

typannot,

Typannot: a glyphic system for the transcription of handshapes

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TRANSCRIPTION

“The goal of all transcription is to produce a permanent, written record of communicative events, allowing for analysis and re-analysis.” ... “The most basic aim of every system of notation of behavior is to **help researchers see patterns in the data** — that is, to facilitate their human pattern-recognition devices. The task of transcription and subsequent data summaries is to present information in various forms, so that one may identify regularities that may not be evident while directly observing the behavior in question.”

Slobin et al (2001: 64):

BASIC REQUIREMENTS

LEVELS OF DESCRIPTION

GRAPHEMATIC RULES

GLYPHIC SYSTEM

INDEXATION

DIGITAL TOOLS

TRANSCRIPTION OF SIGN LANGUAGE

The screenshot shows the ELAN software interface. At the top, there are menu options: File, Edit, Annotation, Tier, Type, Search, View, Options, Window, Help. Below the menu is a video player showing two people signing. To the right of the video is a table of LH ID glosses:

| LH ID gloss | Annotation | Begin Time | End Time | Duration |
|----------------|------------|--------------|--------------|--------------|
| 1 SAME | | 00:00:15.140 | 00:00:15.330 | 00:00:00.190 |
| 2 SCOTLAND | | 00:00:15.330 | 00:00:15.630 | 00:00:00.300 |
| 3 HOLD-FLAG | | 00:00:17.040 | 00:00:17.270 | 00:00:00.230 |
| 4 ETON | | 00:00:17.270 | 00:00:17.590 | 00:00:00.320 |
| 5 G | | 00:00:17.590 | 00:00:17.890 | 00:00:00.300 |
| 6 PEOPLE-LOOK | | 00:00:19.380 | 00:00:19.640 | 00:00:00.260 |
| 7 NORTH | | 00:00:19.850 | 00:00:19.860 | 00:00:00.010 |
| 8 IRELAND | | 00:00:19.870 | 00:00:20.310 | 00:00:00.440 |
| 9 SAME | | 00:00:20.320 | 00:00:20.550 | 00:00:00.230 |
| 10 PEOPLE-LOOK | | 00:00:20.560 | 00:00:20.930 | 00:00:00.360 |
| 11 PTpro1 | | 00:00:24.420 | 00:00:24.610 | 00:00:00.190 |

Below the table is a detailed transcription grid with various tiers for phonetic and linguistic analysis, including LH ID glosses, dependent variables, handedness, grammatical functions, and summary information.

*MOT: t@ag(*2) w@ag ^opr'WHQ SEE
WHAT(1h) ^ ?

*CHI: MOUSE(*N) .

*MOT: t@ag g@ag(nh): \- ^opr'WHQ
WHAT(1h)^\?

BTS coding

B_aB_a^z ~ ʌʌʌ^á 3[±] [] JC[†]JC[×] }Y[⊙] JG_λ[<]v<
 B_a B_λ^ω G[±] B_λ[†]B_λ[‡] D Á^{⊗x} B_b B_v[±]
 G[>] ^5^x [] JC[†]JC[×] X₁X₁^á B_T V_b^v
 B_a L[#] X₁X₁^á

Stokoe coding

ELAN



HamNoSys



Si5s



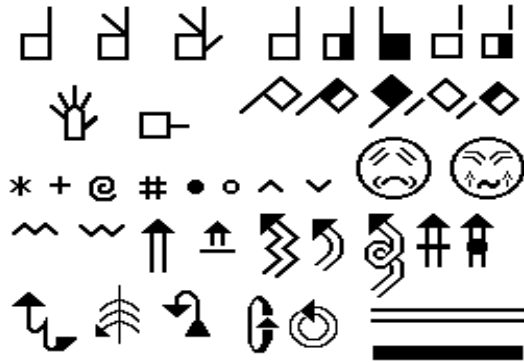
Signwriting



WRITING SYSTEMS

SignWriting

(Valerie Sutton, 1974)



Si5s

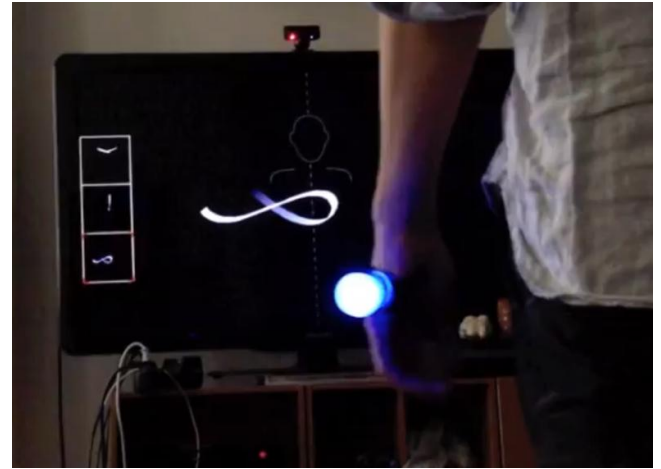
(Robert Arnold Augustus, 2007)



OUR APPROACH

Hypothesis : an analogical approach is available for the glyphs (Monneret 2003). The similarity might be visual, motoric or spatial. Those similarities can be traced or captured to be transformed systematically into glyphs.

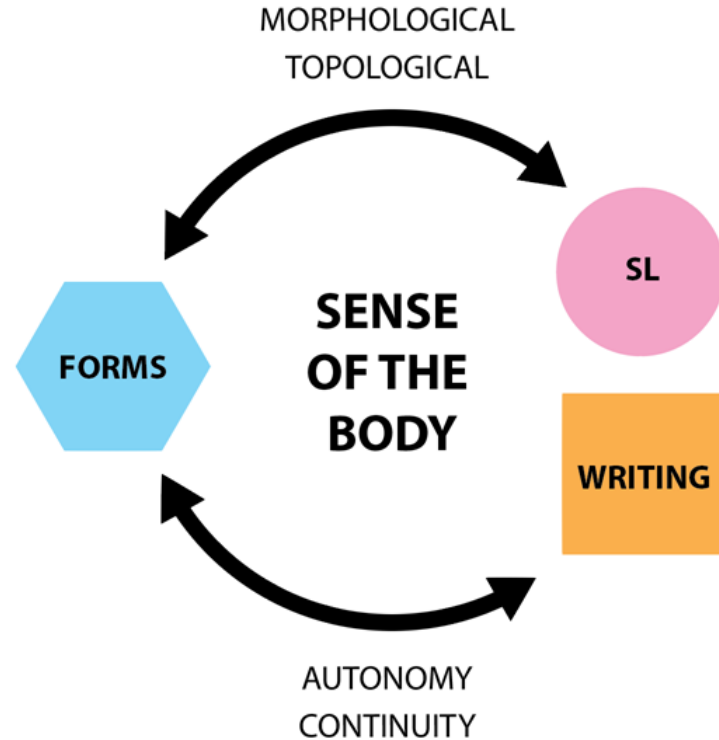
The diversity of the analogy might help us to fulfill our criteras (readability, writability, modularity and searchability) and serve as a ground for the emergence of a form of writing using the body.



SIGNING AND WRITING, A SHARED CORPORAL PERSPECTIVE



"Incredible" in FSL
Photocalligraphy. C. Danet & Al.
2010.



GOALS

Develop a glyphic system based on physical, visuo-spatial and motoric analogies that allows users to make consistent transcriptions while promoting shared corporal behavior between writing and signing. Four main guiding criterias arised from our research and analysis: readability, writability, modularity and searchability.

Phonological models for each parameters / combinatory logic / corpus

Glyphics compounds and composition rules

Input tools compatible with transcription software

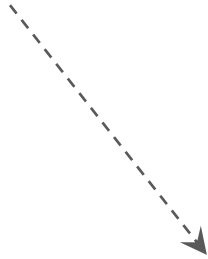
Open system that can transcribe any SL

Toolbox for a future writing

Grapheme

<u> = phoneme /u/

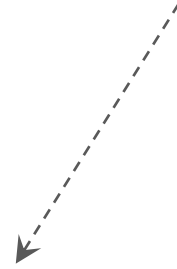
the smallest unit for a writing system
of a phoneme



Glyphs

∩ or **u** or *U* or ***u***...

various glyphs representing the grapheme <u>
which is composed of the characters “u”



Characters

“u” (U+0075)

unit of information in computer and machine-based
telecommunications terminology standardized by Unicode

Two approaches



Phonology

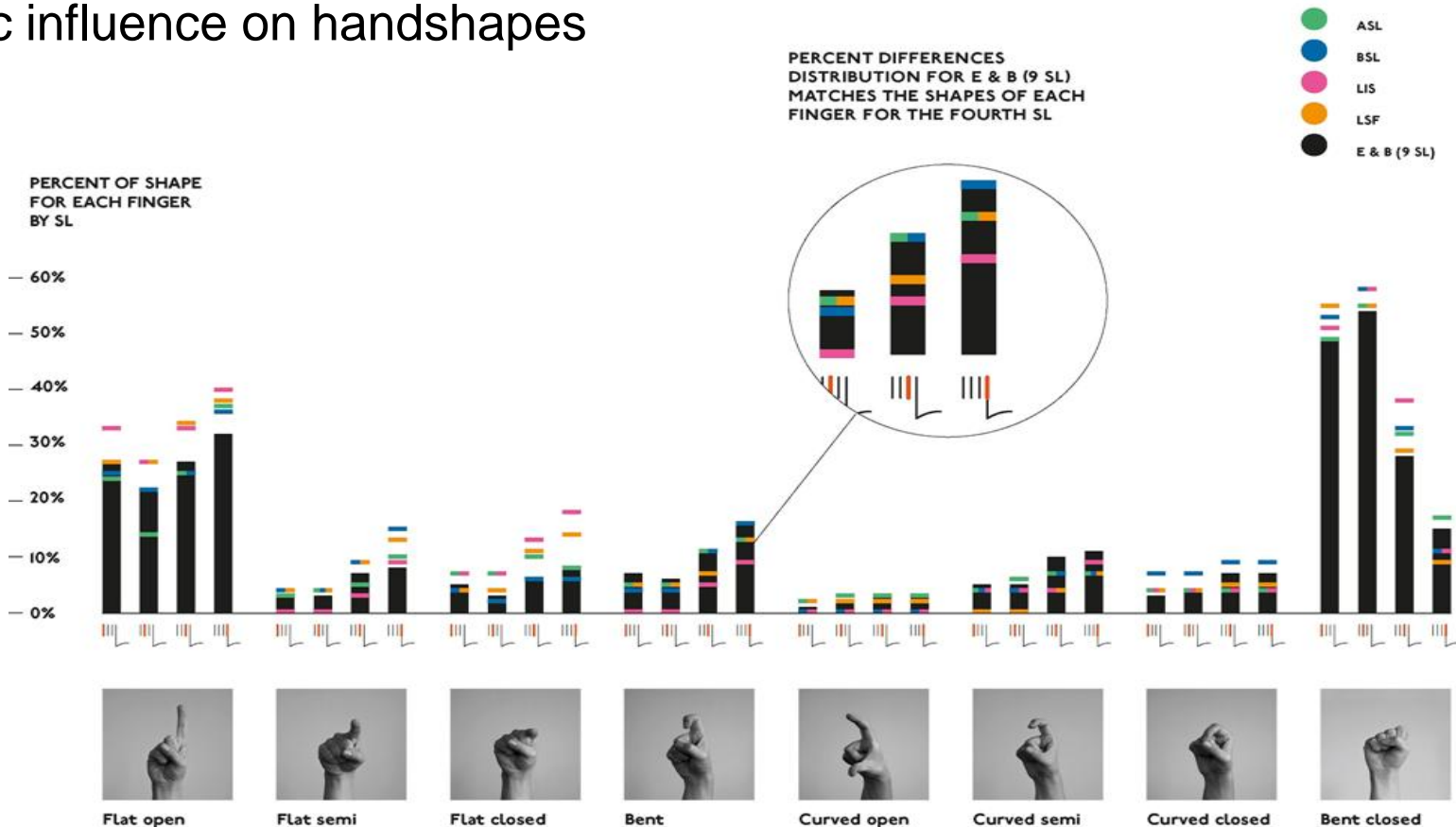
T. Johnson & S.K. Liddell (2011-2012);
D. Brentari (2010); J. Ann (1996);
Sandler (1987)

Phonetics

J. Ann (1996); Boutora (2008)

GENERAL HYPOTHESIS :

phonetic influence on handshapes



HYPOTHESIS OF THE PRAXIS Napier (1956)

Context: *features for power grip and precision grip*

Hypothesis 1

- The closer a handshape is to grip (power or precision), the more frequent it is.
- Results: 73% of the handshapes have a grip form



FIG. 1
A power grip posture.



FIG. 2
A precision grip posture.

HYPOTHESIS OF THE PRAXIS Napier (1956)

Context: *features for power grip and precision grip*

Hypothesis 2

- A non prehensile handshape is under-represented, because it is not so differentiated.
- Results: 6,75% are non prehensile handshapes.



FIG. 1
A power grip posture.



FIG. 2
A precision grip posture.

GRAPHEMATIC FORMULA



Eccarius & Brentari

1To;/

Index Thumb Curved-closed
Non Selected fingers extended

Typannot

1TOCsc 234Fo

Index Thumb Opposed Curved semi-closed Contact
Middle Ring Pinky Flat open

GENERIC DECOMPOSED CHARACTERS

Finger



Index



Middle



Ring



Pinky



Thumb

Non-Opposed



Thumb

Opposed

Closeness



Grouped



Crossed



Stacked



Contact



Reverse

Shape



Flat



Curved



Bent

Angle



Full open



Open



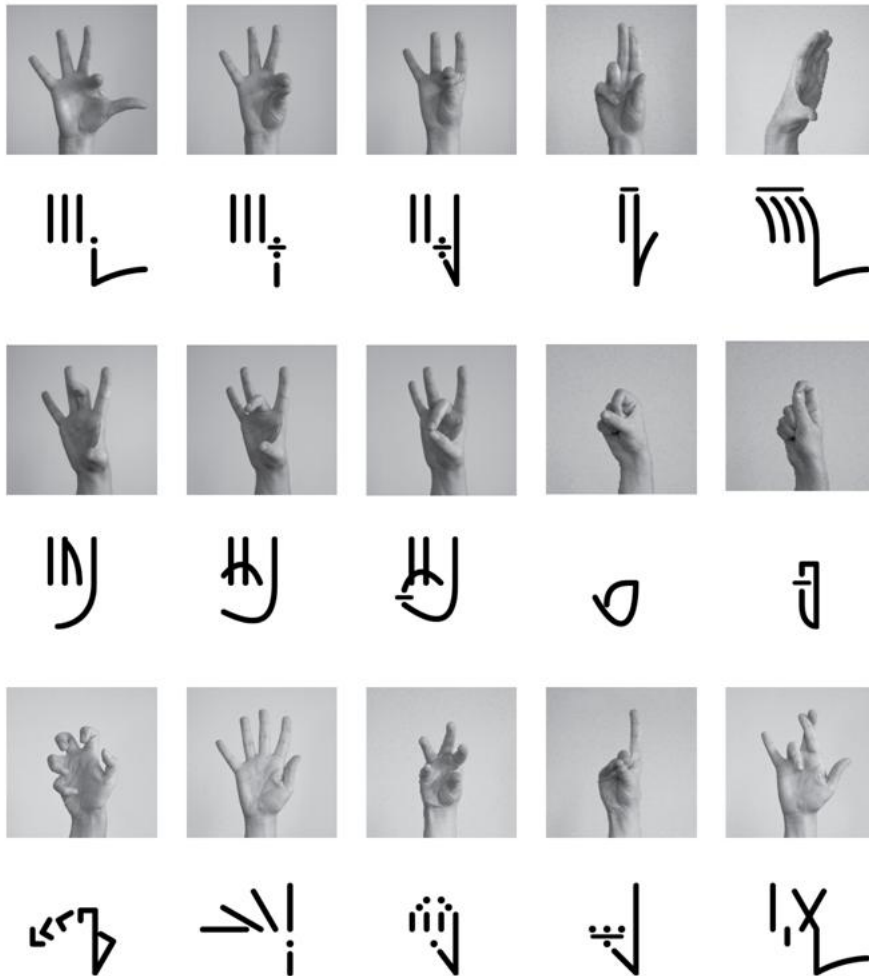
Semi-closed



Closed

SPECIFIC COMPOSED CHARACTERS

Current set: 257 characters based on I & B.
Expendable to all possible combinations



User Interface: Virtual keyboard

**Parametric interface
demo**

User Interface: Virtual keyboard

**Table and setting interfaces
demo**

User Interface: Virtual keyboard

The screenshot displays a software interface for a virtual keyboard. The top menu bar includes: Fichier, Edition, Annotation, Acteur, Type, Rechercher, Affichage, Options, Fenêtre, Aide. The main window is divided into several sections:

- Video Player:** Shows a scene with a woman and a man. The current time is 00:24:38.885. A selection range is marked from 00:24:38.866 to 00:24:38.885.
- Controls Panel:** Contains three sliders: Volume (0-100), ALLER ARRIVER - Jules.mov (0-100) with Mute and Solo options, and Taux (0-200).
- Timeline:** A horizontal axis with time markers from 00:24:47.500 to 00:24:52.000. It features three tracks: Config MD, Config 230, and Sélection.

The Config MD track shows a sequence of keyboard keys: [Left Arrow], [O], [N], [Right Arrow], [I], [Left Bracket], [Right Bracket], [5], [Left Arrow], [O], [I], [N], [Right Arrow], [Left Arrow], [O], [N]. The Config 230 track shows a sequence of keys: [Left Arrow], [O], [N], [Right Arrow], [I], [Left Bracket], [Right Bracket], [5], [Left Arrow], [O], [I], [N], [Right Arrow], [Left Arrow], [O], [N]. The Sélection track is currently empty.

Outcomes

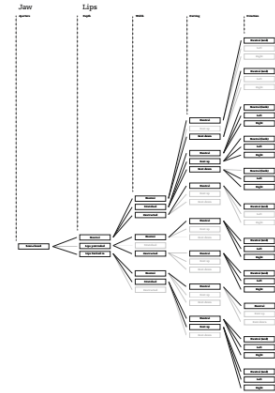
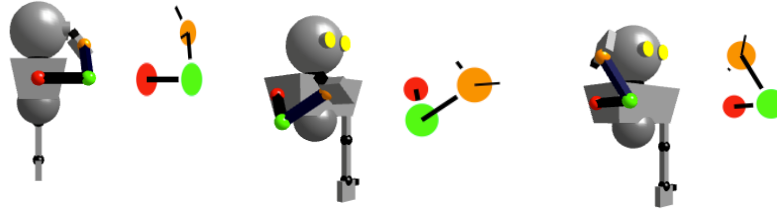
Locations: Graphematic formula >> Bêta test june 2017
 Glyphic system V 0.1

Movement: graphematic formula >> Bêta test fall 2017

| | Flx | | Ext | | Abd | | | Add | | RInt | | RExt | | Sup | | Pro | | | |
|------------|-----|---|-----|---|-----|---|---|-----|---|------|---|------|---|-----|---|-----|---|---|---|
| | 2 | 1 | 0 | 1 | 2 | 3 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 1 | 2 |
| BRAS | X | X | X | X | | X | X | X | X | X | | | | | | | | | |
| AVANT-BRAS | X | X | X | X | X | | | | | | X | X | X | X | | | | | |
| MAIN | X | X | X | X | X | | | X | X | X | | | | | X | X | X | X | X |

Mouth Action: an exhaustiv list >> 2018

Handshape: ready fall 2016



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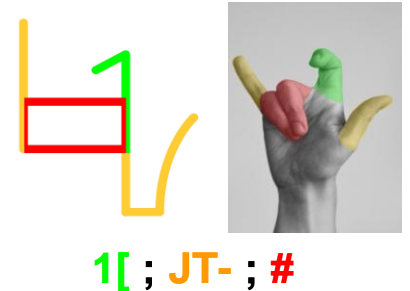
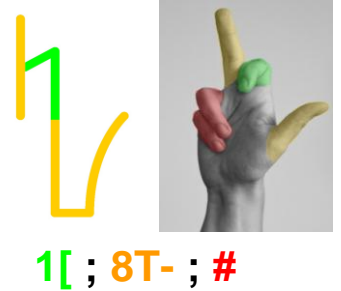
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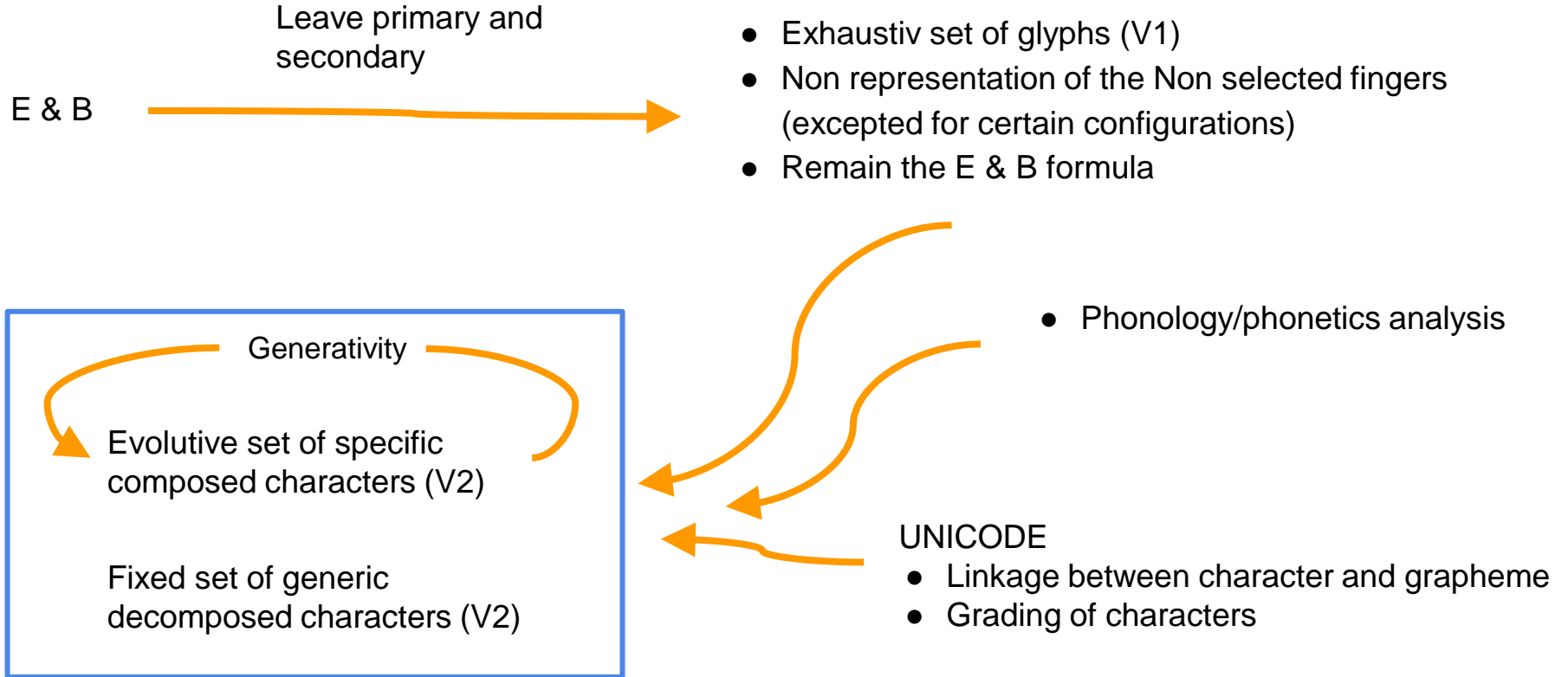
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Typographic adaptation

- Typographic adaptation of selected fingers
 - PrimSelec & SecSelec become FingersSelected
 - NonSelec are not represented only if extended or inbetween two FingersSelected
 - Contact between the thumb and any finger



Graphematic/Glyphic relationships



User Interface: Virtual keyboard

**Visual interface
demo**

User Interface: Virtual keyboard

**Textual interface
demo**

01

Equipe pluridisciplinaire

02

FUNDAMENTAL REQUIREMENTS FOR ANNOTATION SYSTEMS

In short, Slobin says that transcription is WRITING DATA. It breaks down language into useful components allowing systematic analysis. A glyphic system has to allow a wide range of transcription possibilities within the many levels and sublevels of annotation.

- LEVELS OF DESCRIPTION: Braking down the parameters requires to choose a principle of analysis, whether phonetic, phonologic.
- This principle of description and organisation should be at the root of the graphematic formula.
- A GRAPHEMATIC FORMULA: This formula provides all the logic and the phonological features to follow for designing the glyphic system
- A GLYPHIC SYSTEM is defined by a set of drawings and the rules for combining those drawings together.
- SEARCHABILITY & INDEXATION: as Slobin suggests transcription requires encoding standards that allows universal indexation for a consistant searchability accross different environnement.
- Finally, the transcription system is made available through digital tools: font and a virtual keyboard

03

Transcription of sign language data is a difficult and time-consuming process. It requires to use dedicated transcription tools and standards to help the analysis of the collected data. A common advise is not to use glos in the first place in order to preserve SL structures and avoid interpretation to take place during the transcription phase. We will quickly review the current standards in order to give the context of our research of a glyphic system for the transcription of SL.

04

Among the existing system, HamNoSys offers the possibility to annotate SL using their own conventions and a specific font. It can transcribe the variuos parameters (handshape, orientation, location and movement) of the language.

It is mainly based on the Stokoe annotation system that uses existing glyphs as graphematic conventions.

From a writing point of view, Hamnosys offers a consistent deconstruction of the sign into a linear formula. Using a computer interface, Hamnosys is compatible with “alphabetic writing” environnement and allows a high level of searchability.

05

Because of its gestural and multilinear nature, writing SL represents, still today, an extremely complex challenge that very few graphic systems succeeded to undertake.

Signwriting is probably the most famous and used of them. Developed by Valerie Sutton, this modular writing system combines a limited amount of symbols that can literally create an iconic representation of the sign in a spatialised representation of the body. Non linear, feature based, iconic, SW is striking by its visual expressivity and powerful readability. Although extremely readable and versatile, SW main disadvantage comes from its nonlinear 2D composition space that requires specific composing tools and makes it incompatible with current writing software.

06

OUR APPROACH

While having to fulfill all those requirements, our approach tries to answer the questions raised by the limitations of existing systems : one being very analytic and conventionalized, the other being visually explicit

Our hypothesis is to use analogy to approach the design of the glyphs. Our idea is that a diversity of analogies might help us to fulfill the following four criteria: readability, writability, modularity and searchability.

Recognizing the shared modalities between SL and writing, both using visuo-gestural modalities to work, we follow the idea that preserving and promoting existing links between the language and the form or the act of writing might help people to connect with writing through tracing, building, reading the glyphs.

07

Writing, as a corporal technique that extends our cognitive and communication capacities, share a very strong relation with SL. Both rely on a deep sense of the body to draw revealing structures in space using morphological and topological transfers between meaning and form.

Morphology, referring to an autonomous form, and topology, referring to continuous relations between forms

While we can perceive the meaning and the visible properties of a sign, what makes it take that specific form?

What activity organizes it from within? In his book “the chinese art of writing” (1990), J.F. Billeter calls for a sense of the body to understand how the calligrapher achieves balance in the infinite combinations of brush strokes. By using his own corporal dynamic, organisation and unity, the calligrapher can address two fundamental requirements of writing : autonomy and continuity.

Finally, writing, as a corporal activity, can open new possibilities for SL by expending its modalities of expression.

Those questions are being currently studied by Claire Danet in her Phd.

08

Our goals are to develop a glyphic system based on physical, visuo-spatial and motoric analogies.

To reach our goals, we have determined 5 key steps.

First, we must ground our study of the Sign Languages on a phonological model or, if there is none, create one based on combinatorial logic or on a corpus.

Second, we must build the glyphic elements and their compositional rules for the components we have extracted from the first step.

Third, we choose to create a virtual keyboard that provides a flexible and various use, even with ELAN or ANVIL

Four, The glyphic system must be wide enough to allow a good transcription for a large variety of Sign Languages. It must be open in order to include new glyphs that we would have not taken into account.

Five, this glyphic system is a toolbox for a future writing system.

09

For this talk, we focus on one parameter: the handshape. Through this parameter, we would like to present the framework of our project.

We have to present the notion of Character. To do that, the grapheme is the smallest unit of a writing system which is distinctive in any language (speech). The grapheme “u” forms a unit in french, this unity has a conceptual equivalent in terms of unit of written information: the character “u”. Thus, a character is a concept with a place in a writing system (UNICODE). This concept has a glyphic instantiation. A glyph is the drawing of a character. There are many glyphs for the same character.

In our project we try to find the graphemes of each parameter for SL, to determine the corresponding characters and to propose a glyph for each character.

A graphematic formula represents the phonological features of any grapheme.

10

Two kinds of structuring are available for handshapes, a phonological one and a phonetic one. There is several approaches for the phonology. We selected one of them. The approach of Brentari.

Opposed to the speech, the phonetics of Signed Languages have praxic functions. We can claim the physiology of the gestuality encounters the human activity. During this daily activity we hold, grip, throw, catch, write, text, outstretch, group and so on. The handshapes are massively praxic notably through every single handling of any object.

With this phonetic point of view, we can expect a praxical structuring of the handshapes.

11

In the phonological approach, we chose Eccarius & Brentari's proposal because of the graphematic formula.

With this formula, they provide a syntax that covers 9 sign languages.

On the left, you can see the formula with the different levels of information. We kept the differentiation between the selection of the fingers and the selection of the thumb (as you can see on the right). We change the denomination of the fingers selection. Instead of the ASL way (1, J, U...) we prefer to write the behavior of each finger or each group of finger, in order to be explicit.

Naturally, these choices are partly due to the glyphic system we finally chose.

We are going to show the reasons of these changes in the next slides.

12

For the phonetic approach, we study the representative aspect of the handshapes taken from these 9 sign languages and the behavior of each finger.

In black bars for the 9 SL of the E & B study, you can see the distribution of each finger according to the shape (flat open, flat semi, flat closed and so on...). The bars on the right of each bloc represent the proportion of the index for the shape below. The sum of the index bars equals 100%. This calculation is made for the 237 handshapes itemised. The same calculation is made for the middle finger (second bar from the right of each block) and so on and so forth.

The other colours represent other Sign Languages.

We can notice that between the four Sign Languages and compared to the black bars (9 Sign languages) the Standard Deviations are very weak. It means the behavior of each finger is quite the same whatever the languages

It seems that beyond a phonological fact, something gathers the shapes in the same extent. The behavior of fingers is quite the same: same shape in the same extent beyond the handshapes.

We can infer

- first, that the behavior of each finger is not different between the sign languages, and then the E & B phonology is quite representative of what is going on for the sign languages in general.
- second, that these behaviors are not coming from a convention. They come maybe from praxis.

13

Napier in 1956 wrote a paper about the two kind of grip. He differentiates a precision grip from a power grip. The features for the power grip is the non opposition of the thumb, as you can see on the photo on the top with a handle, for the precision grip, the position of the thumb is in opposition to the other fingers, as you can see on the photo just below. In both cases, the fingers are slightly or strongly curved according to the object.

We can have also an interdigital grip like for holding a cigaret.

Our hypothesis : the closer a handshape is to a grip, the more frequent it is. This hypothesis relies on the assumption that the praxis of handling, grasping, holding and son on implies a rich differentiation of the handshapes. The behavior of each finger is then very diversified. To calculate the potentiality of grasping of each handshape, we take into account every behavior of curved, bent or flat shapes for each finger. Because just one of them in a bent position is a way to grip : for instance to hook, we exclude the complete extension of a finger when it is not selected according to the description of E&B.

Upon 237 handshapes, 73% are gripping handshapes.

14

On the contrary, the absence of any grip should be under-represented in a praxic hypothesis because of the main influence of manipulation. To consider just the non gripping handshapes, we have taken into account the extensions of the fingers, excluding any complete flexion of any finger when it is not selected in the Eccarius & Brentari terminology.

The results are very contrasted because only 6,75% of the 237 handshapes are non prehensile handshapes. (able to grasp or hold objects)/ This study is obviously non sufficient to conclude about a praxic hypothesis. But new perspectives are then opened which deserve more investigations.

In any case, we choose to consider not the level of selected fingers as an entity like Brentari does, but to consider each finger in the graphematic formula.

15

The graphematic formula of Eccarius & Brentari is quite different for the one we built for the system typannot, despite the fact we begin with Eccarius & Bentari.

We write explicitely all the fingers to facilitate the searchability. All the features of the graphematic formula are now explicit. For instance the feature opposed/non-opposed of the thumb is written in our formula.

16

One of the singularity of our approach : the fact we can annotate any handshape with generic glyphs. This is the case here. There is a correspondance between the graphematic features and the generic glyphs. We can search any feature thanks to these generics.

This generic system provides the mean to transcribe a handshape even when a part of the hand is hidden. So, you have the opportunity to annotate at the granularity required by your research. For instance, you can transcribe just a pointing element: an extended index, or the opposition of the thumb.

17

Very shortly, this is the main categories of the generics. For instance in the meta category Closeness, the fingers can be Stacked in one way or on the Reverse one [SHOW]. The feature Crossed can be associated to the Reverse one, as well [SHOW]. On a deux registres de forme: linéaire (à la manière `HamNoSys) et analogique (` Sign writing)

18

19

Let's have a look on the virtual keyboard we develop to transcribe any sign languages into any software (like word, Excel, or ELAN..).

There are three interfaces to select the glyphs.

The first one is the parametric interface, for beginners.

The second is the visual interface, for an annotator who knows the system and demands a quick access to the glyphs.

The third is a textual interface for experts that gives access to graphematic formula.

We're going to present you one of those interfaces.

In the first interface, we compose every handshapes in a parametric way.

It is probably the most intuitiv and for this reason we consider it as the easiest interface for a beginner.

With Selection 1 and index, you can see the image of each handshape. And for few of them, the translation in Hamnosys or in Sign Writing. These equivalences are not yet implemented, but we will provide this solution.

After, if you select a "Curved Closed" feature, you have the choice among 5 Handshapes.

And then, you can choose one and put it in a software

20

This interface Table presents all the contents organised through the E & B's logic. It could be organized by the UNICODE logic as well.

We will see how to deal with that after users feed-back.

21

This is a screenshot of a transcription made with ELAN. You can see generic decomposed glyphs and specific composed glyphs.

22

To conclude,

The parameters Location, Movement and Mouth Actions are in progress.

We've got the graphematic formula for the Location and a first version of its glyphic system. The schedule for a bêta version is june 2017.

We've only got a first version of the graphematic formula for the Movement. The schedule for a bêta version is end of 2017.

An exhaustive list of the Mouth Actions is already made. We expect a fonctionnal font in two years.

And, WE expect a Handshape font ready, fall 2016

23 Bibliography A

24 Bibliography B

25

From this phonetic study we have made some adaptations in the glyphic formula. We present some of them.

No distinction is made anymore between the selected fingers. The non selected fingers are not represented only if they are extended or if they are inbetween two selected fingers.

We add a symbol for the contact between the thumb and any finger.

26

This graph represents our steps in the design of the glyphs and the graphemes.

Our departure point is a phonological system (E & B). We excluded the distinction for the primary and the secondary selections in favour of the behavior of each finger, shared or not. This choice is allowed by the glyphs. At this step, we keep the E & B formula.

Then, we analysed the behavior of each finger from a praxis point of view.

The recommandations of the UNICODE consortium link a character and a graphem. We complied with these recommendations, grading the characters

Doing this step, we have got a second version with coupled glyphs and graphemes. A set of generic and decomposed characters have been added. The system in few months could generate new characters, if it is lacking/missing in the set.

We have begun to adopt this methodology for the parameter of the location, for the movement and for the mouth actions.

27

The second interface, the visual one looks like what we call in french le “triangle vocalique” the “vocal triangle” maybe.

We have an entry through the form of each glyph. The categorization is made according to a table of features. When you select one of them (ungrouped Two fingers for instance) the others are not clickable anymore.

This interface is made for an annotator who knows the system and demands a quick access to the glyph.

28

The third interface, the textual one provides an access through the graphematic formula. So far the E & B formula is active. But in few months, you can access through the graphematic formula of typannot characters.

Let's have a look on the principle.

You select a category. For instance the shape “7” in E & B annotation system. You have all the handshapes with the ring selected, even the generic.

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Typannot: a glyphic system for the transcription of handshapes

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Existing writing systems for Sign Language (SL) (SignWriting [1], HamNoSys [2]) have seldom taken into account the details of the phonology of SL. Yet, the diversity of phonological approaches and the scope of the results, especially for handshapes, are very rich and may cover many languages [3, 4, 5, 6]. In the context of SL study, three distinct functions can easily define a writing system: the readability, the writability and the teachability. None of the existing systems offers a good compromise. In this work, we present the construction of a glyphic system able to cover all SL handshapes existing in the world, consisting of features based on a phonological description [6]. This multidisciplinary project, combining linguistics and type design, aims at producing a readable and usable, unambiguous and fully searchable glyphic system that provides a relevant solution for the transcription of SL and for a forthcoming writing. The glyphic and the glyphic systems (127 glyphs) are modular and adaptable to new configurations as needed, particularly including all the 120 SLs found in the world. The consequence of the glyphs was equally guided by the highlighted phonological/phonetic features (glyphic system) and the graphical and xperimental rules (glyphic forms) [7, 8]. We consider that the phonology for handshapes is given: beside a linguistic one, phonetic details exist for signs independently from manual gestures. The influence of the gesture of points on the visual perception is investigated here (connection between phonology and phonetics). What is at stake in the handshapes of pointing play [9] in SL handshapes [10]? The distribution of the relations of the fingers, the independence of each finger, and the behavior of each phalanx have been studied. The results challenge the ideas developed by [5] in favour of McNeill's hypothesis of power and precise grips. This analysis suggests an influence of phonetics on the phonology of the handshapes. These features helped designing the shapes and the glyphic system we use and on which we build the glyphic forms.

Following this work, and according to the phonological/glyphic description of handshapes by [6], a modular glyphic system based on phonological key components was devised. This approach allowed an economical and visual, yet rigorous, design process. These glyphs have been tested during a practical learning in a recognition task (52 subjects) and a compositional task (6 subjects). The results underlined the need to follow logical construction rules using limited numbers of compounds (Yoshida [2]), as opposed to more randomized shapes for each configuration (Version 1). After this first phase we are organizing and encoding the glyphs in order for them to be fully searchable through the Unicode standard.

Keywords: Sign Language, transcription, handshapes, glyphic system, Unicode

