some similarity, either in meaning or in production, together—to facilitate decisions about gloss labeling—but these groupings are not intended to have specific linguistic significance. In this case, then, both PRAY and (B-L)PRAY are grouped under the same "Primary entry" label, PRAY, as distinct Entry/variants. Since there is no universal convention for English-based gloss labeling of ASL signs, we have established a Sign Bank to help in ensuring consistency in labeling. Thus from within SignStream, for lexical signs and number signs, lookup in the Sign Bank is facilitated as part of the annotation process.

7.6.5   Sign Bank

7.6.5.1   Look-up

For *lexical* and *number* signs, there is one intermediary step in the process of entering the gloss label and morpho-phonological information, and that is, *before* entering all of the information, to check to see if the sign already exists in the **Sign Bank**. If it does, then all of the relevant information can be copied into the *Morph-Phon Info window* with a single click.

There are 2 relevant buttons at the top of the *Morph-Phon Info window*; see Figure 55.

Figure 55. Sign Bank buttons in the *Morph-Phon Info window*

Click on the "**Search Sign Bank**" button to see if the sign exists there. The **Sign Bank** is a collection of signs with their corresponding gloss labels and morpho-phonological properties. If the user has already entered information about whether the sign is 1- or 2-handed, and possibly also the relevant handshapes, this information will be transferred to the *Sign Bank Search window,* as shown in Figure 56. The user can choose to search by any character string (with or without requiring an exact word match) and may or may not choose to restrict the search by number of hands (i.e., the search can be conducted over 1-handed signs, 2-handed signs, or either) and/or specific start or end handshapes on the dominant and/or non-dominant hand. Handshapes will not be included unless the "Include Handshapes in Search" box is checked. The user should click on the triangles for entries that are of interest to see details of the Sign Bank entries that may be of interest. To see the information for a particular entry/variant, double-click on it. After selecting an item for the first time, the user may be asked to accept network connections (as some of the Sign Bank information is being read from the Internet), as shown in Figure 57 ; choose yes. Otherwise some information may not be able to be displayed in the *Sign Bank Search window.* What appears next is shown in Figure 58.
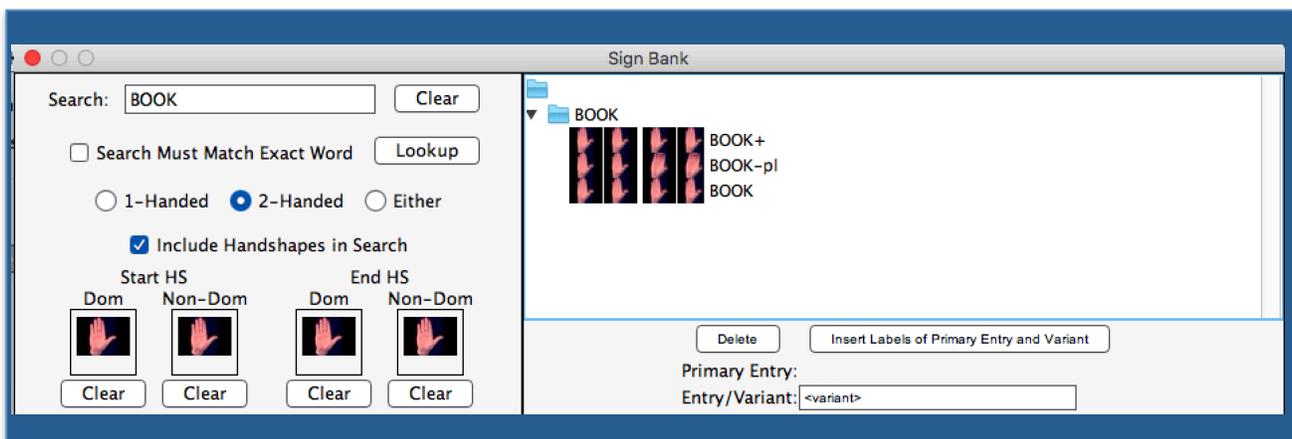
Figure 56. *Sign Bank Search window*
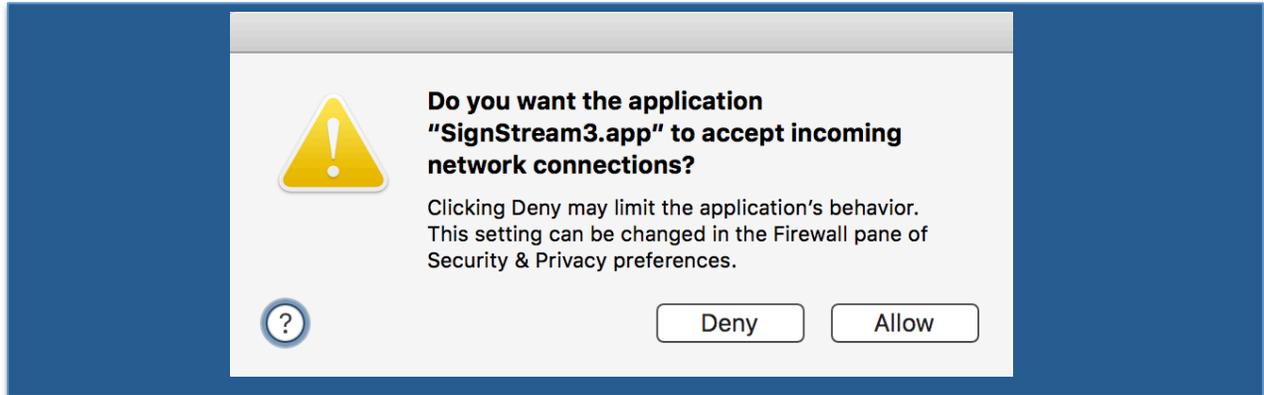
Figure 57. Accept incoming network connections
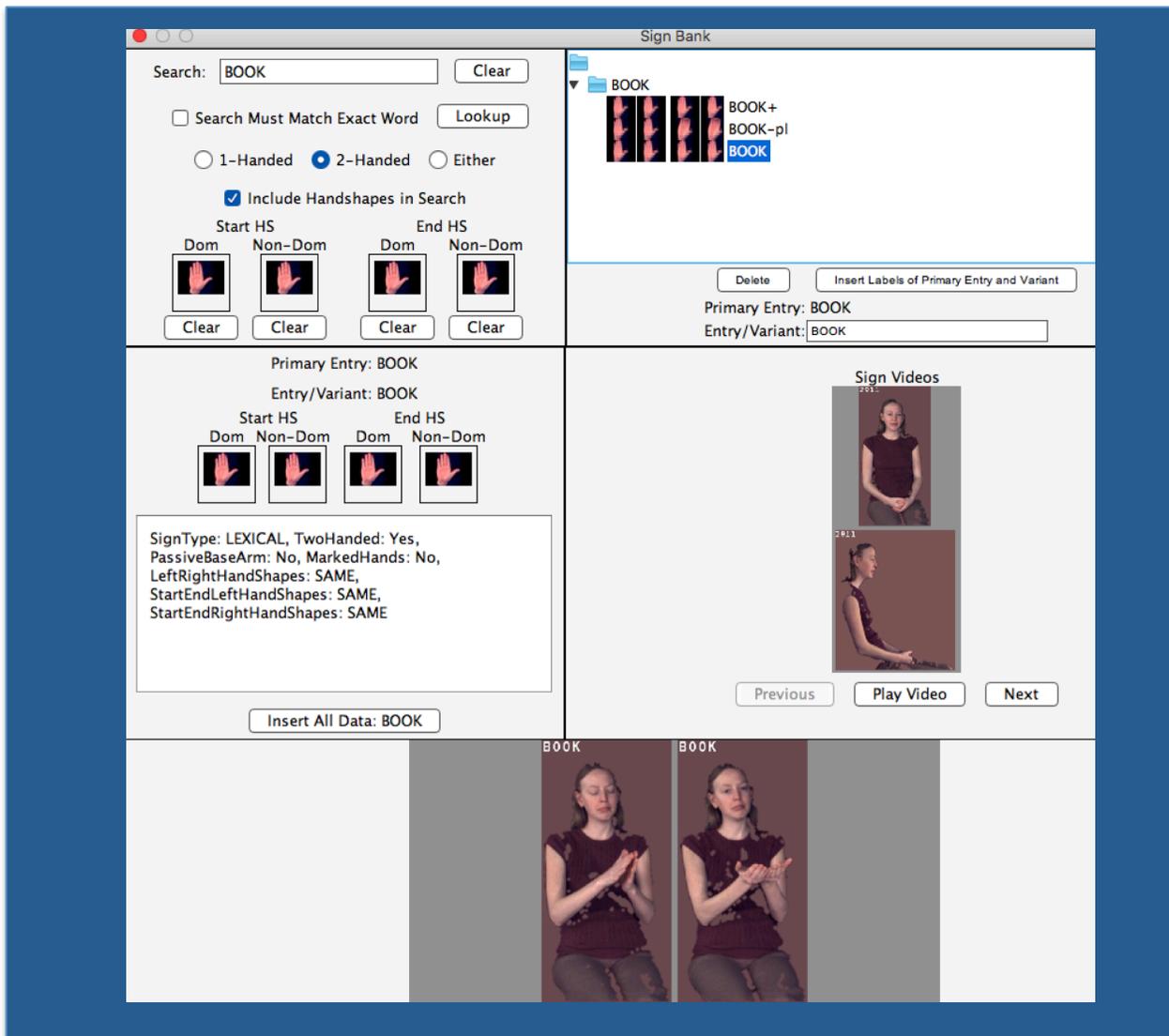
Figure 58. Sign Bank Search Results

The user can play the video to view each of the signs that appear in these lists. By choosing "**Next**" (to the right of "**Play Video**") a video showing multiple productions in parallel (if such a composite video is available) will appear and the user can play that. This is shown in Figure 59.
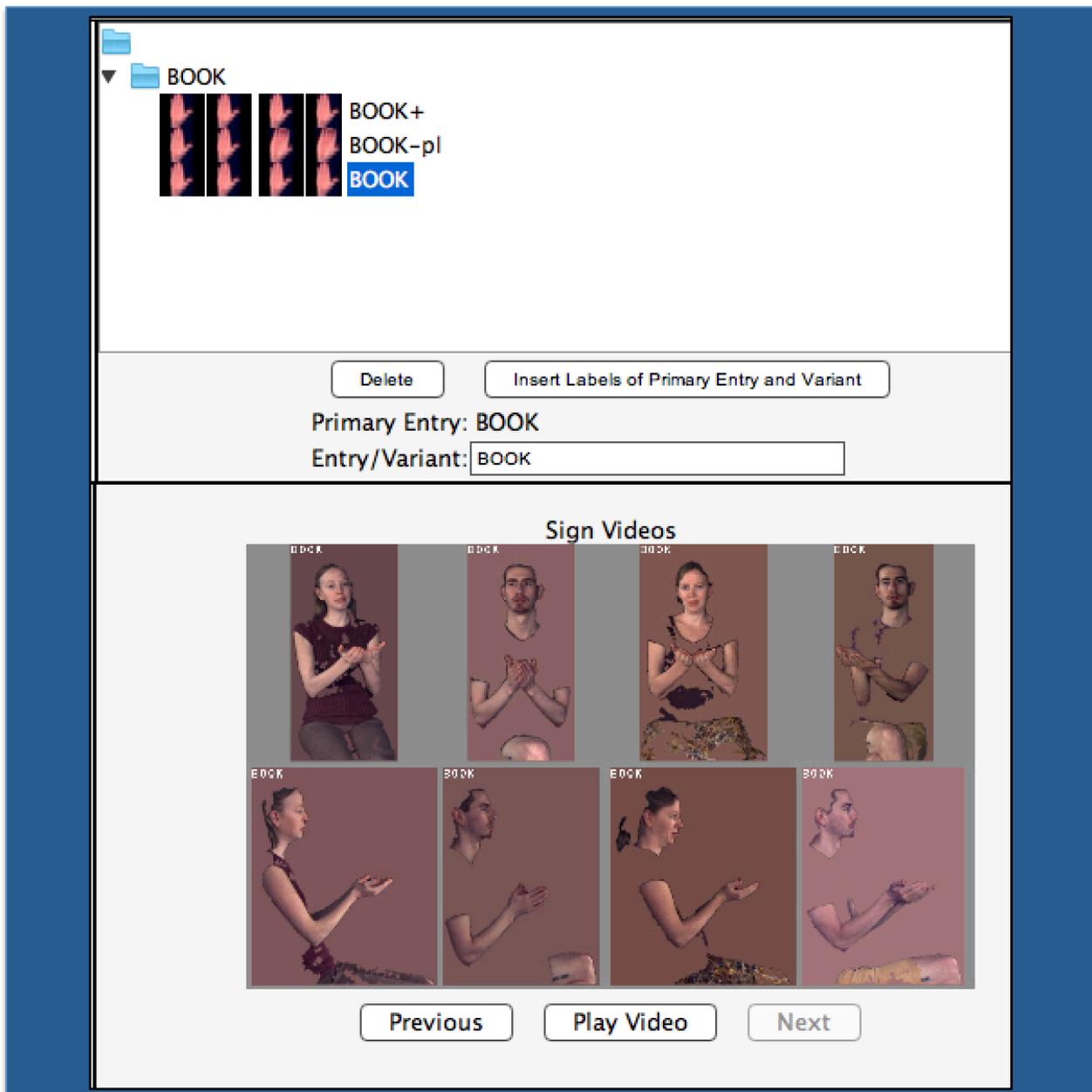
Figure 59. Viewing other available videos

To return to the previous video, click the "**Previous**" button.

If the sign the user is looking for is found in the Sign Bank, the user can click the "**Insert All Data**" button to copy the information as displayed to the *Morph-Phon window,* where any further editing can be done prior to entry of the information into the

Utterance window. Note that this preserves any grouping information within the Sign Bank. So, the user who looks up PRAY will see:
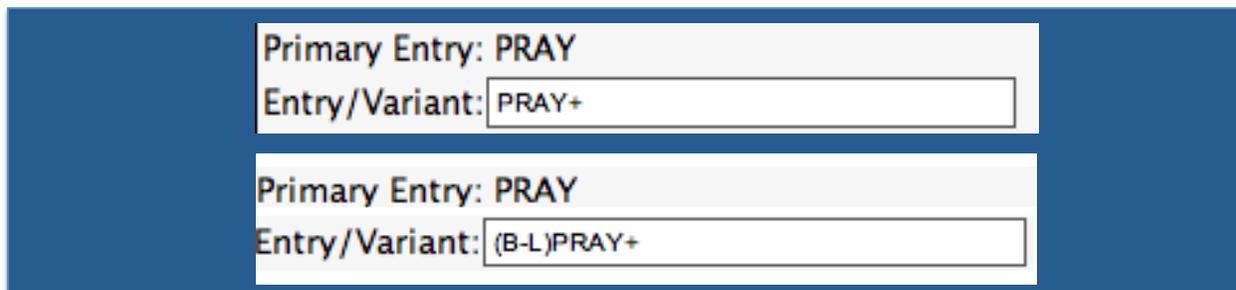
Figure 60. Details for Sign Bank Entry

Clicking on "**Insert All Data: (B-L)PRAY+**" will insert the information about the entry/variant label, the primary entry with which it is associated, and the handshape information as well as other properties displayed within that window.

However, suppose the user has yet a third distinct Entry/variant of PRAY to annotate, a variant that is not yet present in the Sign Bank, but that should also be associated with the Primary Entry "PRAY ", the user should find the Primary Entry (in this case "PRAY") in the Sign Bank and add it, along with all its data, to the *Morph-Phon Info window.* Then, edit within the *Morph-Phon Info window* to the properties desired of the new variant, while keeping the Primary Entry label as is. Finally, click "**Add to Sign Bank**" to add that variant to the local sign bank, as illustrated in Figure 61.
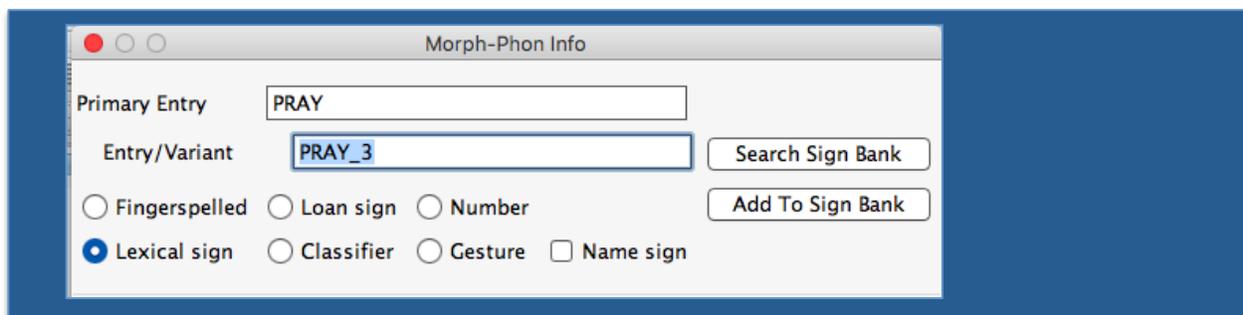
Figure 61. Adding a new Entry/Variant to a particular Primary Entry

If the annotator has not found the Entry/variant, nor the Primary Entry to be associated with the current example, after searching the **Sign Bank**, the annotator can enter all the relevant information and then click on the "**Add to Sign Bank**" button.

If the user attempts to enter a new lexical sign or number (not already included in the Sign Bank) by clicking the "**Enter**" button at the bottom of Figure 52, the user will be prompted to add the new sign to the Sign Bank before proceeding.

When the user adds a sign to the Sign Bank, it is, in fact, added to the Local Sign Bank rather than the Global Sign Bank. Thus the image of start and end frames and a link to play the sign video will not be available. This can nonetheless help to ensure consistency of gloss labeling. See the important note in Section 11 about preserving the

information in the Local Sign Bank file Bank file when updating SignStream®, and see Section 9.2 for information on how to share a Local Sign Bank file with another user.

Note also that SIGN, SIGN+, SIGN++, etc. – with the + signs indicating the number of partial reduplications at the end of the sign (if any) – are all considered to be matches with respect to the Sign Bank.[8] So, if you are looking for one of those but find another, you can insert the information from the Sign Bank and then simply adjust the number of +'s for your entry (or delete any +'s), as appropriate.

7.6.5.2 *Bypassing the Sign Bank*

Annotators who are using the ASLLRP glossing conventions are urged to use the ASLLRP Sign Bank, as just described, and to add any new entries (which get added to their local Sign Bank). However, if you are doing a different kind of annotation and using conventions not consistent with those used in the ASLLRP Sign Bank, you may (or may not) wish to *view* the examples we have, but you would not want to impose glossing conventions inappropriate for your work. Such users, rather than clicking on "**Enter**" to insert information into the *Utterance window,* should click instead on the "**Bypass Sign Bank Check**" button to insert the information from the *Morph-Phon Info window* directly, without verifying that the sign has been added to the Sign Bank.

7.6.6 Compounds

A compound is a sign that is made up of a combination of usually two, but potentially more than two, meaningful elements that can (normally) occur independently. Frequently there are some changes in articulation found within a compound, as compared with the way that the signs may be produced independently.   Within SignStream®, a compound can be created by first annotating the component parts and then by associating them by selecting the Compounds sub-menu from the pull-down menu used for editing gloss items.   Control-click on one of the elements of the compound, then choose Compounds, and you will be able to link that item to the gloss that comes before or after it, as illustrated in Figure 62 (2) . A + symbol will then appear between the connected glosses. To link another gloss, or to unlink two glosses, you should again use the Compounds options. This is illustrated in Figure 62 (4).

---

[8] This is despite the fact that the reduplication may carry important linguistic information about such things as aspect or grammatical category.

1. Annotate two component parts that will form a compound:
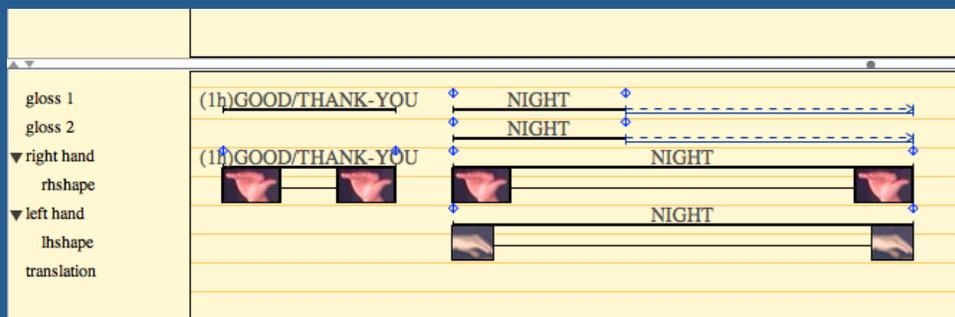
2. Control- (or right) click on one of the glosses, and see the options listed under Compounds:
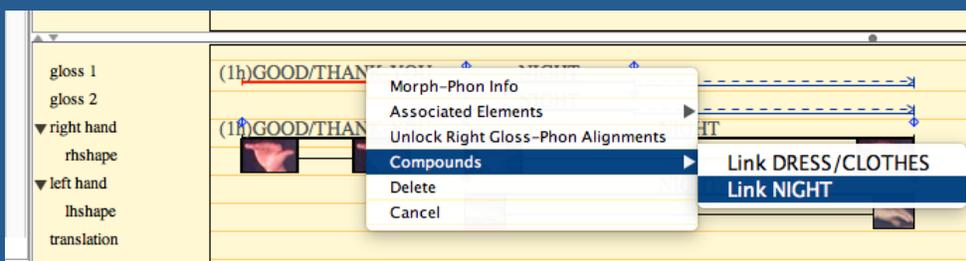
3. Choose the segment that you want to link; a + will connect the parts in the display.
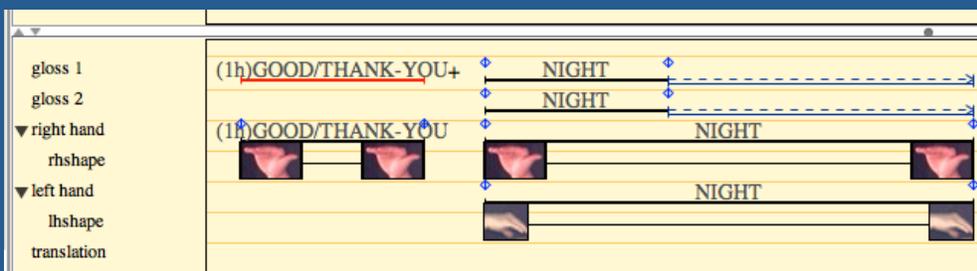
4. Use the same method to delink glosses, or to link another adjacent gloss.
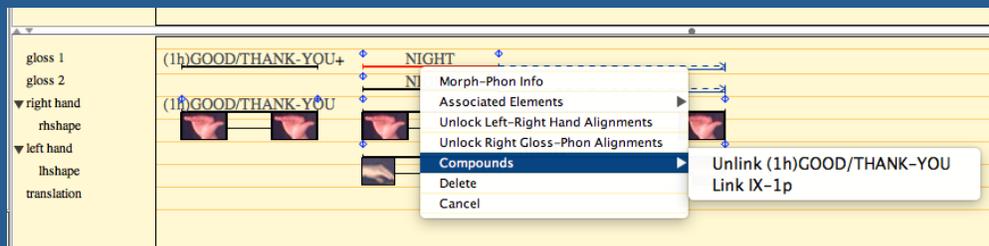
Figure 62. Steps for creating a compound

51

Note that for any parts of compounds that are in themselves lexical signs or numbers, the method for looking up the individual components in the Sign Bank is as described in Section 7.6.5. So, BOY and ALSO, when they occur as part of a compound such as BOY+ALSO, would be need to be entered separately from the Sign Bank and then linked. Once linked into a compound within the application, the + sign will be sufficient to make it visually clear that these occur as parts of a compound.

7.6.7 Locking and Unlocking Manual Fields

The default status of a manual Entity is to be temporally synchronized for both hands; however it is possible to unlock this synchronization and adjust the two hands separately. If there is a 2-handed sign where the 2 hands are not starting and ending at the same time, Control-click on the gloss label of the dominant or non-dominant hand, and then select "Unlock Left-Right Hand Alignments." It then becomes possible to adjust the start and end points of the two hands independently, as shown in Figure 63.
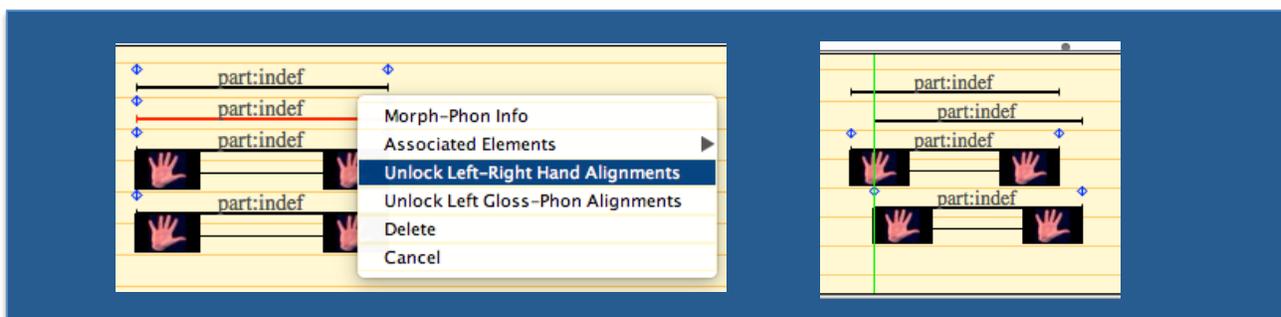
Figure 63.   Unlocking the left and right hand alignments

This can be undone by relocking those alignments. To re-synchronize the entity, repeat the same process but select Lock (which has replaced Unlock in the menu), as shown in Figure 64.
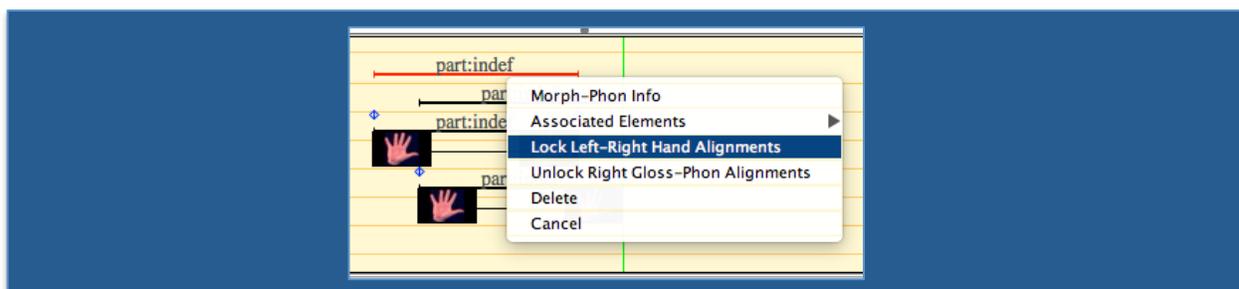
Figure 64.   Re-locking the left and right hand alignments

The fields will snap back to be temporally synchronized at the point where the dominant hand is currently defined (unless this would cause overlap that is not allowed, in which case the timings of the non-dominant hand will be used if possible, and otherwise an error message will alert the user to the problem).

There may similarly be cases where the sign starts or ends a bit before or after the

real start/end time of the handshape. It is also possible to unlock the left or right alignment of the gloss and handshapes on the selected hand (left or right), as shown in the above menu.

7.7 Translation Field

To insert a translation in the "translation" field at the bottom of the *Utterance window*, double-click in that field near the left edge, and a box will appear for insertion of text, as shown in Figure 65.
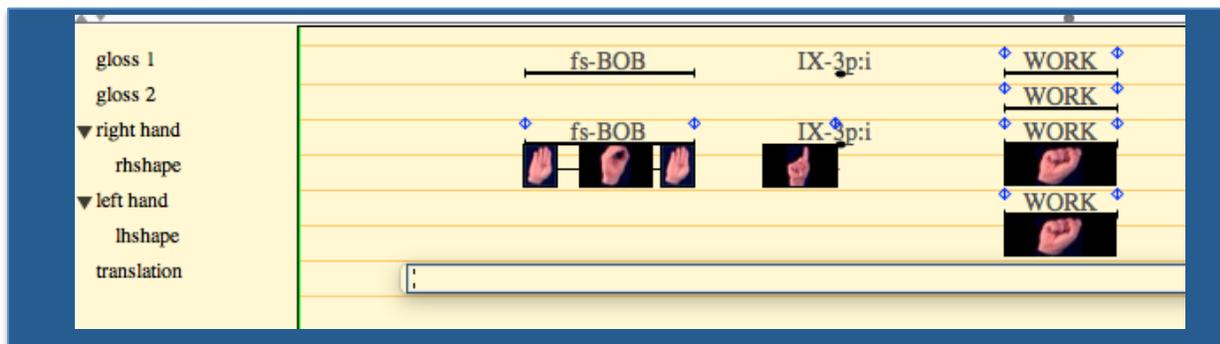
Figure 65. Double-click to bring up a text box for insert of a translation

Type in the text, and hit "Return" to enter it. If you want to make further changes, double-click again in the translation field so that you can modify the text that has been entered, and hit "Return" to enter the changes.

7.8 Duration

There is a tooltip display of the duration of items in the *Utterance window.* Hold the cursor over an item to see its duration, as shown in Figure 66 and Figure 67.

53
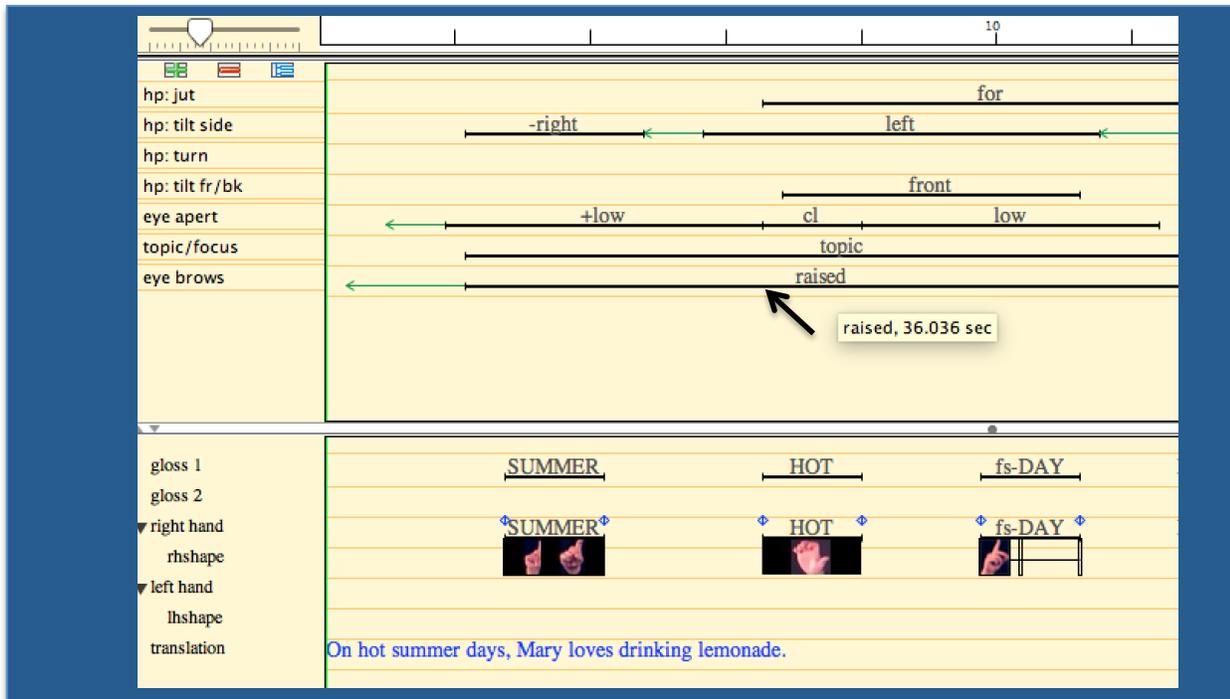
Figure 66. When the cursor hovers over a non-manual item, the duration is displayed
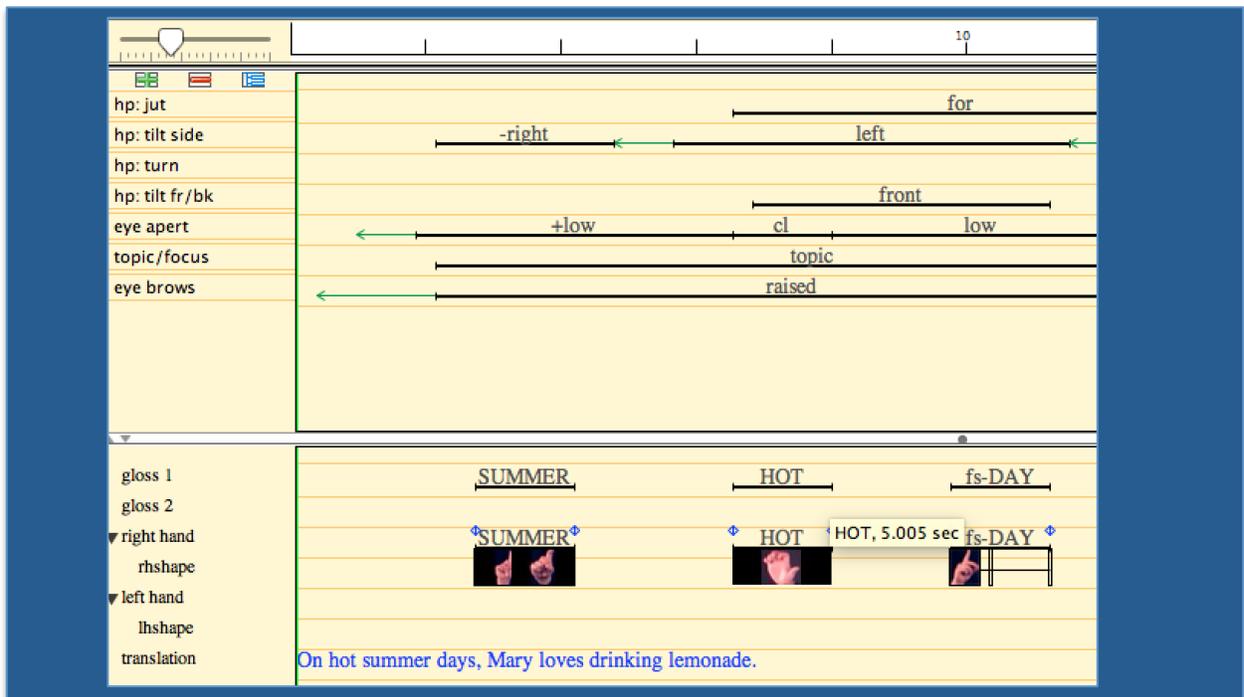
Figure 67. Tooltip display is available also for gloss items

7.9   *Controlling Display of Temporal Partitions and Segment Tiers in the* Utterance window

The Temporal Partition (TP) and Segment Tier (ST) being viewed are displayed just above the *Utterance Index.* If you had clicked on one of the <u>Segment</u> Bars from the Database View, e.g., the one selected and highlighted in red in Figure 68, then you would see only the corresponding TP/ST in the *Utterance window,* as in Figure 69.
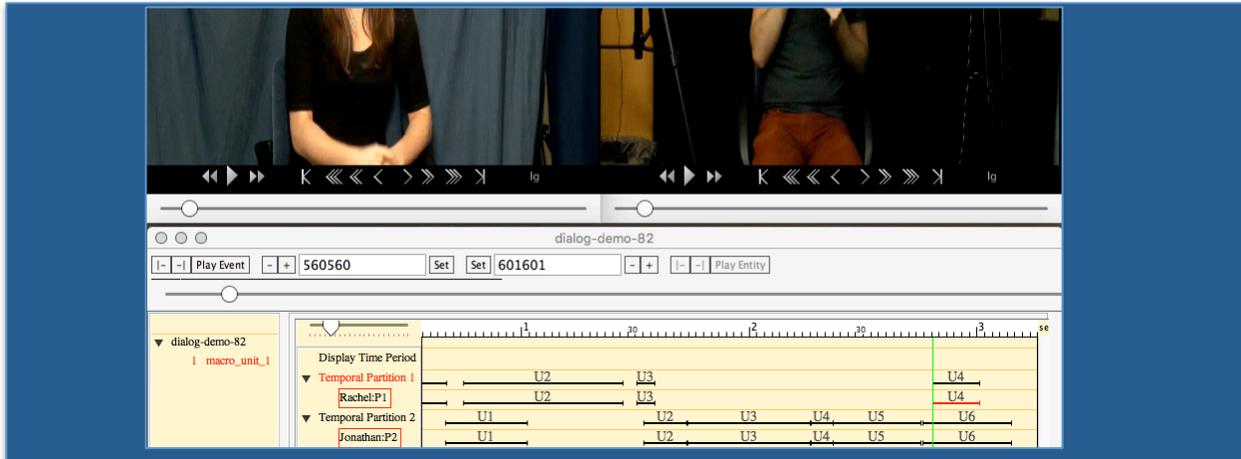
Figure 68. Double-click on a Segment Bar to Display that Segment in the *Utterance window*

55
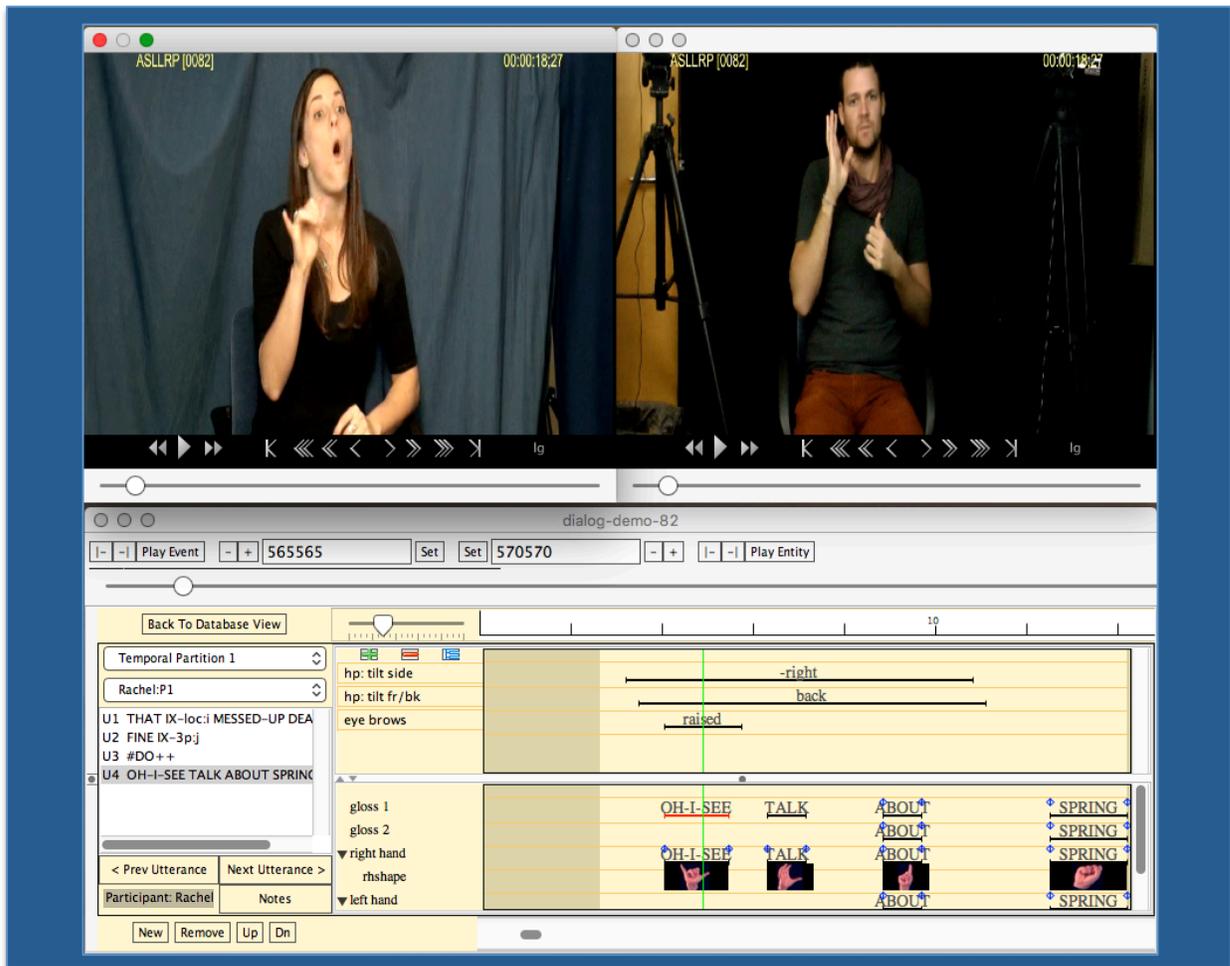
Figure 69. Display of a single Segment – result of clicking on the Segment Bar from the _Database View window_

However, if more than one TP or ST is available, choosing a different one from the dropdown-menu in the _Utterance window_, above the _Utterance Index_, will cause the one currently in view to be replaced by the one you have selected, as shown in Figure 70. Figure 71 shows the TP/ST for Rachel having been replaced by the TP/ST for Jonathan.
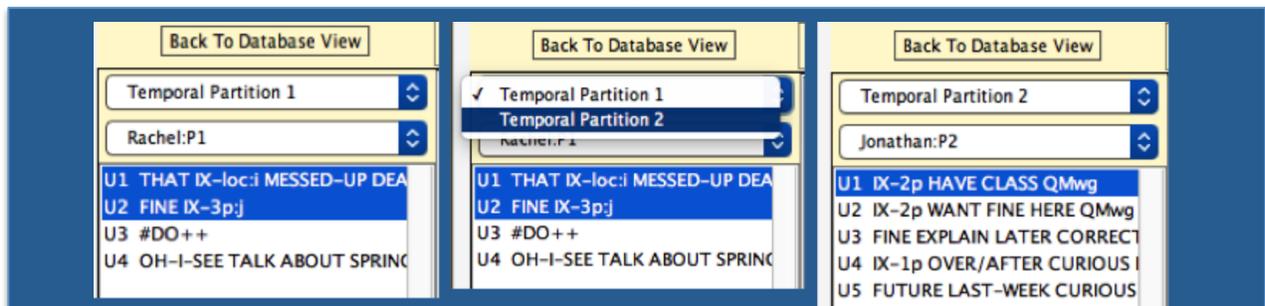
Figure 70. Switching to view a different Temporal Partition/Segment Tier using the Drop-down menu at the top of the _Utterance Index_
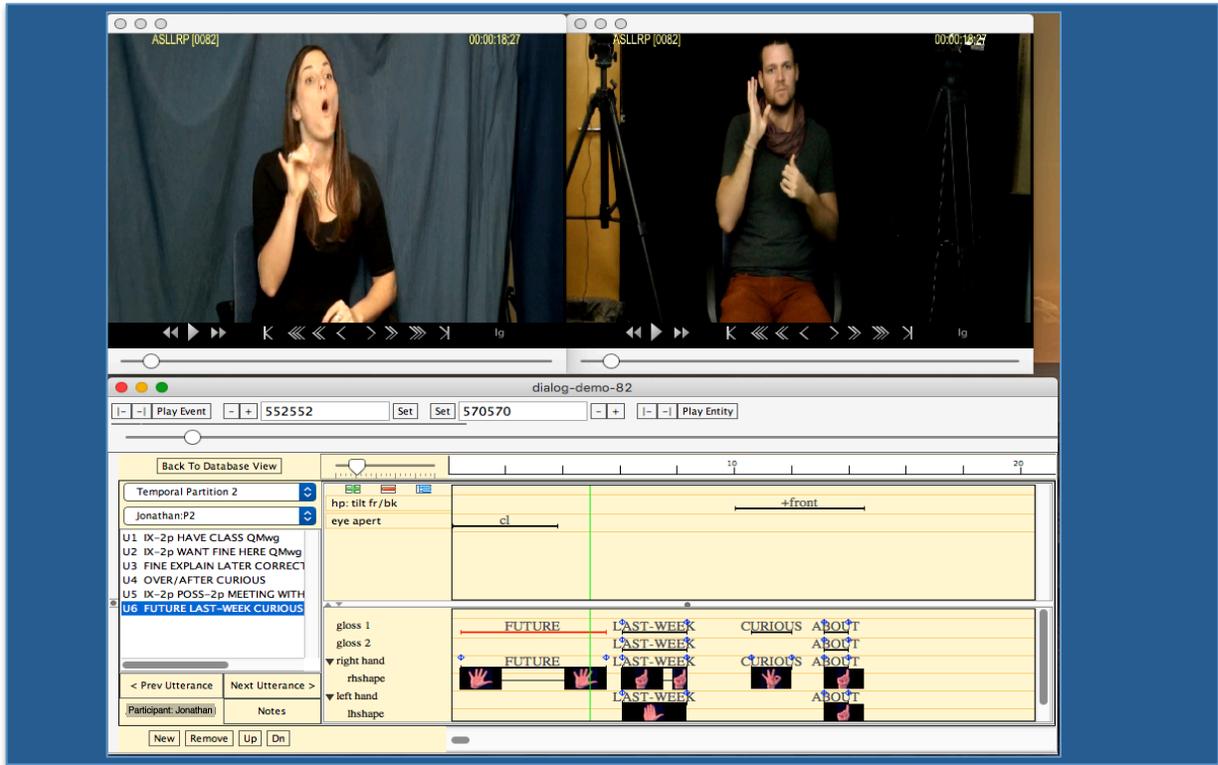
Figure 71. The TP/ST with Jonathan has replaced the one with Rachel in the *Utterance window*

Clicking on "**New**" from the bottom left in Figure 69 will allow you to select an additional TP/ST for viewing. For example, from what is shown in Figure 68, one can arrive at a view like that in Figure 73 by selecting the other TP/ST to add to the display, as shown in Figure 72.
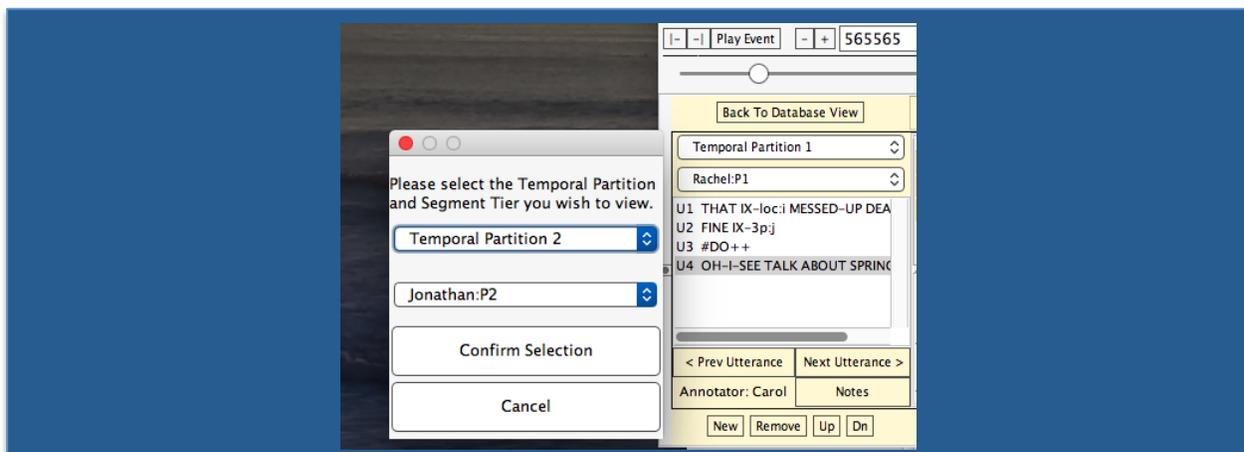
Figure 72. Choosing a New (=Additional) Temporal Partition/Segment Tier to be Viewed in the *Utterance Window*
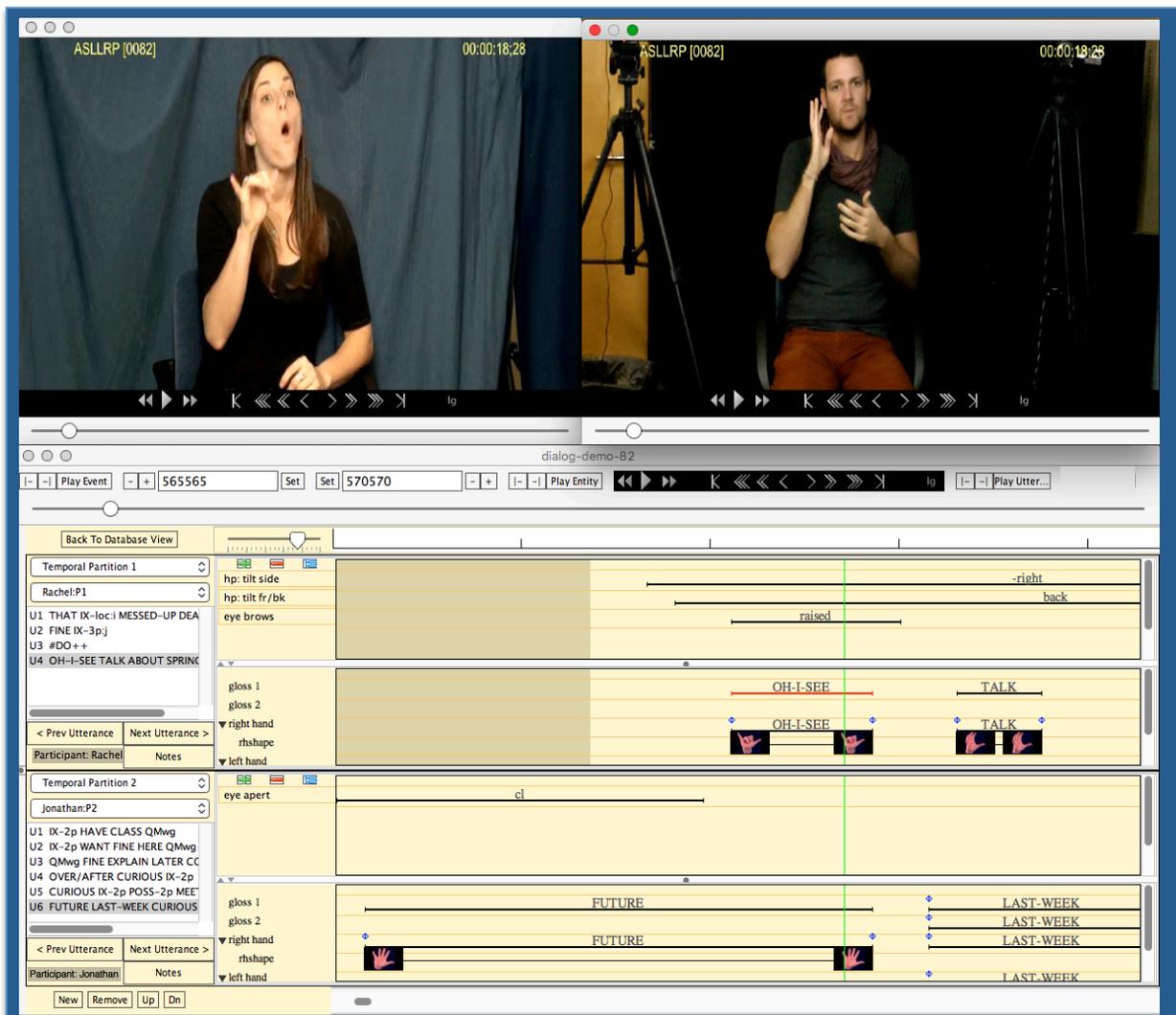
Figure 73. Display of the two available Temporal Partitions (each with a single Segment Tier) – result of clicking on the Utterance Bar from the *Database View window*

The "**Remove**," "**Up**," and "**Dn**" (=down) buttons can be used to further modify the display of Temporal Partitions/Segment Tiers. These will apply to the active TP/ST. To select/activate one, click on the Participant box in the lower left, below the *Utterance Index*; the highlighting in that region (see Figure 74) will confirm that the selection. "**Remove**" will then remove that TP/ST from view (although there must be at least one displayed); the "**Up**" or "**Dn**" buttons will reorder the TP/ST as you would expect, moving it up or down.
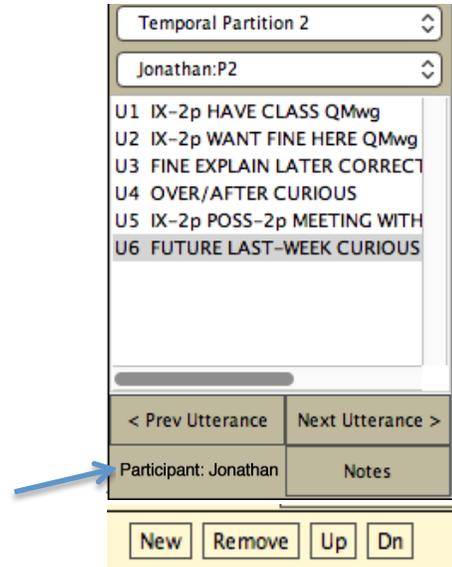
Figure 74. Select a TP/ST by clicking on the Annotator region, and use the buttons to act upon it.

Note also that this method of selecting a TP/ST when more than one is displayed will also come in handy in relation to the use of the "**Play Utterance**" button. In Figure 73, for example, if the user chooses "**Play Utterance**," the utterance that corresponds to the selected item, highlighted there in red (OH-I-SEE), will be played. However, if no item is selected, then of the two selected/highlighted utterances shown there, the user could determine which one should be played by activating the appropriate TP/ST in the way just described.

8   Searching

8.1   Basics

To launch a new search, first be sure that you have a Collection open; then choose Search from the Collections menu:
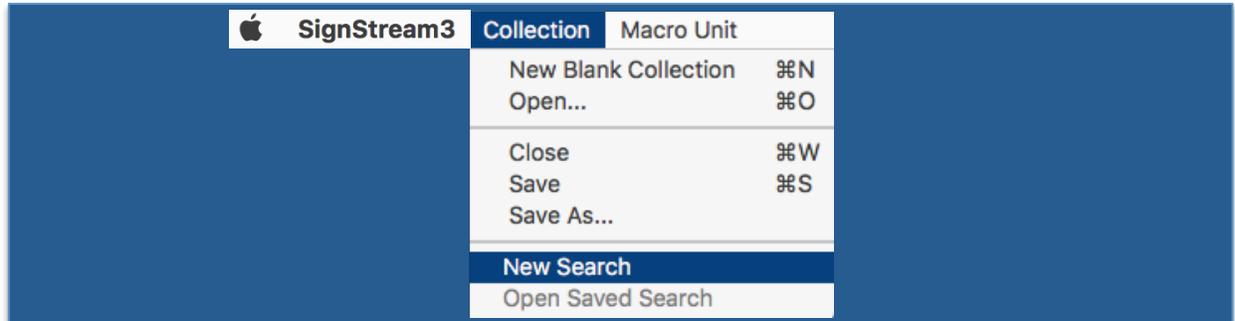
Figure 75.   Open a New Search

By default, the Search Domain will be the current SignStream® Collection, but a different domain can be selected by clicking on the "**Change Search Domain**" button in the upper right-hand corner of the *Search window,* shown in Figure 76. You will then be offered the standard dialog box to select a file to open.
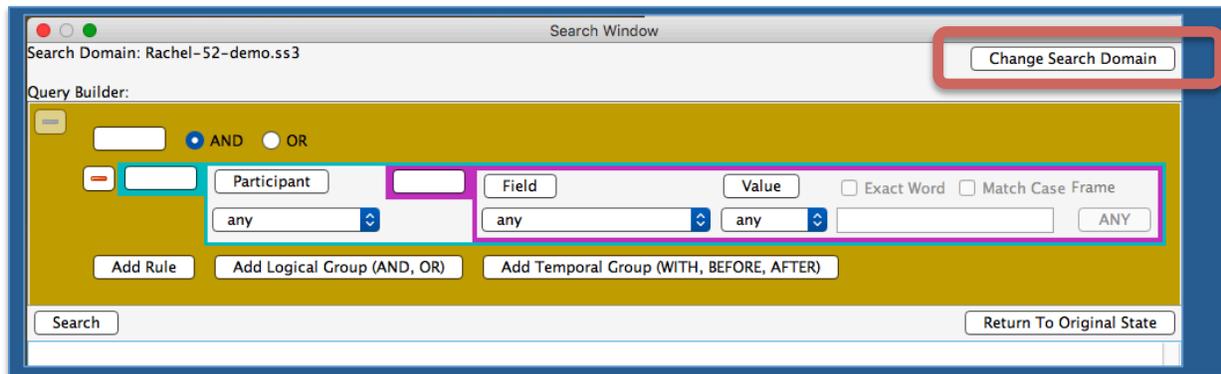
Figure 76.   *Search window*

Once the search domain has been selected, you can limit the current search to a particular Participant by choosing one from the pull-down menu, which will display the set of all Participants in the Collection. If there is only 1 Participant defined for the Collection, or if you don't wish to limit the search by Participant, you can leave that as it is. To search for a value within a specific field, choose that from the options available by clicking on "any" in the pull-down menu below the "**Field**" button, which displays all fields for which there is coded information in the Collection, as shown in Figure 77.
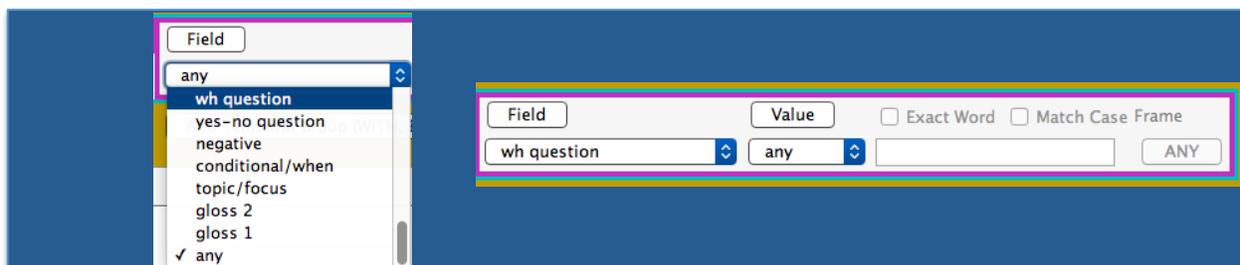
Figure 77.   Limiting a search to a specific field

Once you have chosen a particular field, the options under "**Value**" will include all of those values for which there is coded information in the Collection of the Search Domain, or you can choose "specify" to type in a value. So, for example, you could search for negation as follows:
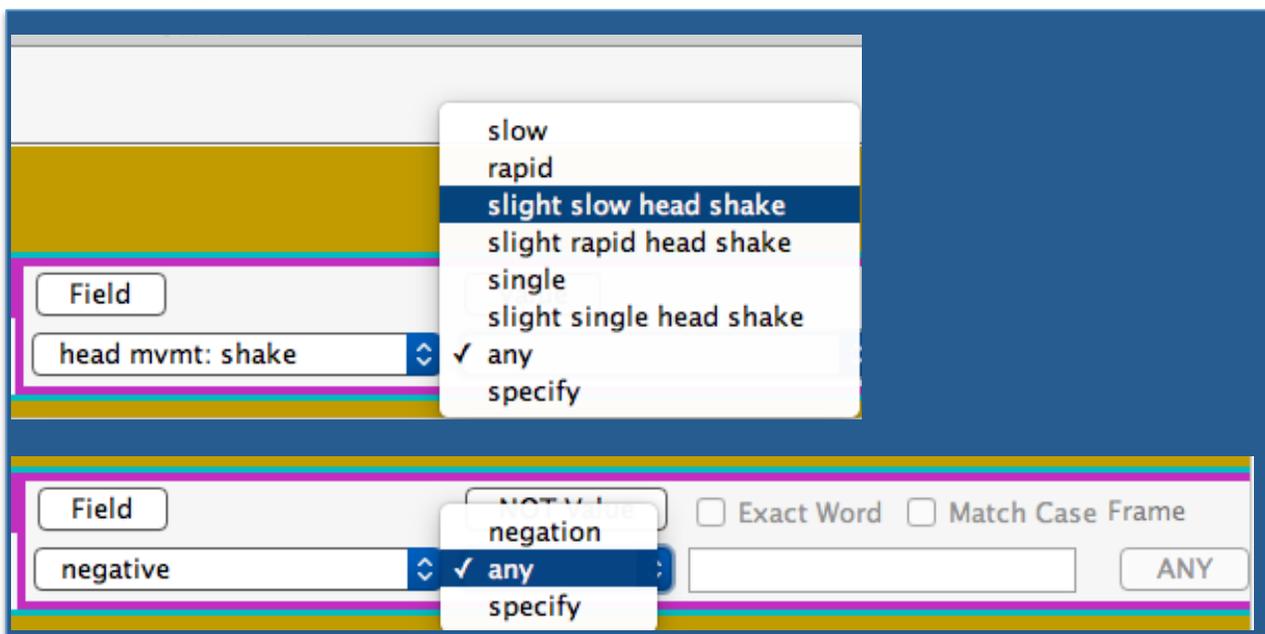
Figure 78.   Specifying a field and a value for that field

Since there is only one value for "negative," and only one field with a value of "negation," any of the choices below would result in an equivalent search:
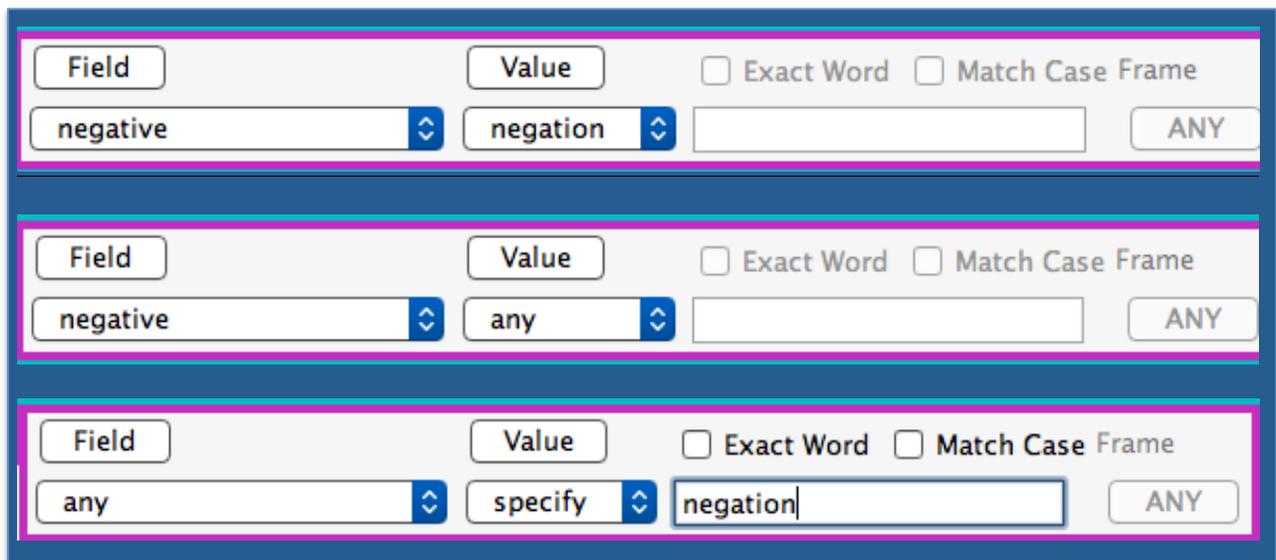
Figure 79. Field or value can be 'any' and value can be specified.

When you are ready to Search, click on the button at the bottom left of the *Search window,* as shown in Figure 76. The results will be displayed at the bottom, as shown in Figure 80.
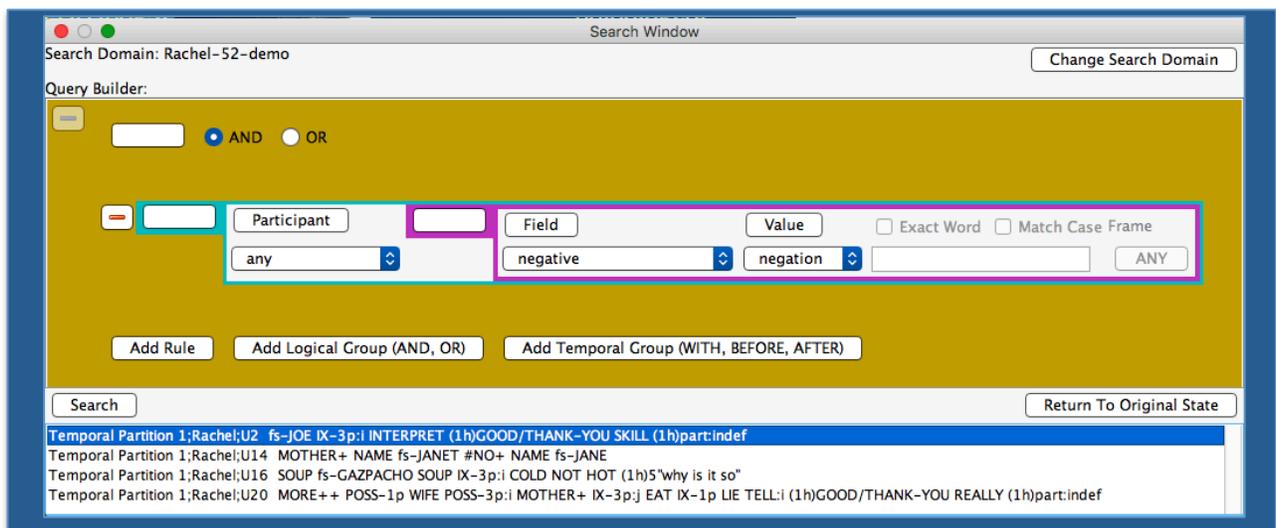
Figure 80. Search results

Clicking on one of the utterances returned by the search will take you to the *Utterance window* for that result, as shown in Figure 81.
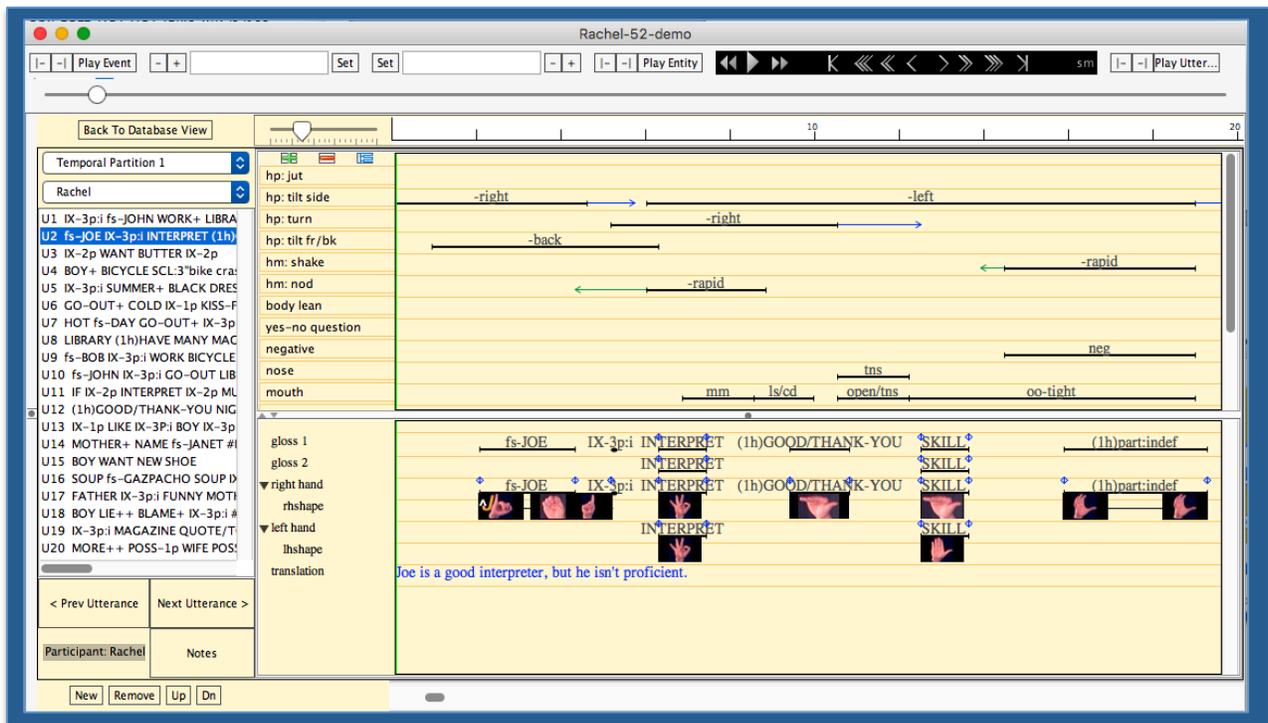
Figure 81. Viewing one of the search results

You can return to the *Search window* (in Figure 80) to click on a different result. The previous result will then be replaced by the new result you have selected for viewing.

Warning: Do not just close the search results *Utterance window*, as this will exit the program!

It is also possible to click on "**Return to Original State**"– at the bottom right in Figure 80 – to return to the Utterance view that preceded the search (although this may not currently act as expected; this is included in Known Issues in Section 12.1).

8.2   *More Advanced Search Options*

Returning to the *Search window,* there are ways to formulate more complex searches.

Clicking in the colored box to the left of the "**Participant**" or "**Field**" button will insert a NOT operator. (Clicking one more time will remove that.) So, for example, if one searched as in Figure 66, but rather for sentences that do ***not*** contain negation, one gets the complement of the results shown there.
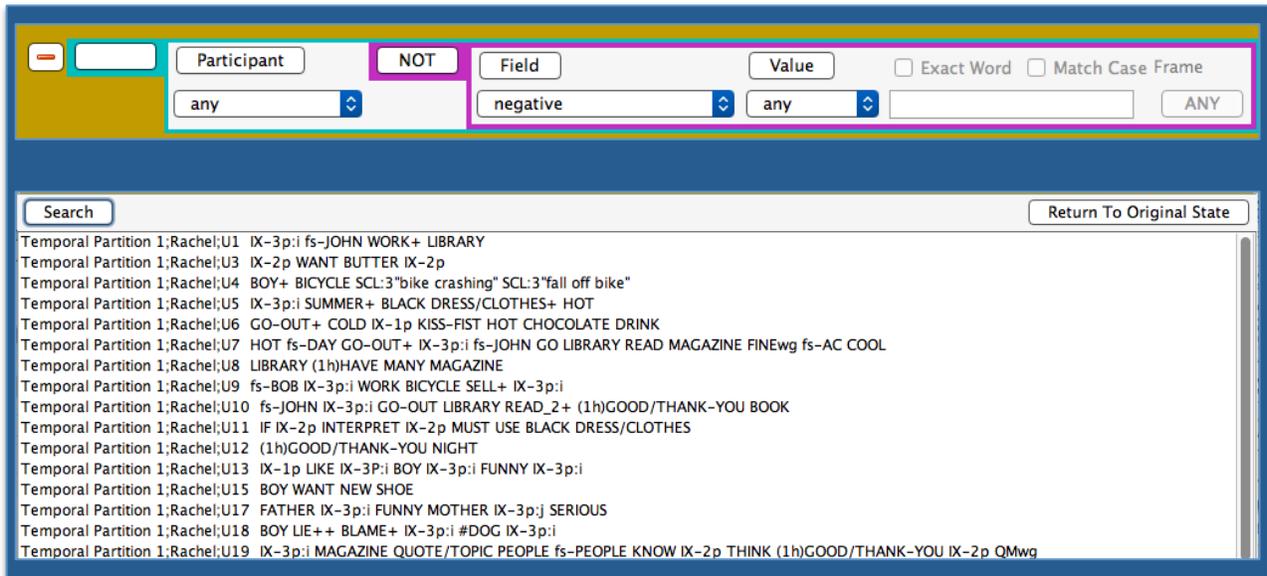
Figure 82. Search results for sentences that do NOT contain negation

Clicking directly on the "**Participant**" or "**Field**" or "**Value**" button will change that to "NOT... " and clicking again will toggle back to remove the "NOT". Only one "NOT" is allowed at a time for those three. The possibilities are shown in Figure 83.
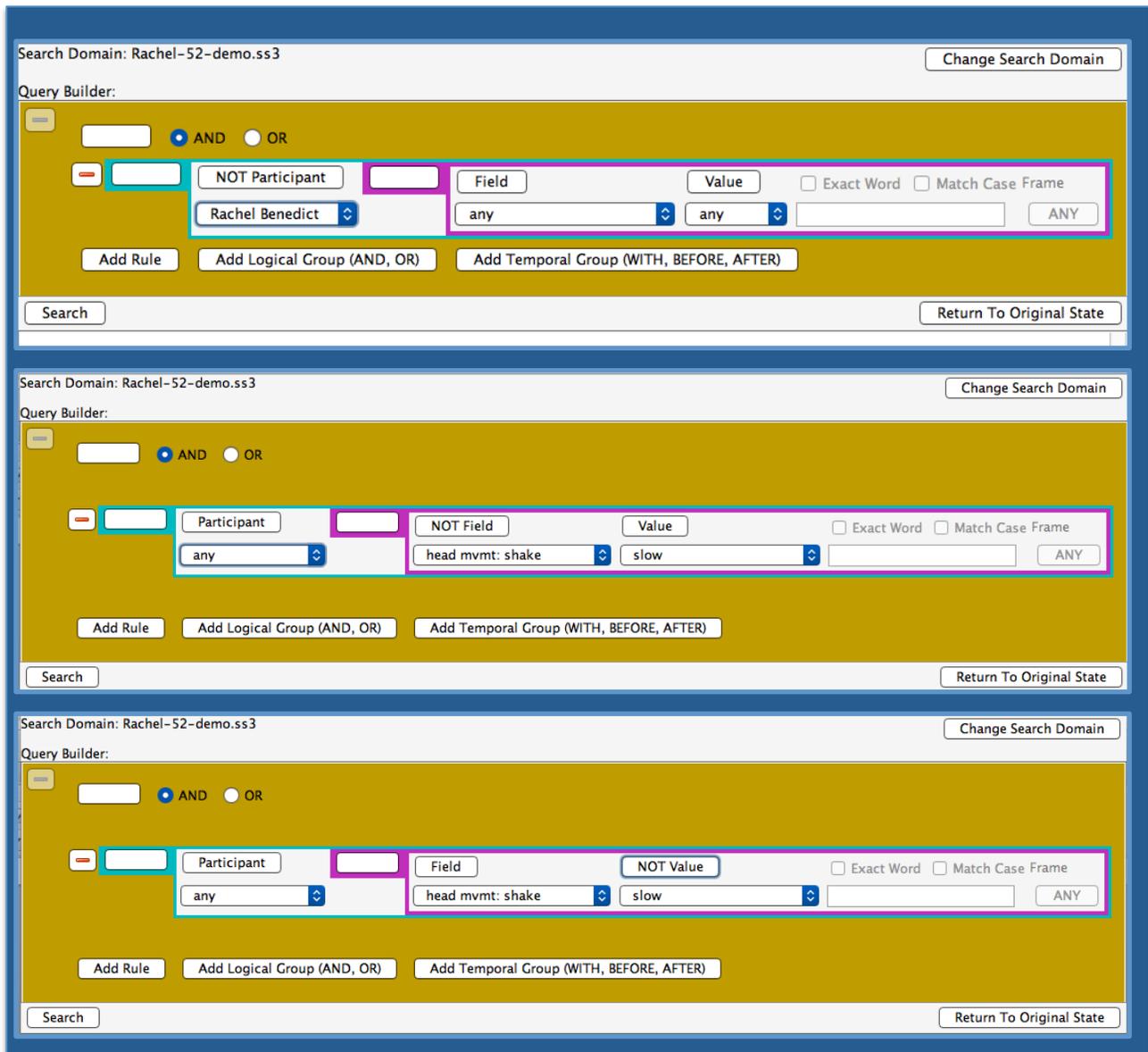
Figure 83. **Possibilities for excluding a specific Participant, Field, or Value**

The user can also user the Query Builder combine search criteria using logical operators AND or OR (shown at the top of Figure 84). To add another rule and connect it with the desired operator, click on Add Rule (shown at the bottom of Figure 84).
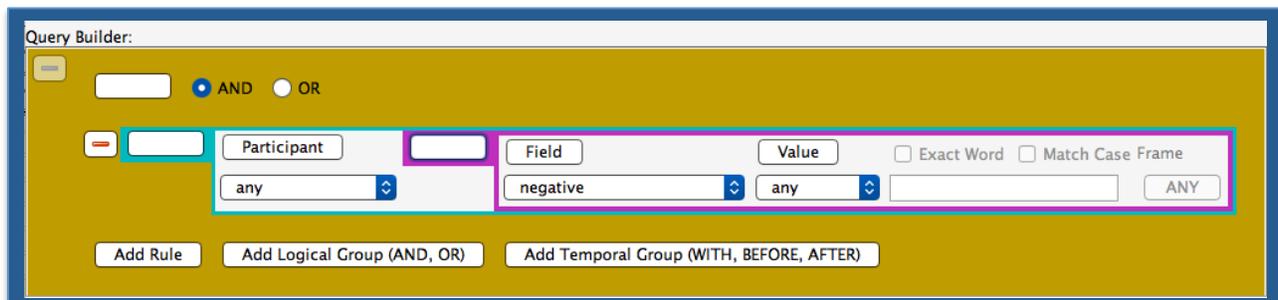
Figure 84.   Building a Complex Query

So, Figure 85 illustrates how to restrict the search from Figure 80 to those sentences that, in additional to containing negation, also include a main gloss item SOUP.
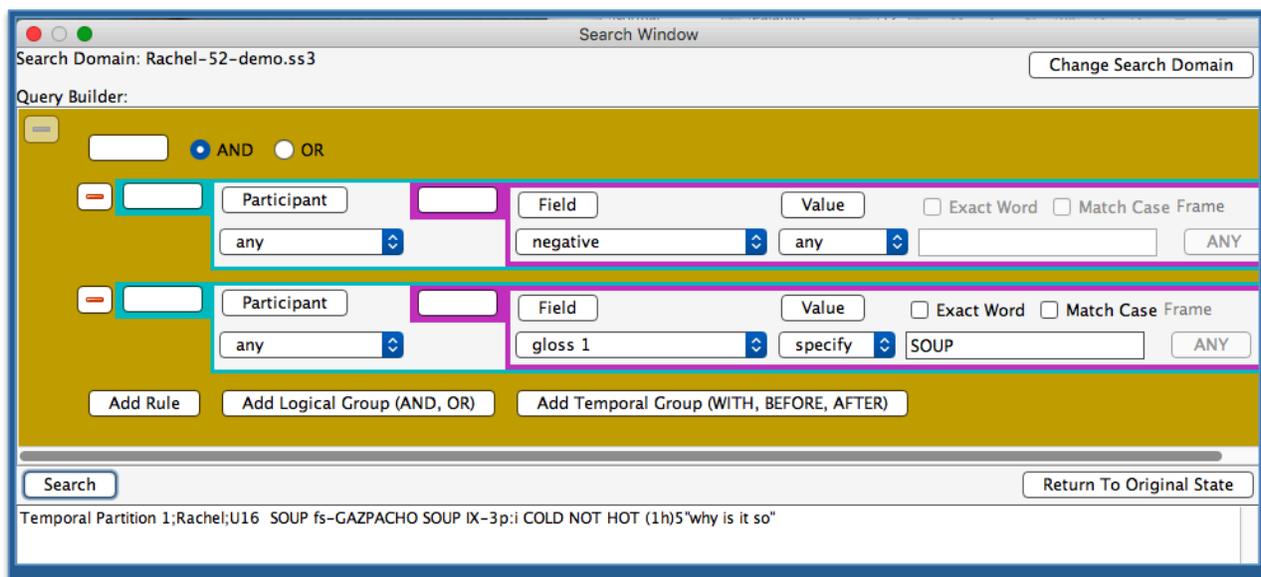
Figure 85.   Searching for sentences that contain Negation *AND* the gloss item SOUP

Note that it is also possible to use the temporal operators WITH, BEFORE, and AFTER.[9] Just click on the button so labeled. You can remove the lines being displayed by clicking on the "**minus**" button to the left. So, if we remove the above two lines and click on the Add Temporal Group button, Figure 86 shows how to search with a temporal operator (with bright red highlighting to indicate the lines that are being put in temporal relationship).

---

[9] WITH is inclusive, so if two items overlap by a frame or more, they are counted as occurring WITH one another. BEFORE and AFTER are exclusive, so strictly before and after, with no overlapping.
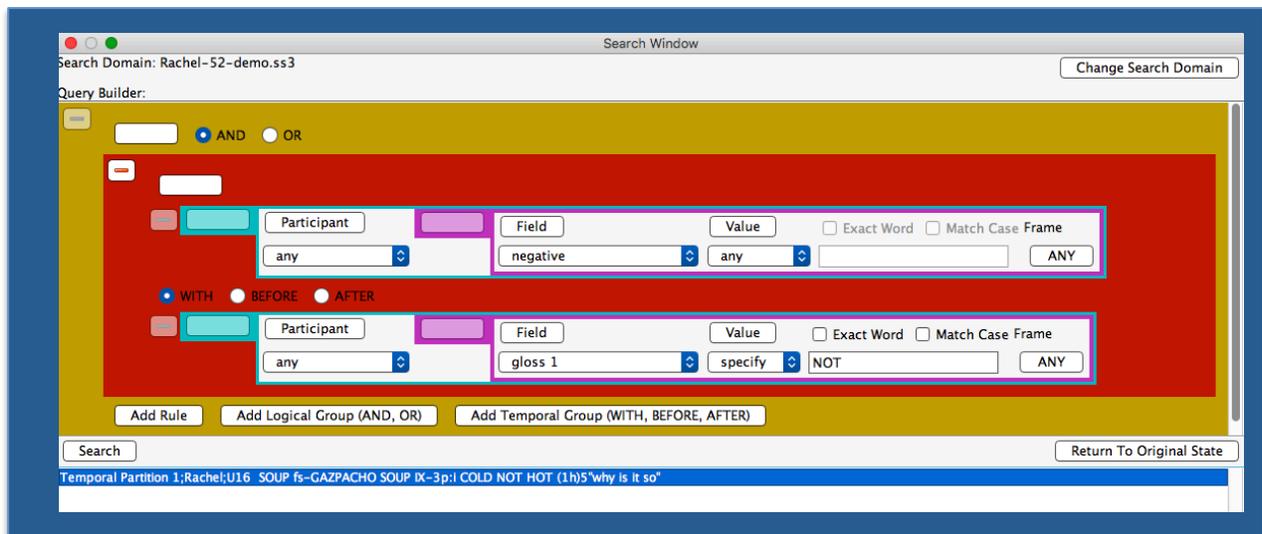
Figure 86. Searching for sentences that contain Negation *WITH* the gloss item NOT

A NOT operator can also be included at the top by clicking in the box at the top of the red area. Changing the above search by adding NOT in the rectangle at the upper left displays all sentences in the Collection *except* the one identified by the search in Figure 86. This is shown in Figure 87.
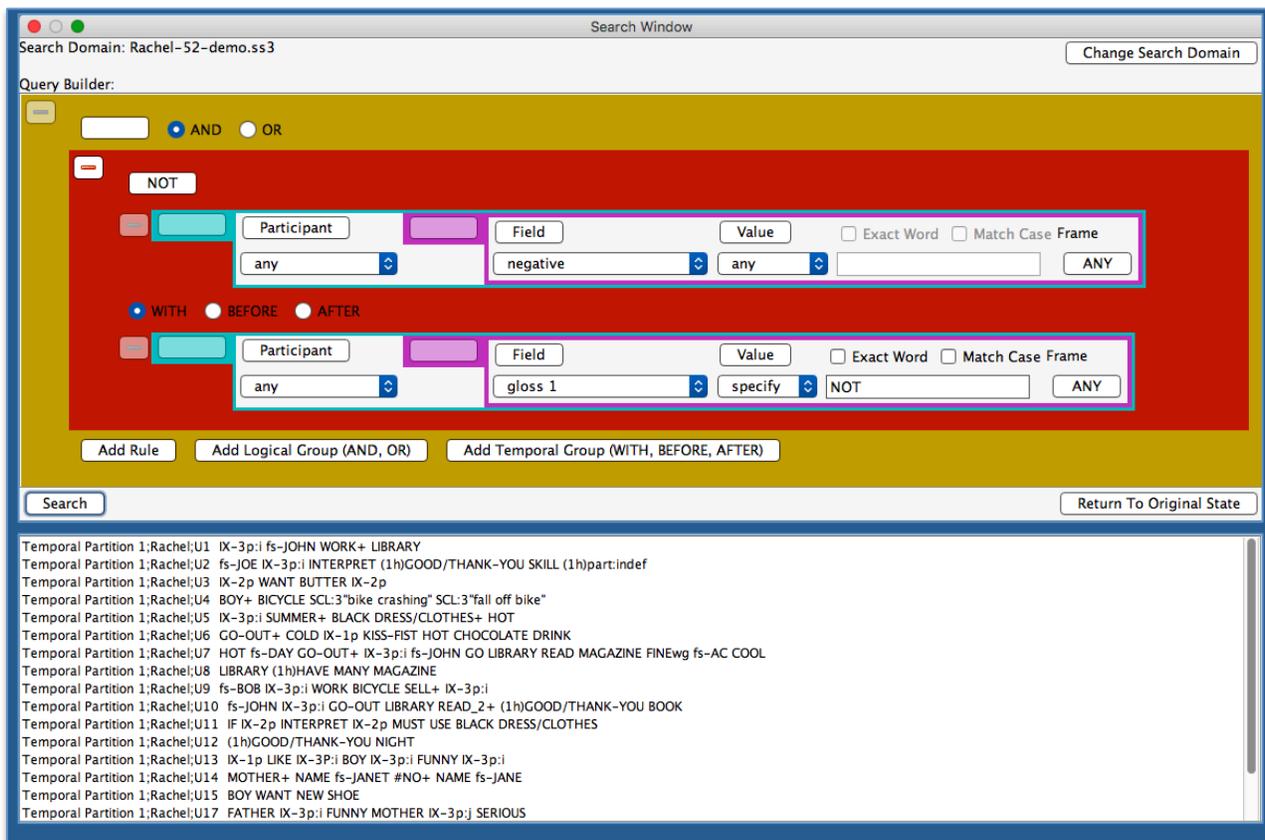
Figure 87. Adding NOT to the temporal grouping shown in the previous figure

8.3 Saving Searches

This functionality has not yet been implemented, but is planned for the future.

8.4 Data Access Interface (DAI) 2

Additional tools for searching through corpora shared by the American Sign Language Linguistic Research Project are available from http://www.bu.edu/asllrp/.

9 Sharing Collections

9.1 Video Files

It is possible to share a Collection with others. In this case, the video files will also need to be made accessible to the other user, and the video files will need to be relocated as described in Section 4.2.

9.2 Local Files for Participants, Annotators, and Sign Bank

There is certain information that is stored locally, however, that will not be automatically shared with another user to whom you might send your Collection, although this can be done explicitly in a number of ways. (We hope to implement a better way to do this in future versions of the application.)

Unfortunately, information about Participants and Annotators that is stored locally will not be available to the Collection when it is opened from a different application folder (i.e., on a different computer). If you are sending a Collection to someone who has not otherwise created or edited SignStream Collections, you can also send that person a copy the relevant files to be replace those of the same name already contained in the SignStream directory on their own computer:

<Signstream3 directory>/newXMLfiles/localParticipants.xml

<Signstream3 directory>/newXMLfiles/localAnnotators.xml

<Signstream3 directory>/signbank/localSignBank.xml

However, if there is already information in those files from other users, then their own information will be overridden by doing that. In the latter case, you might suggest that the other user recreate the necessary information, especially for Participants. If you email a screen shot of the Participant information (from the *Macro Unit Information window*), as shown in Figure 88, then the other user can easily recreate the relevant Participant and associate the data with the proper (newly replicated) Participant.
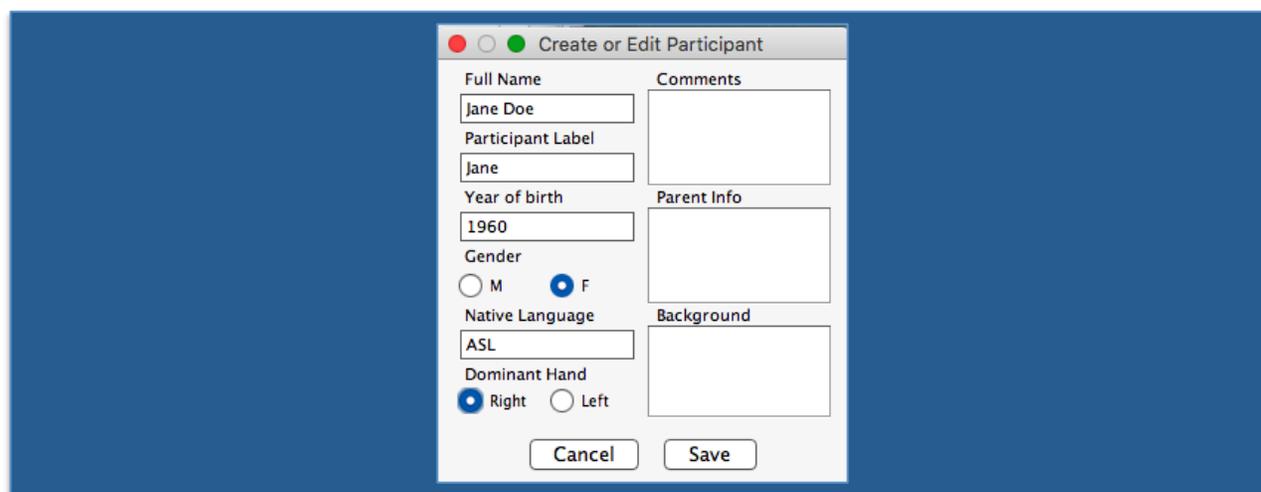
Figure 88. **Send a screen shot of Participant Info so that the user with whom you share your Collection can recreate it, and re-associate the data with the newly recreated Participant**

If you want to share your Local Sign Bank file with another user, that user will need to overwrite their Local Sign Bank file with your copy of that file. However, doing this will fail to preserve anything that may already have been in the other user's original Local Sign Bank file.

10 Quitting the Program or Closing a Collection

You can Quit SignStream from the main SignStream menu or by using the keyboard shortcut ⌘Q. Various other actions will cause the program to quit, perhaps unexpectedly:

- o Closing the *Database View window*
- o Closing the *Utterance window* (including the Utterance window displaying a result from a Search)

It is possible to close a Collection from the Collection menu (the keyboard shortcut is ⌘W). This will replace the current collection by a new blank collection. Choosing New Blank Collection from the menu (or with the keyboard shortcut ⌘N) will have exactly the same effect.

If you wish to close one collection and open another, there is no need to actually close the first one. Opening a new collection (from the Collection menu or with the keyboard shortcut ⌘O) will cause the currently displayed collection to be replaced by the new one that is opened.

Be warned, however, that if you close a collection in any of the ways listed above, the application will ***not*** check for unsaved work. This is a feature that has not yet been implemented. So be very careful…

11 Some Technical Details

11.1 Requirements

In order to use SignStream®, you must have Mac OS 10.8 or higher, with Java 1.6 or later installed. If you do not have Java installed, you can find the latest version of Java at the following URL: https://www.java.com/en/download/.

11.2 Installation

The application is available for download from:

> http://www.bu.edu/asllrp/SignStream/3/download-newSS.html

Before launching the SignStream application from the SignStream folder:

1) You will need to allow the launch of the SignStream® 3 application, despite the fact that it is not provided by Apple or certified developers (to get around security features that have been implemented in Mac Operating Systems since OS 10.8).

2) If you wish, you can download the latest **ASLLRP Global Sign Bank**, which consists of a repertoire of signs, with gloss labels and annotations of other properties, as well as images and video illustration of those signs, to assist in the process of annotating new video files. This Global Sign Bank is *not* required for use of SignStream®. If you do download the ASLLRP Sign Bank, you are agreeing to the **terms of use** below (which will also be downloaded to your SignStream folder).[10]

Open a Finder window, and double-click on the SignStream folder (the folder you downloaded, which includes the application and related files).

1) You will see a file called "**DisableQuarantine.scpt**". Double-click on that.
   An editor will open, with a 'play' (triangle) button in the toolbar; click this
   to run the script. Close the Script Window.

2) **If** you wish to download the ASLLRP Global Sign Bank, double-click on
   "**GetSignBank.command".** You will be asked whether you agree to abide by the
   terms of use. If you click 'yes', the download of the ASLLRP Sign Bank materials
   (and of the Sign Bank terms of use) will commence. Close the Terminal window.

You will then be ready to launch SignStream® by double-clicking on the application.

Do not move the SignStream application out of its enclosing folder.

---

[10] Terms of use of the ASLLRP Sign Bank, which can be used in conjunction with SignStream® 3:
The ASLLRP Global Sign Bank—and all SignStream® data files and associated video files distributed by ASLLRP—can be used only for research and education purposes, but cannot be redistributed without permission. Commercial use, without explicit permission, is not allowed, nor are any patents and copyrights based on this material. By downloading ASLLRP Sign Bank materials, you agree to abide by these terms.

11.3 Upgrading the ASLLRP Global Sign Bank file

When a new version is available, you can update your ASLLRP GlobalSignBank file as follows. Be sure that you quit the SignStream® application before proceeding:

Open the SignStream folder and click on the file "**GetSignBank.command**."
This will download the latest version of the ASLLRP Global Sign Bank (once you have reaffirmed that you agree to abide by the terms of use).

11.4 Upgrading the application

When installing the latest version of SignStream®, repeat the steps above. Deploy the package to a new directory distinct from your previous SignStream directory. Then copy the following files over from your old directory to the new SignStream directory:

signbank/localSignBank.xml
newXMLfiles/localAnnotators.xml
newXMLfiles/localParticipants.xml

These directories contain information about your local annotators, participants, and sign bank. Copying them will ensure that you still have access to this data on the newest version of SignStream.

Aside from these updates, please do not modify any of the files and folders that come with SignStream®.

12 Plans for Future Development

12.1 Known Issues

See the README file included with the SignStream® distribution.

12.2 Future Features

In some cases, there are placeholders for features that have not yet been implemented. Some of these are listed here.

- The Lookup function for videos within the *Macro Unit Information window,* to help in relocating video files, has not yet been implemented (see Section 17).
- Also not yet implemented:
  o Functionality for Display Time Period in the *Database View* and *Utterance windows* (see p. 11)
  o Functionalities for editing field types and properties in the Field Specifications Editor (see p. 31)
  o Parameters other than handshapes in the *Morph-Phon Info window* (see p. 40)
  o Ability to save searches (see p. 68)

12.3 Additional Plans for Enhancements and Optimization

- Option for having more than one Macro Unit per Collection (see Footnote 2, p. 8).
- Automatic selection of Participant for a new Segment Tier when the Collection contains only one (see Footnote 3 on p. 9)
- Optimization of the display in the *Search Sign Bank window*
- Optimization of user's ability to resize portions of the window in several of the displays
- Providing the user with a warning about the existence of unsaved data when the user closes a collection or quits the application (see p. 71)

12.4 Other New Features

We hope to incorporate additional features in the future, including but not limited to:

- Links from SignStream® to the online DAI 2 data
- The ability to display graphical data (such as computer-based analyses of the videos, in order to display graphs of such things as head position, eyebrow height, eye aperture, etc.) within SignStream®
- Cut, paste, and undo functionalities
- The ability to compare annotations

13 Summary of Keyboard Actions

Action	Mac Keyboard Shortcut	Page reference
In *Database View window*		
Create new utterance	Option + click (in Temporal Partition) - drag	27
Open utterance	Double-click on Utterance Bar	15
Open segment	Double-click on Segment Bar	15
Rename utterance	Click + hold (makes text editable)	28
Change utterance start or end point	Option + click (on endpoint) - drag	29
In *Utterance window:* Non-Manual Fields		
Create new event	Option + click (in field) - drag	33
Add onset/offset	Control (or Option) + Click*	34
Change label	Double-click on label or line	33
Delete	Control (or Option) + Click*	33
Change non-manual event start or end point	Option + click (on endpoint) - drag	33
Change display order of non-manual fields	Click (on field label) - drag (up/down)	35
In *Utterance window:* Gloss and Text Fields		
Create and label new gloss item	Option (or Control) + click (in gloss field) (brings up editable text box)	37
Open *Morph-Phon Info window*	Double-click on label; **or** Control (or Option) + Click*	39
Add onsets, offsets, holds; Control the alignments of the gloss fields; Link or unlink parts of compounds	Control (or Option) + Click*	38, 52, 50
Enter or edit information in Translation field	Option (or Control) + click; **or** Double-click (brings up editable text box)	53

*Brings up a contextual menu, from which this option can be selected. (Although Control-Click is the standard Mac OS shortcut, Option-Click will also work ☺ .)

Main menus:
 Open, Save, New, Close, Hide, Quit, etc., are available through the standard Mac ⌘ + O, S, N, W, H, Q.

14 Acknowledgments

Credits for SignStream® development

Gregory Dimitriadis	Application Developer at Rutgers University (July 2015 - present)
Douglas Motto	Application Developer Supervisor at Rutgers University (February 2016 - present)
Augustine Opoku	Application Developer Supervisor at Rutgers University (July 2015 - January 2016)
Thanks also to...	● Jason Boyd, George Kierstein, Robert G. Lee, Joan Nash, John Olson, Stan Sclaroff, Ashwin Thangali, Christian Vogler, and Iryna Zhuravlova, for prior contributions to design and implementation; and to our linguistic consultants and to all those at BU and Gallaudet University who have used versions of the program, provided feedback and suggestions, and shared their expertise !
	Partial list: Justin Arrigo, Aimee Aylward, Ben Bahan, Cory Behm, Joshua Beckman, Rachel Benedict, Naomi Berlove Caselli, Elizabeth Cassidy, Lana Cook, Jaimee DiMarco, Daniel Ferro, Amanda Gaber, Graham Grail, Chelsea Hammond, Ryan Hevia, Reema Kharoufa, Kelsey Koenigs, Alix Kraminitz, Corbin Kuntze, Yulia Labkovsky, Carly Levine, Rebecca Lopez, Jonathan McMillan, Indya-Loreal Oliver, Caelan Pacelli, Braden Painter, Chrisann Papera, Emma Preston, Donna Riggle, Tyler Richard, Tory Sampson, Dana Schlang, Michael Schlang, Jessica Scott, Jonathan Suen, Norma Bowers Tourangeau, Blaze Travis, Amelia Wisniewski-Barker, Jennifer Witteborg, Norman Williams, and Isabel Zehner
We gratefully acknowledge:	● contributions and assistance from the developers of the ASLLRP Data Access Interface (DAI, DAI 2), Christian Vogler and Augustine Opoku
	● support provided at Rutgers University by Dimitris Metaxas, Charles Hedrick, Charles McGrew, Hanz Makmur
	● support provided at Boston University by Stan Sclaroff, Ashwin Thangali, Vassilis Athitsos
	● support provided at Gallaudet University by Christian Vogler, Ben Bahan
	● those who contributed to development of prior versions of SignStream: David Greenfield (developer of versions through 2.2.2), Otmar Foelsche (developer supervisor), Ben Bahan, Judy Kegl, Robert G. Lee, Dawn MacLaughlin
Carol Neidle	Project Director

15 Appendix I: Some Details on Conventions for Annotation of Non-manual Events

<div align="center">List compiled by Chelsea Hammond</div>

Detailed information about annotation conventions is available in [5, 7].

Note that in the list below, there are some distinctions that were made in 2007 which have been collapsed. These are shown in blue.

Head

Head position

- **head pos: jut**: Head moves straight forward or backward from the neck, typically lead by the chin.
  - o Onset: N/A
  - o Event: movement from neutral to maximal front/back position
  - o Offset: movement from maximal front/back position to neutral
- **head pos: tilt side**: Head leans from vertical toward left or right shoulder.
  - o Onset: N/A
  - o Event: movement from neutral to maximal left/right position
  - o Offset: movement from maximal left/right position to neutral
- **head pos: turn**: Head turns from looking straight ahead to facing more towards left or right of signer.
  - o Onset: N/A
  - o Event: movement from neutral to maximal left/right position
  - o Offset: movement from maximal left/right position to neutral
- **head pos: tilt fr/bk**: Head tips front or back from vertical, typically lead by forehead.
  - o Onset: N/A
  - o Event: movement from neutral to maximal front/back position
  - o Offset: movement from maximal front/back position to neutral

Head movement

- **head mvmt: jut**: Repeated movement of head into a jutted position.

- **head mvmt: side to side**: Head moves left to right from the neck. Head moves alternatingly towards each shoulder while remaining upright, chin parallel to the floor, without turning or tilting. This is a rare marking.
  - o Onset: N/A
  - o Event: entire movement from side to side
  - o Offset: N/A

- **head mvmt: shake**: Head repeatedly turns side to side.
    - o Onset: Initial turn from neutral to left or right
    - o Event: entire back and forth shaking movement
    - o Offset: N/A
- **head mvmt: nod**: Head repeatedly tilts front and back.
    - o Onset: movement from neutral to front/back
    - o Event: entire nod movement
    - o Offset: N/A
- **head mvmt: nod cycle**: Head executes a series of jutted nods. From side view, head makes a circular movement.
    - o Onset: movement from neutral to front/back
    - o Event: entire nod movement
    - o Offset: N/A

Face

- **cheeks**
    - o Onset: N/A
    - o Event: entire time cheeks are moving from neutral or are in marked position
    - o Offset: N/A
- **nose**
    - o Onset: N/A
    - o Event: change from neutral to non-neural state and entire time nose is in non-neutral state
    - o Offset: change back to neutral
- **mouth**
    - o Onset: N/A
    - o Event: entire time mouth is fully in marked position
    - o Offset: N/A
- **eye gaze**
    - o Onset: N/A
    - o Event: entire time signer is not looking directly at front view camera
    - o Offset: N/A

- **eye aperture**
  - squint: Eyelids lowered with tension. Can be identified by wrinkles under and around eyes
    - Onset: movement from neutral to fully squinted position*
    - Event: duration of squint
    - Offset: return from fully squinted position back to neutral*

    *If squint is immediately preceding or following a blink or closed eye event, it may not require on/offset

  - blink: Eyes closed for 4 or fewer frames
    - Onset: N/A
    - Event: duration of blink when eyes are fully closed
    - Offset: N/A
  - closed: Eyes closed for more than 4 frames
    - Onset: N/A
    - Event: entire time eyes are fully closed
    - Offset: N/A
  - lowered: Eyelids lowered without tension
    - Onset: movement from neutral to lowest position for that occurrence*
    - Event: duration lids are held at that position
    - Offset: movement from lowest position back to neutral*

    *If lowered event is immediately preceding or following a blink or closed eye event, it may not require on/offset

  - wide: Eyelids raised
    - Onset: movement from neutral to widest position for that occurrence*
    - Event: duration eyes are held at that width
    - Offset: movement from widest position back to neutral

    *If wide event is immediately preceding or following a blink or closed eye event, it may not require on/offset.

- **eye brows**
  - raised
    - Onset: movement from neutral to maximal height for that occurrence
    - Event: duration eyebrows held in that position
    - Offset: movement from maximal height back to neutral
  - lowered
    - Onset: movement from neutral to lowest position for that occurrence
    - Event: duration eyebrows held in that position
    - Offset: movement from lowest position back to neutral
  - raised-furrowed: Eyebrows are raised and drawn together.

    - Onset: movement from neutral to maximal position for that occurrence
    - Event: duration eyebrows held in that position
    - Offset: movement from maximal position back to neutral

Body

- **neck**
  - Onset: movement from neutral to marked position
  - Event: entire time neck is fully in marked position
  - Offset: movement from marked position back to neutral
- **role shift**: Signer takes on the role of another person or entity in a story by shifting body position (e.g., shoulders) to a new position in signing space and/or by shifting gaze (e.g., looking up or down in depicting interaction between parent and child)
  - Onset: N/A
  - Event: body movement from neutral or one side to other side and entire time body is in this secondary position
  - Offset: N/A
- **body mvmt**
  - Onset: N/A
  - Event: movement of body from neutral position to lowered position and entire time body is lowered
  - Offset: movement from lowered position back to neutral
- **shoulders**
  - Onset: movement from neutral to maximal marked position
  - Event: entire time shoulders are in maximal marked position
  - Offset: movement from maximal marked position back to neutral

- **body lean**
    - Onset: movement from neutral to maximal lean
    - Event: entire time body is in maximal lean
    - Offset: return from maximal lean to neutral

Grammatical
(Note: Grammatical markings do not have onsets or offsets.)

- **relative clause** (or correlative): In ASL, a sentence-initial clause that serves to restrict or define an NP, e.g., corresponding in meaning to underlined portion of the English: the cat <u>that I like.</u>

- **rhetorical question**: Question asked and then immediately answered by signer without expectation of response from the interlocutor.
    - rhq: Marked with raised eyebrows
      (e.g., *Mom went where*? To the store.)

      Note that we initially distinguished between **wh rhq** and **yes-no rhq**, but these have now been collapsed.

    - rhq2: Looks more like a regular wh question (i.e., includes lowered brows), but is rhetorical

- **wh question**: Question phrase involving *who, what, when, where, why,* or *how* (as in the English sentence, *Where is mom*?). Nonmanual event aligns with entire question marking, indicated by lowered eyebrows and often a head tilt or jut. Nonmanual event endpoints may not align exactly with main gloss of wh question clause.

- **yes-no question**: Question phrase that calls for a yes or no answer (e.g., *Did you see that movie*?). Marked with raised eyebrows and often a head tilt or jut. Nonmanual event endpoints may not align exactly with main gloss of yes-no question clause.
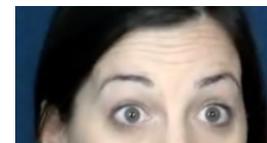
- **negative**: marker of negation, characterized by a side to side head shake.

- **conditional/when**: Phrase indicating a causal, conditional, or temporal relationship or dependency
    - Conditional: *If it's raining*, I will bring my umbrella.

    - When: *When it's raining*, I bring my umbrella.

    Nonmanual event aligns with entire conditional or when phrase, italicized in examples above.

- **topic/focus**: Nonmanual event can start before signing of the first manual element of the associated phrase, but normally ends with the final manual gloss to which it is related.
    - topic: Clause-initial phrase that marks contrastive focus or an 'as for' topic. Signified by raised eyebrows. (e.g., *Tomatoes* Mary hates, or *As for tomatoes*, Mary hates them).

        Note that we initially distinguished between **foc**/**top1** (a syntactically moved contrastive focus phrase) and

        top2 (an 'as for' topic),

        but these have now been collapsed under the label 'topic'.

    - top3: Signaled by rapid head nod (i.e. You know *John*? He's my cousin).
    - focus: Emphasized phrase in a non-sentence-initial position. Signified by raised eyebrows (i.e., I bought a *book*, not a wallet).
    - sentence-initial adverbial (foc/adv): as in *Tomorrow* I will leave. Nonmanual event aligns with main gloss of the adverbial.
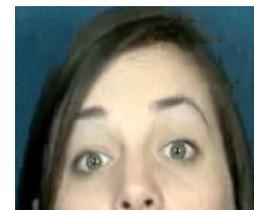
16 Appendix II : Some Tips for Following the ASLLRP Annotation Conventions: Classes of Signs

Prepared by Joan Nash, Jessica Scott, and Carol Neidle

This is intended to supplement the information available in [5, 7].

There is a general template for information that is included for gloss representations for different types of signs. The details, and relative ordering of the parts, are important. A chart on p. 98 shows the possibilities, including some not discussed in this document. See http://www.bu.edu/asllrp/asllrpr11.pdf for further details about glossing conventions, although in some cases, our conventions have evolved since that time.

Each type will be described below starting from most intuitive/least complex to the more complex mixed types of compound signs with multiple inflections.

1. BASIC (LEXICAL) SIGNS
2. FINGERSPELLING & LOAN SIGNS
3. INDEX SIGNS
4. AGREEING PREDICATES
5. CLASSIFIERS
6. GESTURES
7. COMPOUND SIGNS

16.1 LEXICAL SIGNS

The English-based gloss label for the sign is written in capital letters.

CAT

16.1.1 Signs that use a marked number of hands: (1h) or (2h) as prefix for gloss

Since we consider the base form of CAT to be the one-handed sign, the less usual two-handed sign is considered the *marked* form and is glossed as follows:

(2h)CAT

On the other hand, the base form of HAVE is two-handed. So the two-handed (unmarked) form would be glossed as HAVE, whereas the *marked* 1-handed version, is glossed as: (1h) HAVE:

HAVE   vs.   (1h) HAVE
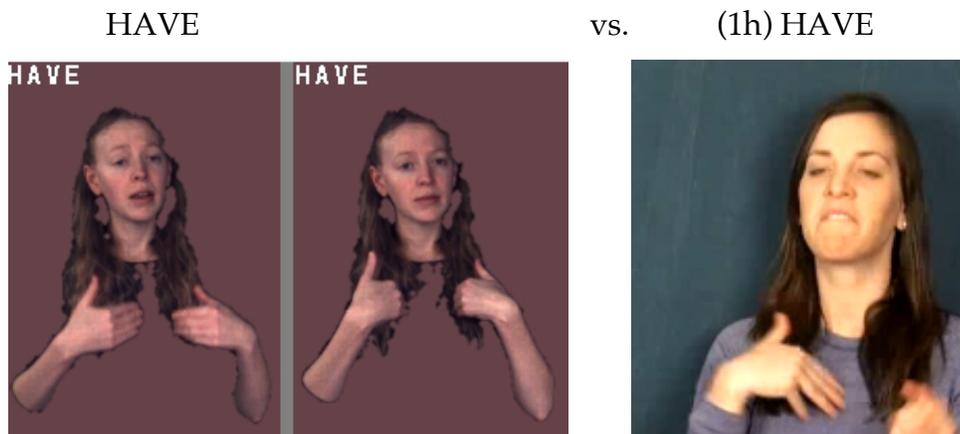
16.1.2 Importance of unique gloss labels (very imperfect reflections of the actual meanings of ASL signs)

The English words used in any particular gloss are often arbitrary and not expected to reflect the true meaning (or range of meanings) for the ASL sign. It is intended to be rough approximation of meaning (to make it easy to remember) and most importantly, to establish a one-to-one correspondence between signs and glosses, so that every time that gloss is found in the corpus, it corresponds to the same sign production, and every time a given sign production occurs in the corpus, it has the exact same gloss. Thus

what is important is that we have *unique gloss labels* and reliability and consistency in the labeling. The gloss is not intended to represent an actual translation of the ASL sign.

16.1.3 Multiple English words for a single gloss: use hyphens

Sometimes the gloss for a sign cannot be easily expressed using a single English word and are more better glossed using an English phrase. In that case, the words in the gloss are connected by hyphens:

<div align="center">OH-I-SEE</div>
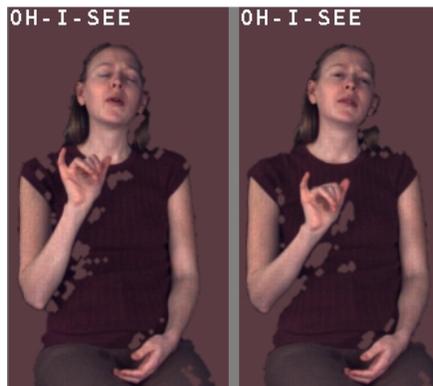
16.1.4 Capturing multiple uses of a sign: use of slash

In other cases, a sign may have more than one widely used meaning, and in that case the two glosses are separated by a slash:

<div align="center">SHELF/FLOOR</div>
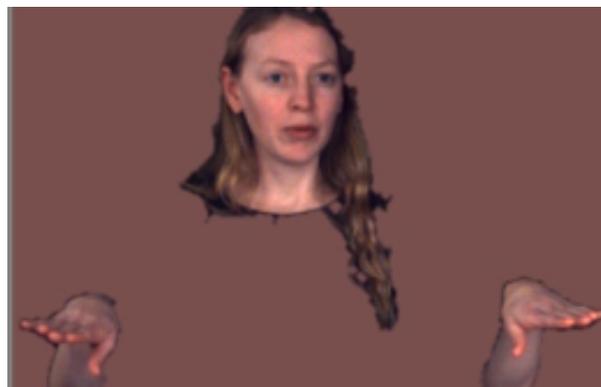
It is important to note, though, that in many cases, it would take a whole string of different English words to represent all the possible meaning of an ASL sign, and there are obvious disadvantages in having very long glosses. So in many cases, additional meanings are not included in the basic gloss label.

16.1.5 Glossing distinct sign variants

There are also instances in which several variants exist of a single sign, with very similar meanings (or the same meaning) but with some significant difference in articulation, e.g. handshape, location, movement type, etc.

In some cases, when the signs are very close but differ in handshape, a prefix is used to indicate one of the handshapes, e.g.,

DOCTOR   vs.   (D)DOCTOR
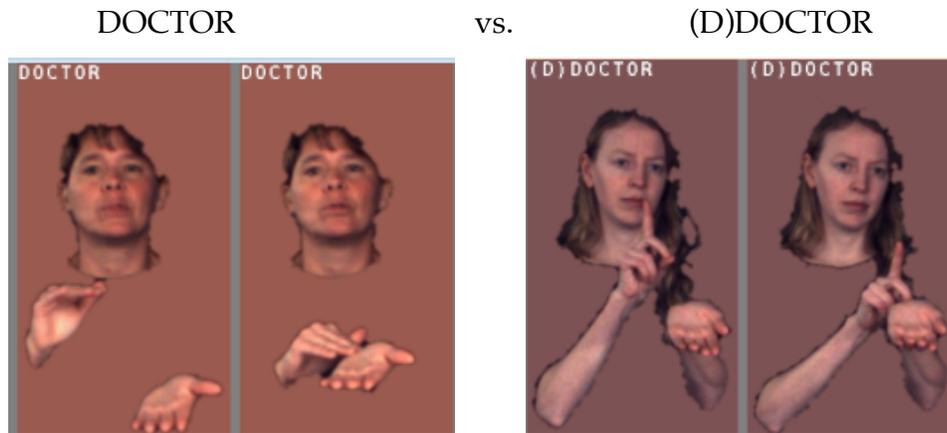
In other cases (especially but not only when the difference in articulation cannot be reduced to handshape alone) a numbered suffix is used for variants: _2 (and potentially, _3 or _4, etc.)

See two examples of signs meaning "fall" below, glossed FALL and FALL_2:

FALL   vs.   FALL_2

This convention is sometimes used as well to represent two signs that are very different in ASL but that often have the same translation into English (for example several rather different signs for 'corn').

16.1.6 Reduplication and Plurals

Reduplication

When a sign is reduplicated (signed with a movement repeated more than once in a row) a "+" is added for each repetition:

CAT+ (movement performed once and then repeated)

CAT++ (movement performed once and repeated twice)
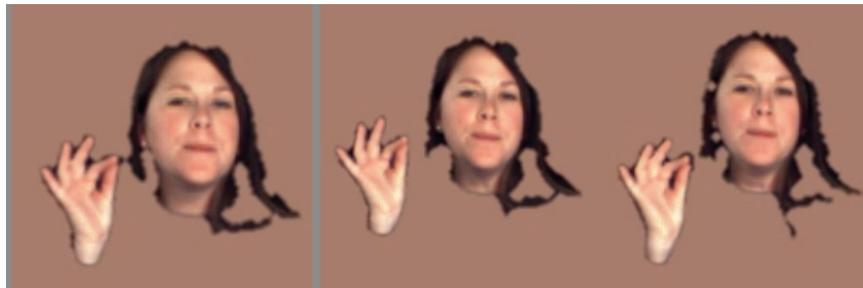
Sometimes this results in a change of meaning, and the reduplicated and non-reduplicated versions would have different English translations, but this difference is generally not reflected in our glosses. For example, English Noun-Verb pairs that differ in that the nominal form is reduplicated in ASL have the same (verb) base, such as: EAT vs. EAT+ ('food'), or BUY vs. BUY+ ('store').

Note: When the citation form of a sign includes a repetition, our conventions vary as to whether the reduplication is explicitly indicated. For example, BIRD, which includes a repeated movement in citation form is coded BIRD in the original DAI, but as BIRD+ in the Sign Bank. The latter policy provides an unambiguous way to show that in rapid signing a repetition may be omitted. (And that in compounds the repetition is almost always deleted.)

Plurals

Relatively few signs have specific plural forms. For some signs, the plural can be marked with a reduplicated movement (frequently repeated with a slight sideward translation), such as HOUSE and POSTER. These overtly marked plural forms have been glossed as HOUSE-pl or POSTER-pl.

In many cases, where reduplication may but need not indicate plurality, we have just indicated the reduplication with +'s. The -pl marking should be restricted to cases where the reduplication unambiguously marks the form as plural; forms not so marked explicitly can often be interpreted as either singular or plural.

There are also irregular forms, such as CHILD vs. CHILDREN (signed with two hands), or PERSON vs. PEOPLE (with reciprocal movement).

In some cases of plural articulation, a movement may be reduplicated along a path. In that case, the movement is not counted as a reduplication, and a distinct gloss is used unless the path itself also repeats, e.g., MILLION, OPTION.

16.1.7 Name Signs

Name signs are identified by the prefixed characters "ns." Examples : ns-LINCOLN, ns-BOSTON, etc. A subset of name signs that have an additional demarcation added to their gloss is the name of a country in its own native sign language. Compare the ASL sign for "Italy" above with the sign used in Italian Sign Language, ns-nat-ITALY, below:

ns-ITALY   ns-nat-ITALY
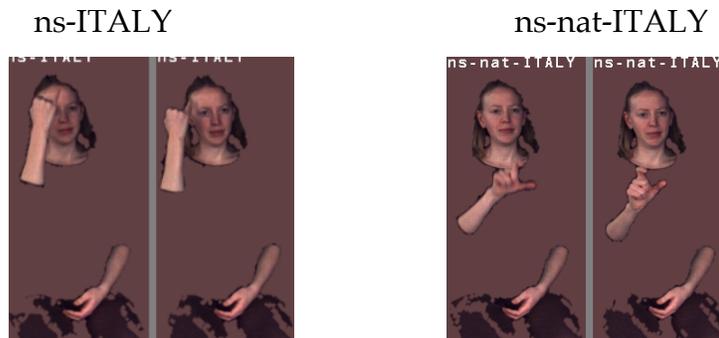
In the event that a handshape must be specified due to the existence of variants, this comes prior to the ns- designation. For example:

ns-CALIFORNIA_2   (25)ns-CALIFORNIA.

16.1.8 Two special cases

Of the ASL signs that can be translated as 'what' in English, there is one that (because of glossing traditions) includes quotation marks around it (in a way that we do not otherwise use quotation marks). Compare WHAT with "WHAT"":

WHAT   vs.   "WHAT"

We also use an irregular gloss for what we identified as a 'particle of indefiniteness' [8] (which is actually somewhat similar in articulation to "WHAT" but involves a single outward movement, with the palms up). We gloss that as either part:indef (when it is 2-handed) or (1h)part:indef when articulated with 1 hand.

part:indef   vs.   part:indef

16.2 FINGERSPELLING and LOAN SIGNS

Fingerspelled words are preceded by "fs-"e.g., fs-JOHN

Loan signs are marked by the "#" sign, e.g., #JOB

Warning: It can be difficult to distinguish between some loan signs and fingerspelled words. Generally, if you can identify all of the letters in the word, even if some are only partially formed, it is fingerspelling, and we use the full set of letters in the gloss, even if some were omitted in the production.

If you can clearly see three letters or fewer, and if the hand orientation changes or a path movement occurs, it is probably a loan sign.

89

16.3 INDEX signs used as Pronouns, Determiners, or Adverbs of Location

See the table on the next page for the conventions used for the root of an indexical sign (IX, THUMB-IX, POSS, or SELF) plus the suffix used to indicate person agreement.

A subscript is normally used to identify a location in the signing space that is used referentially. An arbitrary subscript is used, but if the same referent is referred back to through use of the same location, the same subscript will be used again. However, since it is difficult to type in subscripts, what would usually be represented as a subscript is instead marked with a colon, i.e.,

IX-3p$_i$ (to represent a third person index used with location "i" associated with the referent in question)

is instead represented as

IX-3p:i

IX	-1p	First person (signer)	IX-1p	I, Me
	-2p	Second person (addressee)	IX-2p	You
THUMB-IX*	-3p	Third person or determiner associated with location "i"	IX-3p:i *THUMB-IX-3p:i For third person, only. (rare)	He, She, It
POSS	-1p	First person (signer)	POSS-1p	My, Mine
	-2p	Second person (addressee)	POSS-2p	Your
	-3p	Third person or determiner associated with location "i"	POSS-3p:i	His, Her, Its
SELF	-1p	First person (signer)	SELF-1p	Myself
	-2p	Second person (addressee)	SELF-2p	Yourself
	-3p	Third person or determiner associated with location "i"	SELF-3p:i	Himself, Herself, Itself

Figure 89.   Examples of Indexical Signs

Indexical signs referring to plurals often involve an arc-shaped movement, which is represented as in the following examples:

IX-3p-pl-arc They (did the job well.)
POSS-3p-pl-arc Theirs (was the best.)
SELF-2p-pl-arc Yourselves (Please do the work yourselves – don't farm it out.)

16.4 AGREEMENT PREDICATES

ASL verbs can be categorized as *plain verbs* or *agreement verbs*. These might also be categorized as body-anchored verbs and verbs that are easily lend themselves to being moved around in space. Transcribing the plain verbs presents no more challenges than any other basic sign (see HAVE above). Agreement verbs add an additional level of challenges as they may include a number of agreement markers. Below, we take the example of GIVE, which may be articulated a number of ways that express agreement, as shown below. Note that again things that would normally be represented as subscripts are instead represented using colons.

Glossed as	Meaning
GIVE	Neutral sign for give
neu:GIVE:i	It is given to person represented at location i (with a neutral articulation not overtly expressing subject agreement)
i:GIVE:j	Person represented at location i gives it to person represented at location j
neu:GIVE-3p-pl-arc	It is given to many people (with a neutral articulation not overtly expressing subject agreement)

Although linguists frequently indicate coreferentiality by using matching subscripted indexes of this kind, we have *not* used indexes with any signs produced in neutral space. Therefore, if the subject of the verb **GIVE** were **fs-JOHN**, an index would only be used with this noun if it were signed in a non-neutral spatial location. Thus, we have the distinction between the following two situations:

Noun	fs-JOHN i:GIVE:j	John is signed in a neutral location.
Noun:i	fs-JOHN:i i:GIVE:j	John is signed in the location associated with the referent (the same location with which the verb displays manual subject-verb agreement).

Similar notation would be used to indicate spatial agreement for other predicates besides verbs that can exhibit spatial agreement. For example, sometimes an adjective like BLUE is articulated in a location in space that marks it as referring to a particular referent. In such a case, it would be glossed as BLUE:i

16.5 CLASSIFIERS

To represent a classifier, the coder must establish the type of classifier, e.g., descriptive, locative, semantic, body, instrument, body part, and plural classifiers, as shown in Figure 90.

The core of the classifier coding is the type of classifier. The example below is a semantic classifier, abbreviated "SCL". The handshape used is "3" which is commonly called the 'vehicle classifier'

Type of classifier: semantic	SCL	SCL
Handshape: 3	:3	SCL:3
Description of meaning in quotation marks "vehicle sink"		SCL:3"vehicle sink"

SCL:3"vehicle sink"

When both hands are used, as in the case below where one vehicle follows another, "(2h)"(two-handed) is prefixed to the gloss: (2h)SCL:3"vehicle following car"

If both hands are in use and they move alternately, as in "people falling out", "alt." is infixed between "(2h)" and the classifier type: (2h)alt.SCL:bent-V"falling out"++

Abbreviation	Explanation	Example
LCL – locative LCL:B"leaf drifting to the ground"	Represents an object in a specific place (may include movement). Handshape is specified. Location and movement included in quotes. E.g., LCL:1"path turn around"	
SCL – semantic SCL:1"person walking stiffly and hurriedly".	Represents a category of nouns such as vehicle or person. Handshape is specified. Category and movement included in quotes. E.g., SCL:crvd-V"person climbing up ladder" In two-handed semantic classifiers, the non-dominant hand often represents a different object and would thus be glossed separately. In this case, SCL:U"ladder"	
BCL – body BCL "acting macho" BCL "put arms around friend"	The body acts out the verb in the sentence. Action is described in quotation marks. BCL:crvd-5"picking up log"	
ICL – instrument ICL"driving", ICL"playing jacks"	The hands manipulate an object. Action is described in quotation marks. ICL: "peeling paint" In this example, the non-dominant hand is representing a semantic classifier, a wall, and would be coded separately as SCL:B-L"wall"	
BPCL – body part (2h)BPCL:1"crossing legs"	Represents a specific part of the body doing an action. Handshape is specified. Body part and action included in quotes. (2h)BPCL:B"tapping foot"++	
PCL – plural PCL:3"people walking" PCL:4"long line of people" PCL:5"hordes of"	Indicates a specific or non-specific but plural number of things. Handshape is specified. Noun is often specified and included with number in quotes. E.g., PCL:5-C-L"crowd of people"; PCL:3"three people walking forward"	

Figure 90.   Examples of Classifiers

When both hands participate in different parts of a classifier relationship they are on separate lines, time-aligned, in the transcript:

dominant hand   SCL:bent-1"wolf go"
non-dominant hand   LCL:C"chimney"

Classifier Annotation Summary:

1. Is it two handed?

    Yes –go to 2.   No – go to 4.

2. Same handshape?

    Yes – note "(2h)" and go to 3.   No - go to 4 and code each hand separately

3. Hands alternate?

    Yes – note "(2h) alt." and go to 4.   No – just go to 4.

4. Note classifier type

5. Colon

6. Handshape (just dominant hand!)

7. Open quotes

8. Meaning

9. Close quotes

10. Number of repetitions >1 add "+"

16.6 GESTURES

Gestures are coded by:

- The number of hands, i.e., (1h) or (2h)
- Alternation, if any – "alt."
- The handshape label, e.g., "A", "5", "B-L"
- Text describing the meaning in quotation marks, e.g., "wave", "calm down" (although it is often very difficult to know exactly what is intended as the meaning)

Only the meaning in quotation marks has been obligatory to this point. In that respect, we have tried to use the same label, e.g., "calm down", when the same gesture is produced. This is quite challenging, but we do have a repertoire of gesture signs that have already been annotated, so if the same gestures recur in the future (i.e., approximately the same meanings and articulation), it would be great to try to use the same description of the meaning. Again, there is often a very arbitrary relationship between the words chosen and the actual meaning, so this should be construed as 'meaning' only very loosely. More important is consistency in labeling.

For further details about gestures, see http://www.bu.edu/asllrp/asllrpr13.pdf.

Gesture Annotation Summary:

1. Is it two handed?
   Yes –go to 2.   No – go to 4.
2. Same handshape?
3. Hands alternate?
   Yes – note "(2h) alt." and go to 4.   No – just go to 4.
4. Handshape
5. Open quotes
6. Meaning
7. Close quotes
8. Number of repetitions >1 add "+"

16.7 COMPOUND SIGNS

In some instances it is difficult to decide whether an instance of a sign is a compound or the two components have merged so seamlessly that it is now a single sign. Considerations include number of movements and handshape changes, and types of signs involved in the compound. For example, the compound corresponding most closely with the English term LOUD is signed using two distinct handshapes and movements:

HEAR + RUMBLE

These two distinct components lend themselves to creating the meaning in the compound sign.

Compound Annotation Summary:

1. Is this a single sign or a compound?
   Single Sign – Gloss separately as individual signs
   Compound – go to 2
2. Identify the two (or more) glosses that make up the components of the compound sign
3. Connect the glosses (SignStream will automatically insert a '+' when you link parts of a compound)

		Gloss Unit												
Type of sign	Hold	Marked # of hands	Type prefix	Subject Agreement	Classification and Handshape	Gloss	Infix	Repeat	Agreement	Plural	connector		Hold
Loan	[<--|]	[(1h)] [(2h)][alt.]	#			WORD		[+]*	[:i]		[+] [^]	Gloss Unit	[|-->]
Finger-spelled			fs-										
Name			ns-[nat-]										
Indexical						IX POSS SELF THUMB-IX	[-distributive]		[-loc:i] [-loc:"place"] [-1p] [-2p] [[-3p]:i] [:indef]	[-pl] [-arc] [-2:x/y] [-3:x/y/z]			
Lexical				[i:] [neut:] [1p-] [2p-]		WORD	[-recip]		-1p -2p :i / ,1p ,2p ,i	[-pl] [-arc]			
Classifier					DCL LCL SCL BCL ICL BPCL PCL [:handshape]	"meaning"							
Gesture					[(handshape)]								

Figure 91. Relative ordering of components of gloss annotations; see http://www.bu.edu/asllrp/asllrpr11.pdf for further details.

17 Detailed Table of Contents

18 Index

V

W

Z

19 List of Figures

20 References

[1]   MacLaughlin, D., C. Neidle, and D. Greenfield. 1999. SignStream™ User's Guide, Version 1.5. Boston, MA: American Sign Language Linguistic Research Project No. 8, Boston University.

[2]   MacLaughlin, D., C. Neidle, and D. Greenfield. 2000. SignStream™ User's Guide, Version 2.0. Boston, MA: American Sign Language Linguistic Research Project No. 9, Boston University.

[3]   MacLaughlin, D., C. Neidle, R.G. Lee, and D. Greenfield. 1998. SignStream User's Guide, Version 1.0: American Sign Language Linguistic Research Project.

[4]   Neidle, C. 2000. SignStream™: A Database Tool for Research on Visual-Gestural Language. Boston, MA: American Sign Language Linguistic Research Project No. 10, Boston University.

[5]   Neidle, C. 2002. SignStream™ Annotation: Conventions used for the American Sign Language Linguistic Research Project. Boston, MA: American Sign Language Linguistic Research Project Report No. 11, Boston University.

[6]   Neidle, C. 2002. SignStream™: A Database Tool for Research on Visual-Gestural Language. *Journal of Sign Language and Linguistics* 4:1/2, 203-214.

[7]   Neidle, C. 2007. SignStream™ Annotation: Addendum to Conventions used for the American Sign Language Linguistic Research Project. Boston, MA: American Sign Language Linguistic Research Project Report No. 13, Boston University.

[8]   Neidle, C., and R.G. Lee. 2008. WELL, "WHAT" is it? Discovery of a new particle in ASL. In *Signs and Voices*, eds. Lindgren, K., D. DeLuca and D.J. Napoli, 100-116. Washington, DC: Gallaudet University Press.

[9]   Neidle, C., and D. MacLaughlin. 1998. SignStream™: A Tool for Linguistic Research on Signed Languages. *Sign Language & Linguistics* 1:1, 111-114.

[10]   Neidle, C., D. MacLaughlin, R.G. Lee, B. Bahan, and J. Kegl. 1997. The SignStream™ Project: American Sign Language Linguistic Research Project.

[11]   Neidle, C., S. Sclaroff, and V. Athitsos. 2001. SignStream™: A Tool for Linguistic and Computer Vision Research on Visual-Gestural Language Data. *Behavior Research Methods, Instruments, and Computers* 33:3, 311-320.

[12]   Neidle, C., A. Thangali, and S. Sclaroff. 2012. Challenges in Development of the American Sign Language Lexicon Video Dataset (ASLLVD) Corpus. In *Proceedings of the 5th Workshop on the Representation and Processing of Sign Languages: Interactions between Corpus and Lexicon, LREC 2012*. Istanbul, Turkey.