

1 HamNoSys 4.0







The following description assumes that the user has some familiarity with earlier versions of HamNoSys. A self-contained documentation of HamNoSys 4 is in preparation.

1.1 Handshapes in HamNoSys 4.0

1.1.1 New bending operators

Two new symbols are added to the already existing three bending operator symbols: \sim and $\hat{\sim}$.

The inventory of bending operators is as follows:

	base joint	middle joint	distal joint	
	max.ext.	max.ext.	max.ext.	no bending (default)
	max.bent	max.ext.	max.ext.	bent
	half-bent	half-bent	half-bent	round
	max.ext.	max.bent	max.bent	hooked
	max.bent	max.bent	max.ext.	double-bent
	max.bent	max.bent	max.bent	double-hooked

Note that all bending operators cover a certain range of bending.¹


- Intermediate forms


There will be no new symbol for intermediate forms such as $\hat{\sim} \setminus \sim$. All bending operators cover a certain range of bending. Likewise, a hand with extended fingers and no bending symbol can also be used to transcribe a hand with slightly bent fingers. If necessary, intermediate forms can still be notated with the in-between operator \setminus .

How these symbols are applied:

- Fist

The $\hat{\sim}$ symbol makes the differentiation between the two different positions of the fingers in a fist possible, i.e.:

 fist with the nails touching the palm = default (as before); and

 the fist with the finger pads touching the palm (this almost always also requires some contact with the distal joint). This latter handshape could also be notated HamNoSys as $\hat{\hat{\sim}}$;

¹ Max.ext. = joint maximally extended; max.bent = joint maximally bent; half-bent = joint approx. 45° bent.

it was decided, however, to use the fist symbol in order to show the close relationship between the two different handshapes.

- Fingers [+ spread]

The bending operator \checkmark for “fisting” (double-hooked) is used, for example, to differentiate between the two different productions of the “Y”-handshape:

$\checkmark\downarrow^b$ where the little finger is [- spread] (i.e. position as in $\checkmark\downarrow^{45}$); and

$\checkmark\downarrow^{45\checkmark 4}$ where the little finger is [+ spread] (i.e. position as in $\checkmark\downarrow^{45}$).

This bending operator will only be used in cases where really necessary (see, e.g., above): transcriptions such as $\checkmark\downarrow^{34}$ should be avoided if handshapes can be transcribed in an easier and shorter way, in this case $\checkmark\downarrow^{25}$.

- Closed thumb-finger combinations

For closed thumb-finger combinations, the following bending operator symbols can be used:

symbols bending of selected fingers place/joint where selected fingers contact e.o.

\downarrow $\overline{12}$ \downarrow

$\overline{\downarrow}$ $\overline{12}$ (\downarrow)

$\hat{\downarrow}$ $\overline{12}$ $\hat{\downarrow}$

$\checkmark\downarrow$ $\overline{12}$ $\checkmark\downarrow$

$\hat{\checkmark\downarrow}$ $\overline{12}$ $\hat{\checkmark\downarrow}$

Note that the fingers in the default handshape are round. The $\hat{\checkmark}$ symbol in these thumb-finger combinations indicates that the index finger is bent/hooked in a way that the fingernail of the index finger contacts the middle joint of the thumb, whereas the \checkmark hook indicates a full bending of all three joints. The new bending operator $\hat{\checkmark}$ indicates that thumb and index finger contact each other at the fingertip: the index finger is, however, bent in the proximal and mid joint and fully extended in the distal joint. $\hat{\checkmark}$ cannot be used with the closed thumb-finger combinations.

- Open thumb-finger combinations

With open thumb-finger combinations the new bending operator symbols cannot be used.

1.1.2 Thumb position

The symbol \downarrow for the thumb may now not only be used with the thumb-finger combination symbols but also with all the other symbols. For the fist / flat hand / individual fingers there are now four different thumb positions:

			thumb in the plane [- spread] (no diacritic)
			thumb in the plane [+ spread]
			thumb orthogonal to plane
			thumb in the plane, across

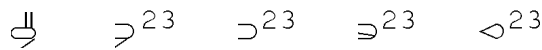
The thumb-orthogonal symbol may not only be used in combination with the base symbols but also with the other symbols. This will obviously lead to quite some overlap of symbols.

• Thumb-finger combinations [\pm spread]

One can now differentiate between $\overline{\text{d}}$ and $\overline{\text{d}}$. The latter equals $\overline{\text{d}}^{23}$. I.e. thumb-finger combinations in which more than one finger is involved are defined as being [- spread]. If one wants to show [+ spread] this is transcribed with individual finger handshapes and the opposed thumb.

Different degrees of opening in these handshapes will look as follows:

open <----->closed



• Opposition/contact in thumb-finger combinations

In thumb-(single)finger combinations where more than the default finger is involved (e.g. d^{23} or d^{23} or d^{345} or d^{34}), if there is a need to indicate which finger the thumb is opposed to, this can be done by using the \bullet symbol as follows:

- $\text{d}^{\bullet 2 3}$ thumb contacting index finger
- $\text{d}^{2 \bullet 3}$ thumb in opposition to the middle finger
- $\text{d}^{3 4 \bullet 5}$ thumb in opposition to the ring finger
- $\text{d}^{\bullet 3 4}$ thumb in opposition to the middle finger

In HamNoSys 2.0, contact information in closed thumb-all fingers combinations was already defined; it was notated as, e.g.:

d^2 thumb contacting index finger

To conform with the newly introduced notation convention we suggest to also use the \bullet symbol in these cases (not obligatory, however), e.g.

$\text{d}^{\bullet 2} | \text{d}^2$ thumb contacting index finger

The same notation can also be used in open thumb-all fingers combinations , e.g.

$\ominus^3 \mid \ominus^3$ thumb in opposition to the middle finger

- Opposition in open hands with opposed thumb

For open hands with opposed thumb, the \bullet symbol will also be used, e.g:

$\overline{\cup}^2 \bullet$ thumb in opposition to the index finger

$\overline{\cup}^3 \bullet$ thumb in opposition to the middle finger

$\overline{\cup}^4 \bullet$ thumb in opposition to the ring finger

1.1.3 Un(der)specified handshapes and handshape groups

- Un(der)specified handshape

We have introduced a new subscript which can be added to the non-dominant-hand symbol: $\overline{\cup}^{\text{rel}}$

In one-handed signs, it means that the hand is relaxed: any handshape between a half-open fist (with or without contact of the thumb and the fingers) and a slightly bent/curved 5-hand or flat hand.

In two-handed signs, it means that the non-dominant hand is either relaxed (see above) or that it copies the handshape of the dominant hand.

- Underspecified handshapes (handshape groups)

The same subscript can be used with basically any handshape (although we expect it rather to be added to the less marked handshapes) to signify that not necessarily the handshape notated is to be performed but anything within a certain range of that handshape, e.g.:

$\overline{\cup}^{\text{rel}}$ may imply, for example $\{ \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \}$

$\overline{\cup}^{\text{rel}}$ may imply, for example $\{ \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \mid \overline{\cup} \setminus \emptyset \}$

(see also 1.2.2 Underspecified orientation, 1.3.7 Underspecified locations, and 1.4.6: Repetition)

1.2 Orientation in HamNoSys 4.0

1.2.1 Relative orientation

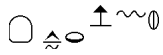
Relative orientation means that the relation of the extended finger orientation or of the palm orientation to the path of the movement remains the same – either it is parallel with it or orthogonal to it. To abbreviate the notation of such signs in which the orientation changes constantly during the movement (e.g. in signs with a zigzag or a wavy movement), a new subscript is introduced: \sim

Notation of signs will look as follows, for example:

• $\circ \triangle_{\ominus}^{\sim} \chi \downarrow \chi$ BALL (“ball”)

• $\circ \triangle_{\ominus}^{\sim} \chi \downarrow$ HAUS (“house”)

• $\circ \triangle_{\ominus}^{\sim} \chi \rightarrow \downarrow \leftarrow \chi$ KASTEN (“box”)



WELLEN (“waves”)

In signs which exhibit a change from relative orientation to absolute orientation (we think that there are only few examples of this type), the notation will look as follows:

• (no gloss – phantasy-sign)

Note: Another option would have been to use another symbol (e.g. the “natural sign”) to indicate the change back to absolute orientation.

1.2.2 Underspecified orientation

The subscript we have introduced for underspecified handshapes can also be used with the orientation symbols to signify that not necessarily the orientation notated is to be performed but anything within a certain range of that orientation, e.g. may imply: $\{ \left| \begin{smallmatrix} \circ \\ \circ \end{smallmatrix} \right| \}$

(see also 1.1.3 Un(der)specified handshapes and handshape groups)

1.3 Location in HamNoSys 4.0

Some new symbols are added, others will no longer be used (they are, however, still available).

1.3.1 Mouth: tongue, teeth

Two new symbols have been added to differentiate between the different locations on (and in) the mouth, namely

tongue, and

teeth.

1.3.2 Mouth, teeth, eyes

and will be used to differentiate between the upper part of the eyes, mouth and teeth respectively, i.e.:

upper lip; and

lower lip

upper teeth; and

lower teeth


upper eyelid; and


lower eyelid

These diacritics are restricted to the above group of location symbols; they may not be used with any other location symbol. In case one wants to be more specific, in-between locations have to be notated, e.g. if a sign is produced on the lower part of the shoulder region one can notate: (as before).

1.3.3 Other locations

New symbols are added:



 on top of the shoulder (the upper surface of the shoulder)

 ear lobe

 under the nose (the lower surface of the nose)









In signs where one wants to be very specific about the location of each finger, e.g. as in the sign SPITZ(-NASE) (“pointed nose”) where the index finger is located on top of the nose, the thumb under the nose, the notation will look as follows: $\overset{\cdot}{\text{h}}(\chi_2)\underset{\text{h}}{(\chi_1)}$

1.3.4 Upper arm, elbow: front and back, right and left



The elbow-outer-side symbol  is abolished. It will be notated as .

(Note that the old symbols still exist in the font for compatibility reasons.)



Upper arm and elbow will use the same reference system as the trunk:



	front (=default)	back	right	left
upper arm				
elbow				



1.3.5 Fingers, wrist, forearm: dorsal and palmar side, right and left

The following location symbols are abolished:  and 

They are now transcribed as follows:

 \equiv 

 \equiv 

(Note that the old symbol  still exists in the font for compatibility reasons and that  continues to be used in handshape notations.)

For all fingerparts, the wrist and the forearm, one can notate the dorsal and palmar side by using the back-of-the-hand symbol and the palm symbol respectively. (If no specification is needed, the fingerpart, wrist or forearm symbols are used without any other symbol.)

 fingernail

 fingerpad

 middle joint (dorsal side)

- ☞ middle joint (palmar side)
- ☞ base joint (dorsal side)
- ☞ base joint (palmar side)
- ☞ ball of the thumb (dorsal side)
- ☞ ball of the thumb (palmar side)
- ☞ wrist (dorsal side)
- ☞ wrist (palmar side)
- ☞ forearm (dorsal side)
- ☞ forearm (palmar side)

The symbol **1** meaning “side of finger” will not be used any more as a location symbol. Instead, the “right of” and “left of” symbol (☞) will be used.² Reference for the finger sides will be the ulnar and radial side of the hand, i.e. the transcription for each hand will look different, for example:

right hand:		left hand:	
☞	the ulnar side of the index finger	☞	the radial side of the index finger
☞	the radial side of the index finger	☞	the ulnar side of the index finger

For the palm, wrist and forearm, the same reference system will be used:

right hand:


- ☞ the ulnar side of the wrist
- ☞ the radial side of the wrist


1.3.6 Fingers and fingerparts: order of symbols in the transcription

In earlier versions of HamNoSys, finger-number and fingerpart symbols could appear in any order in a notation. This is now changed, and there is a fixed order for these symbols: finger-number fingerpart, e.g.:

- 1☞ fingernail of the thumb
- 1☞ middle joint of the thumb

² Note that in handshape transcriptions such as ☞2☞34☞5 the symbol will still be used.

2□ radial side of the middle joint of the index finger

2□ ulnar side of the middle joint of the index finger

1.3.7 Underspecified locations


The subscript we have introduced for underspecified handshapes can also be used with the location symbols to signify that the area in which a sign is performed is larger than normal, e.g.:

 as a location may imply, for example {|\|\|··}



(see also 1.1.3 Un(der)specified handshapes and handshape groups)

Note: Any location symbol refers to a certain area; adding the subscript signifies that the respective area is enlarged. What the exact range of an area is depends on each location (symbol); i.e. the nose with the subscript covers an area which is significantly smaller than an area covered by a body location symbol with the subscript.

1.3.8 Co-reference



For the transcription of texts one may wish to use indices for certain locations to which the hand returns later on in the narration. These locations will be numbered (12345). When a location is used for the first time it will be tagged, i.e. after the movement symbol a number will appear in a rectangular:  1



When, later on, the same location is used (as target location etc), the number will appear in a circle.  1

In double-handed signs, notated with a symmetry operator, reference to the location of the dominant hand will be with the circle (see above); and reference to the location of the non-dominant hand will be with the circle in combination with the non-dominant hand symbol.  1 

1.4 Movement in HamNoSys 4.0

1.4.1 Zigzag and wavy line movements




In previous versions of HamNoSys, zigzag and wavy line symbols (, ) could only be added as modifications to straight movements. They may now also be added to arc and circular movements, e.g.




 or .

1.4.2 Tilde-symbol:

This symbol can be used in two different contexts with two different meanings:

- to indicate repetition

 appears at the end of a movement transcription (where the other repetition markers appear) and carries the meaning: “Do with the non-dominant hand what you have just done with the dominant hand, and vice versa”, e.g.: HANDSCHUH (“glove”):  [...] 

If the movement is repeated with the non-dominant hand and then again repeated with the dominant hand, the repetition marker is added twice:  [...]  

- to indicate out-of-phase movements

~ appears directly after the symmetry operators, e.g. GEBÄRDEN (“to sign”): $\ddot{\bullet} \sim \text{[...]}$

This influences both the movement and the starting position.

1.4.3 Brushing contact during a movement

For brushing contact during a movement a new symbol is introduced: †

Syntactically, these movements will be notated as follows:

MOV (brushing-MOV-symbol LOC-at-which-the-brushing-happens) {End-LOC}, e.g.

KAUFEN $\downarrow \zeta (\downarrow \sim \chi)$

The symbol may also be used in signs which have an “almost-brushing” contact, i.e. which move close to a certain body part, e.g. $\zeta \circ (\downarrow \sim \chi) \circ +$

1.4.4 Bouncing movement

In some signs the hand moves in one direction (in most cases probably onto the non-dominant hand – but it may also be a movement in space) and then bounces back. For this bouncing movement, the following notation will be introduced:

$\downarrow \sim \chi \bullet$ movement onto palm and bouncing back

$\downarrow \parallel \bullet$ movement in space with sudden stop and bouncing back

1.4.5 Fusion of movements

New brackets $\{ \}$ are introduced for the notation of those signs in which movements are fused, i.e. where there is no pause between one movement and the following movement, e.g.

$\{ \leftarrow \rightarrow \rightarrow \rightarrow \rightarrow \}$ KANN-NICHT (“unable to do”)

This is also very useful in signs where the hand describes uncountable small movements in space, for example DIE-FLIEGE-FLIEGT-DURCH-DEN-RAUM (“the fly flies through the room”).

In signs in which only the dominant hand moves onto the non-dominant hand and then continues the movement together with the non-dominant hand, these brackets can also be used to describe that the movement of the dominant hand is an uninterrupted movement, e.g.

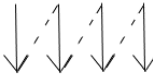
$\{ [\downarrow \diamond] \downarrow \parallel \bullet \}$ (phantasy-sign)

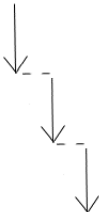
1.4.6 Repetition

- Combination of back-and-fro-movements

Movements such as MOV – back-MOV – MOV will be notated as follows, e.g.: $\rightarrow \leftarrow \leftarrow \leftarrow$ or $\uparrow \circ \leftarrow \leftarrow$

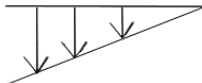
- Movement repetitions with offset

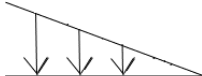
↓(⇨→) Downward movement which is repeated several times while moving to the right (the beginning location is always the same). 

↓(⇨→) Downward movement which is repeated several times while moving to the right (the end location of the first movement is the beginning location of the second movement, and so forth). 

Other examples include:

↓(⇨→) 

↓(⇨→) 

↓(⇨→) 

• Non-specified repetitions in space

In some signs, repetition can be in a non-specific manner, e.g. a sign can be repeated at various locations – where exactly is not important. For this we will use the same subscript as for the underspecified handshapes .. but add it as a subscript to the repetition symbol, e.g.:

⊖₂₃ | ⊖₁ ⊖₀ (⇨→)⇨⇨⇨_{...} This is an example from Hausa Sign Language: TAURARUWA (“star”).

Note: In this notation there is no specification on which line or plane the repetition is performed. If one wants to indicate the plane in which the repetition takes place this can be done by using the ⊖ ⊖ symbols for horizontal and vertical plane respectively, e.g.

↑(⇨⊖)_{...} GIVE (on a horizontal plane, e.g. to various people)

↑(⇨⊖)_{...} GIVE (on a vertical plane, e.g. to God and the devil, among others)

If the movement is repeated at random but always uses the same target location, the notation will look as follows:

↓₁ (⇨⊖₁)_{...} (something like: “several people coming towards the signer from different directions”)

1.4.7 Wrist movements / lower arm rotation

For movements in the wrist (right–left, up–down) two new symbols are introduced (which were already available in HamNoSys Version 1.0): ⇨⇨ ⇨⇨. They will be used to notate repeated uncountable movements in the wrist (it doesn't matter in which direction the hand moves first), e.g.:

⇨⇨ right–left example in DGS: WER (“who?”)

↕ up-down example in DGS: WINKEN (“wave” vb.)³

If the wrist moves in one direction only, this will be notated with changes in the orientation (as has been before), e.g.: KLOPFEN (“knock”) $\ominus \triangle \circ \rightarrow \perp \ddagger$

(Likewise for countable movements in the wrist and for signs in which the direction of the first movement is important.)

For the rotation of the wrist and lower arm (repeated, uncountable, direction in which the rotation begins is irrelevant), e.g. in SPIEGEL (“mirror”), a new symbol is introduced: Ψ

Rotating (circling) the wrist as in RÜHREN (“stir”) or PROPELLER (“propeller”) will be treated differently. There are two symbols, one for each direction: ζ η

The symbols refer to a single movement only. If there is repeated movement, the repetition symbols have to be added in the notation.

Rotating (circling) the wrist continuously in right direction while drawing a large circle in space:

$\perp \triangle \circ \zeta \ddagger$

The same symbols may also be used for rotating (circling) a finger, e.g.

$\zeta \ddagger$

1.4.8 Fingerplay

The fingerplay symbol can now also be used for signs like KRÜMELN (“crumble”), i.e. for thumb-finger combinations in which the selected fingers and the thumb are [+closed] (i.e. $\diamond \diamond \diamond$), resulting in some rubbing of the thumb and the fingers, e.g.

SALZ (“salt”) (and related signs): $\diamond \triangle \circ \downarrow$

If there is a sign with a [+closed] handshape in which the non-selected fingers wiggle, this needs to be notated as follows, e.g.: $\diamond \triangle \circ \left(\begin{smallmatrix} 345 \\ \downarrow \end{smallmatrix} \right)$ or $\diamond 34 \triangle \circ \left(\begin{smallmatrix} 25 \\ \downarrow \end{smallmatrix} \right)$

1.4.9 Handshape change: Extending (or closing) one finger after the other

In handshape changes from the fist to the 5-hand or from the 5-hand to the fist in which the fingers are extended / closed one after the other, e.g. in DGS TÄGLICH (“daily”) (extending the fingers) and KLAUEN (“steal”) (rolling up fingers), we will notate the beginning and the end handshapes together with one of the two HamNoSys-symbols: $\leftarrow \rightarrow$

\leftarrow from the thumb side to the little finger side

\searrow from the little finger side to the thumb side

Examples:

³ Note that these may also be used for nodding and shaking the head, i.e.: $\circ \updownarrow$ and $\circ \updownarrow$ respectively.

- < 𠄎, index finger is extended first (2345)
- < 𠄎, thumb is extended first (12345)
- \→< 𠄎→ 𠄎, index is extended first, thumb is extended last (23451)
- > 𠄎, little finger is extended first (54321)
- 𠄎→> ○, little finger is closed first (54321)
- 𠄎→< ○, thumb is closed first (12345)

1.5 Other: Ipsilateral (signer space) vs. right (real space))

We have introduced a symbol which will be added as a prefix to the notation of a sign (in two-handed signs after the symmetry operator symbol):⁹

It symbolises that the orientation and direction of movement are absolute/refer to real space and not to the signer space (the ipsilateral side), i.e.: the switch of orientation and direction of movement which usually takes place if a left-handed signer performs the sign notated for a right-handed signer should NOT be performed.

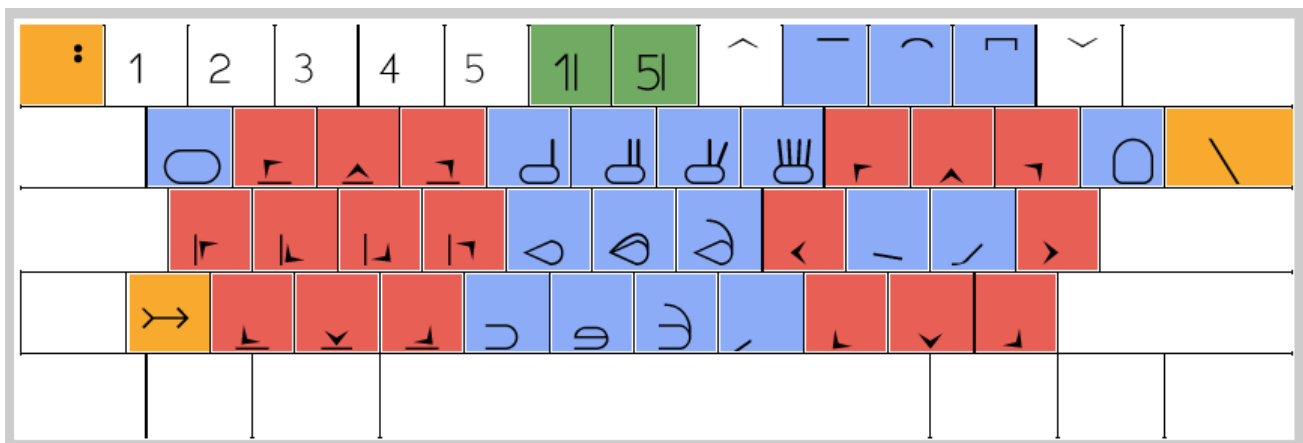
If for some reason one only wants to reverse the orientation but not the direction of movement, the notation will look as follows:

9 ○→ 9→

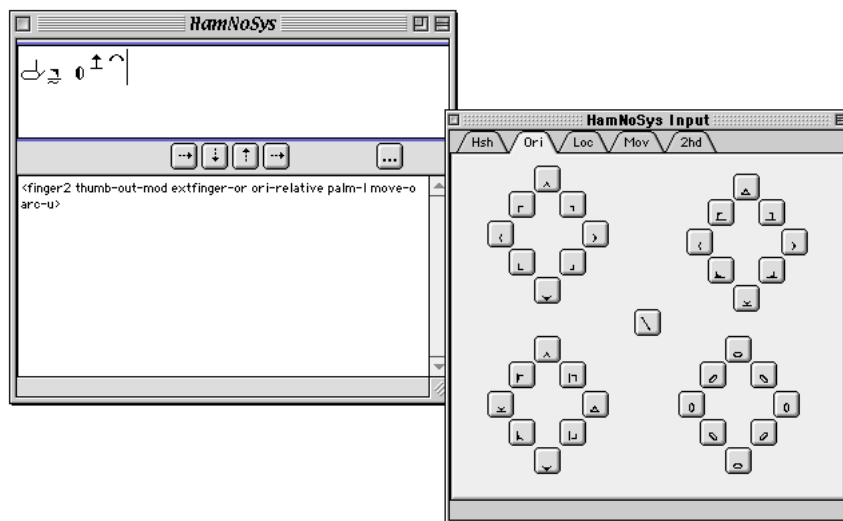
1.6 Implementation

The HamNoSys character set has been available as a TrueType font usable on Macintosh as well as Windows platforms and all Unix systems that support TrueType fonts since version 3. On the Macintosh, it was embedded into a script system (aka Language kit) to automatically switch keyboard to a graphical layout, to adapt sorting routines etc. All of these components have been updated to include the new version 4 characters. The keyboard layout is a compromise between changing as few keys as possible compared to version 3 and the most natural layout for the whole new set.

For the ANSI keyboard (used in the U.S.), some keys have been duplicated onto the numerical pad.



As HamNoSys strings need to be used in a grammar development environment that probably does not allow assignment of a display font for individual features, a small utility has been created that can convert back and forth between HamNoSys strings and an ASCII string consisting of the names of the HamNoSys symbols. In order to facilitate input for users not familiar with typing HamNoSys on a keyboard, an easy-to-use input method has been implemented where the user can input characters by clicking on them on a number of tabbed views.



A MacOS X compatible version of HamNoSys as well as a Unicode-based implementation are planned for later in the project.⁴

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⁴ The Unicode implementation will become part of the proposal for SiGML to become a W3C standard. This is the task of Milestone 5-8 of the ViSiCAST project.