AZVD as a Sign Language Writing System Proxy, and the Potential Evolution

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Abstract. This paper presents AZVD, a proposed graphical form of Sign Language representation. It explains the method used to design it, and its goals of adoptability and synthesisability. The system is built on two prior foundations: a study of the regularities observed in spontaneous diagrams produced by signers, and the formal representation model AZee. Since AZVD can be scripted, whether through pen and paper or through recently developed editing software, and read non ambiguously to the point of being synthesisable by avatar, we submit it can serve as a proxy for writing, and give potential evolution points that would make it an even better substitute for the currently lacking Sign Language writing system.

1. Introduction

Written languages are generally easy to equip with software editors, and often other processing tools consequently. It is however not the case for Sign languages (SLs), which have no written form. Video is sometimes used as a substitute, but with multiple drawbacks: its relative size makes storage a problem, editing is not possible with mouse and keyboard, indexing and querying is not possible with the current state of technology... Video in fact better compares to audio recording than it does to written text, because it is tied to the real time of its contents, whereas scriptural notations allow independent timing for writing and reading. Worse even, anonymity is not possible, which has considerable consequences on the circulation of information and perception of ideas, e.g., on the internet. Written ideas can emancipate.

In the absence of a written standard, this work focuses on graphical representation for SL—in this instance French Sign Language (LSF)—allowing implementation in editing software environments. We first present systems designed for SLs, and contrast them with a non-systematic yet actual practice of spontaneous diagramming. We then

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Stokoe notation SignWriting HamNoSys

FIG. 1. Graphical representations systems designed for SL

present the AZVD graphical proposal, which bridges the regularities of the diagrams and a formal representation model for SL statements, insisting on the method used to build it and its goals of maximising adoptability and synthesiability. Final sections address the potential evolution of the system, both in terms of engaging the community to conventionalise appropriate graphics and to facilitate using it as a writing system proxy.

2. SL Representation, Systematic or Spontaneous

A few representation systems have been proposed for SL, with varying objectives. Some of them were intended more as notation systems for theoretical description of signed forms, in other words more destined for use in linguistics, for example the early Stokoe notation (Stokoe, Casterline, and Croneberg, 1965). Others were designed with language users in mind, sometimes with claims of qualifying as a writing system, e.g., SignWriting (Sutton, 2014). Some were used in, if not tailored for, more or less specific software applications. For example, HamNoSys (Hanke, 2004; Prillwitz et al., 1989) was used as the primary input encoding for the JASigning avatar (Ebling and Glauert, 2013). Figure 1 gives an example of each system mentioned above.

They exhibit differences in their appearance, their minimal graphical units and the way in which they combine. But all of them invariably break down the signed production in a sequence of units ("signs") analogous to that of words in a sentence. Incidentally, each of these units is itself invariably represented through "manual parameters" (Stokoe, 1960), accompanied in some cases by non-manual features.

All of those scripts are designed *systems*, i.e., envisioned as consistent sets of rules ensuring that identical signed productions yield identical representations and vice-versa. This means that scripted representations determine the signed forms to articulate to restore the corresponding signed production. This is an expected property to qualify as a writing system, true for every one adopted for non-signed languages.

However, none of the above systems can be considered adopted and practised by wide communities of users, despite in some cases, notable

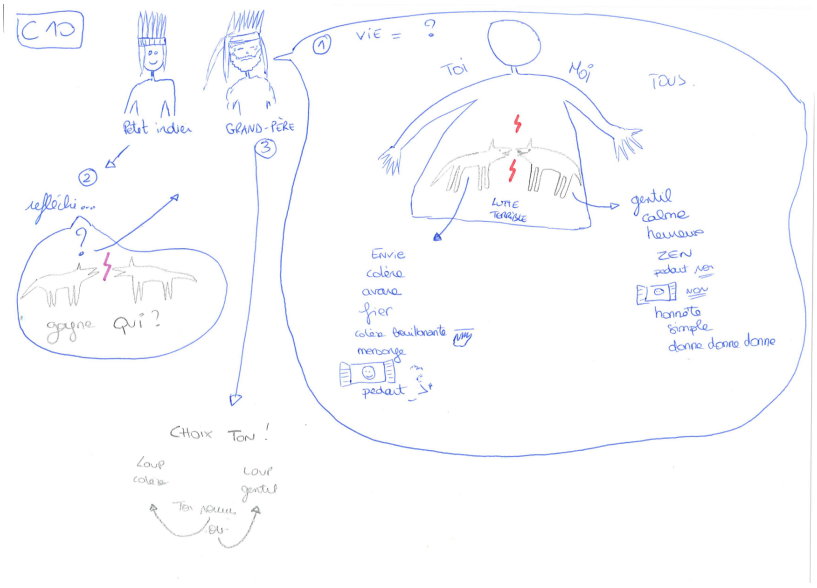


FIG. 2. VD for a short LSF story

promotion or dissemination efforts and software development. For example, SignWriting has considerable ressource[1] and available software[2], HamNoSys is equipped with an avatar-rendered synthesis program, etc.

This lack of adoption contrasts with the writing systems of written languages. It is all the more notable given that the wish for a scripted representation does seem to exist. Deaf people sometimes take notes or prepare speeches with pre-scripted notes, for example to be read in a single camera shot. Translators are also trained to work on their target production in a way that is detached from the source. To do this, such signers commonly resort to diagrams on paper, made of icons, drawings, and lines and arrows to link them together. We called these graphical productions *verbalising diagrams* (VDs) (Filhol, 2020b). Figure 2 is a full example of a short story whose duration delivered in LSF is about one minute.

In contrast to the systems mentioned above, the VD practice is common, but spontaneous. Every symbol, arrangement of symbols, link between them, side mark or annotation is likely chosen on the fly while sketching, outside of any predefined framework of rules. Moreover, VDs are most often intended for personal use only, only to serve once be-

1. The major resource is the online *SignPuddle*: `https://www.signbank.org/signpuddle`.

2. Several are listed at `https://www.signwriting.org/downloads`.

fore being discarded. Consequently, reading here is not deterministic: they do not determine the forms to articulate in a systematic way. It is therefore difficult to develop software assistance for VD, and impossible to automatically generate (synthesise) the represented signed contents with an avatar.

However, regularities have been observed in spontaneous VD instances, both across VDs from the same author and between VDs of different authors. This was published after the collection and study of a first VD corpus (Filhol, 2020b). For example, there is a clear tendency for VD symbols and layouts to represent the *meaning* to interpret from them, over the *form* to articulate to read them out. For example to denote the sun, all VDs draw a pictogram (see figure 3), except when the French word "soleil" was occasionally used instead (which still does not capture the signed form). None of them contain any reference to the position (near the temple) or shape (5 fingers spread and bent to depict a half-sphere) required of the active hand in the sign meaning "sun".

It is yet to note that, although in a minor proportion, articulated form still happens to be favoured consistently in some rarer cases. We also highlight that the meaning vs. form, while viewed as a major division in writing systems (logo-/morphograpy vs. phonography), can sometimes be less of a dichotomy in the case of SL. SLs are indeed known to make a ubiquitous use of iconicity, i.e., produce forms that resemble what they mean. For example, one might place objects near each other in the signing space (form) to express (mean) that they are spatially close. The graphical choice of drawing two symbols near each other then captures both facets without being objectively separable. But the disproportion outside of such cases is strong enough to establish a clear preference to capturing meaning instead of form, without ever being total.

This much contrasts with the systems proposed for SL representation up to this day, which all follow a fully phonographic design. On the contrary, a strongly imbalanced mix of phonographic and logographic features is essentially the norm in established writing systems, which coincides with VD observations. We therefore hypothesise that the exclusively phonographic design is a factor in the lack of adoption of prior SL representation systems, and that a mostly logographic system would make a better candidate for adoption.

Also found in the collected VDs are a number of recurring graphical choices, carrying an identifiable meaning and often signed in the same way, to the point where we can speak of an "associated reading". These are sometimes conventional pictograms or icons/symbols representing fixed signs, like the examples shown in figure 3.

In other cases, they are more complex layouts, combining several parts of the drawing. For example, an equal sign ("=") separating a left part L from a right part R generally means that R provides information

Observed VD symbols	Consistent form	Associated meaning
		sun

FIG. 3. Examples of spontaneous graphical representations

FIG. 4. Excerpts from VD containing an "equal" sign

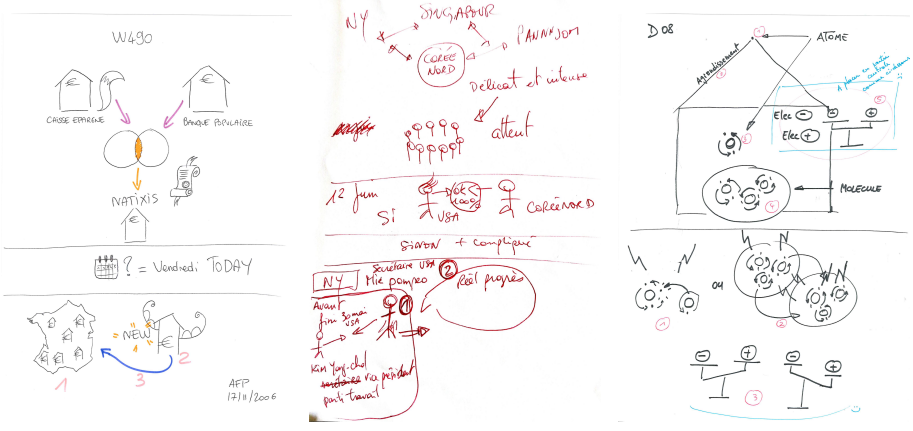


FIG. 5. VD pages with context bars

about *L*. Collected excerpts are shown in figure 4, and their interpretations in context are:

1. Fidel Castro's health is good.
2. The lion is kind.
3. What is cancer? ("Cancer is what?")

Another example is a straight bar separating a top part *T* from a bottom part *B* is always interpreted as providing a context *T* for *B*. This includes cases of temporal sequences, where *B* essentially occurs in the context of *T* having ended before *B*. Examples are given in figure 5.

FIG. 6. Excerpts of VD containing "lightning" symbols

Third example, the separation of two entities by a lightning bolt to express opposition between them, signed by placing each on either side of the signing space. Examples are shown in figure 6.

Clearly, regularities emerge despite the absence of an a priori system. As a practice adopted by some, and by nature suited for SL but evolving outside any system, VD appears as an intermediary between:

- regular systems adopted but not for SL, e.g., written German;
- and regular systems designed for SL but not adopted, e.g., SignWriting.

By positioning them this way, a path appeared to create a system that is both regular, adapted to SL, and adoptable by signers: standardising VD into a system.

3. Standardisation of VD

For us, standardising VD meant creating a regular and consistent graphical system, of which each instance determines its reading unambiguously. And a good test of this ability is whether generating a video, for example rendered through a signing avatar, is possible automatically from any input.

The problem is that each constraint applied to VD to increase its regularity may come with a loss of adoptability. Indeed, the current practice likely depends partly on the freedom felt by the authors. But the presence of spontaneous regularities already observed leads us also to suppose that such constraints are not necessarily a cause for rejection. Thus, we proposed to standardise (Filhol, 2020a) by adopting the spontaneously observed patterns in VD whenever possible. According to this proposal, the list of regular layouts presented in the previous section

should be part of the standard, each imposing an associated reading. The underlying assumption is that the more the system is inspired by familiar practices, the more adoptable it is.

That said, their number remains limited, and it is understood that if alone, this approach inevitably faces the problem of not covering the language enough by any metric. To reach coverage, the graphical system had to be complemented with additional graphics. A valuable source for this extension to the regular set could have come from research like that which examined the parallels between pedagogical/explanatory diagrams and the organisation of signing space in LSF (Guitteny, 2007). The problem is that no such study has yet claimed to cover all language phenomena, let alone be prescriptive in the sense that the reading be determined by the diagrams.

On the contrary, the formal SL discourse representation system *AZee* was designed for synthesis in the sense that it determines output SL from every input expression (Challant and Filhol, 2022; Filhol, Hadjadj, and Choisier, 2014). It also recently demonstrated a good covering capacity for LSF (Challant and Filhol, 2024). Besides, a semantic proximity was noted between several VD regularities and rules established in AZee, which eased bridging AZee and a VD-compatible set of graphics. AZee therefore played a central role in allowing to complement the set above for coverage. We thus provide a quick summary of AZee, before explaining the method followed to build AZVD.

4. AZee

AZee is a formal approach to representing signed utterances based on systematic correspondences between meaning (interpreted) and form (articulated) in the considered SL. Without assuming the existence or distinction of levels (morphology, lexicon, syntax…) nor any syntactic categorisation (verb, noun, adjective…), AZee allows to define *production rules*, each associating an identified meaning (which it is generally named after) with a specified form to express it. Rules are identified in a prior stage through a corpus search methodology (Hadjadj, Filhol, and Braffort, 2018) to ensure reproducibility and empirical validity. Thus, although the approach can in principle be applied to any SL, the set of all production rules found (namely the *production set*) is SL-dependent.

The formal specification of a production rule is done using the native AZee language, not detailed here. It allows to specify and synchronise the various articulations involved (finger orientations, hand position…) in a value of type SCORE, which essentially encompasses signed productions. For example, in LSF, the rule gentil (French for “nice, kind”) is defined as carrying the eponymous meaning and producing the fixed, conventional, stable signed form shown in figure 7.

FIG. 7. Form of gentil in LSF

These rules can be parametrised when a variation in form is semantically interpretable. For instance, regardless of the signed production *sig*, a lip pout gesture synchronised just ahead of *sig* systematically means that *sig* is consensual, that "everybody rather agrees on/that *sig*". This justifies the rule inter-subjectivity, with argument *sig* of type SCORE, conveying this meaning and producing the synchronised lip pout gesture. Both meaning and form jointly depend on those of *sig*.

By combining production rules, one can build *AZee discourse expressions* to represent utterances and discourses of increasing complexity. For instance, the expression below captures the constructed meaning "generally considered nice", and mechanically (recursively) produces the appropriate signed forms.

```
:inter-subjectivity
   'sig
   :gentil
```

Similarly, info-about(*topic*, *info*) produces the temporal arrangement of figure 8 and means "*info*, given about *topic*". Or, not-but(*negated*, *correction*) produces that of figure 9 and means "*correction*, and not *negated*". With these rules, plus assuming the two simple eponymous rules lion (transparent French term) and méchant (French for "bad, nasty"), we can construct the expression below meaning "the lion is not bad but kind" able to generate the appropriate utterance in LSF.

```
:info-about
   'topic
   :lion
   'info
   :not-but
      'negated
      :méchant
      'correction
      :gentil
```

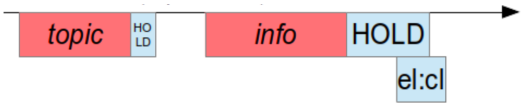


FIG. 8. Temporal arrangement for info-about(*topic*, *info*)

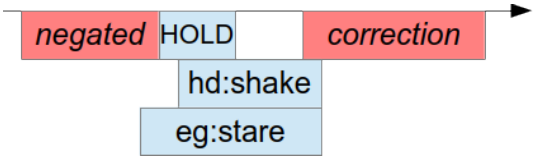


FIG. 9. Temporal arrangement for not-but(*negated*, *correction*)

Thusly, increasingly elaborate discourse expressions can be constructed. An important point is that these expressions allow for an almost direct reading of the overall meaning they represent while entirely determining the output forms.

AZee has gradually developed over more than a decade and the practical work continues to refine the LSF production set by confronting it to new data, as well as theoretical studies to position and compare the approach with formal grammars proposed in the field of Sign processing or even natural language processing at large. But it has already proven effective in terms of LSF coverage, as a corpus of AZee expressions was produced covering 97% of the 1 hour total of news discourse (Challant and Filhol, 2022), namely the 120 utterances of the *40 brèves* corpus, available for download online[3]. What is more, the model has also proven effective in terms of avatar synthesis, as it already enabled automatic animation of the Paula avatar (McDonald et al., 2015; Wolfe, McDonald, and Schnepp, 2011), notably even for several linguistic phenomena that were previously inaccessible such as geometric constructions in continuous signing space (Mcdonald and Filhol, 2021).

5. AZVD

AZee is a computer-oriented approach, and is not human-friendly to parse. An AZee expression resembles more computer code than a graphically organised diagram. However, its advantage for designing a graphical representation system is two-fold:

3. https://www.ortolang.fr/market/corpora/40-breves

- it is a formal, regular, and synthesisable system, which was a goal set for our graphical standard, so it was chosen to formally specify the forms to read from input graphics;
- it has demonstrated a capacity to cover LSF, precisely what seemed unattainable by building only from the VD regularities, so it was leveraged to complement the set of graphics and reach language coverage.

From this, regardless of the actual graphical choices in the beginning, the graphical system AZVD was built following the two goals below:

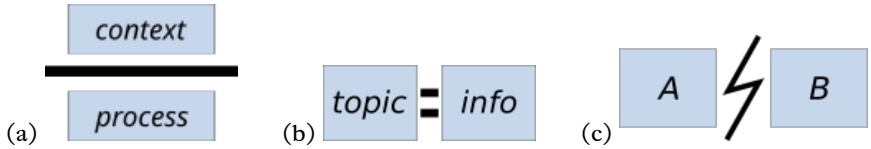
- every graphical icon or layout created should come with a unique AZee expression counterpart so that it is necessarily synthesisable—in formal terms, this amounts to defining a *function* from the graphical set to the set of possible AZee expressions;
- every AZee expression should be able to find at least one graphical antecedent through that function so that the graphical standard itself be as covering as AZee—in formal terms, we aimed for the function to be *surjective*.

First, consider a regular graphical icon or layout observed in VD, with an identified meaning and a determined SL output form. Assuming an effectively covering AZee production set, we can write an AZee expression, possibly parametrised by sub-elements of the drawing, which represents the SL to generate. We therefore specify a graphical *AZVD layout* identical to the VD pattern, together with an associated *AZee template*. Such a layout can use icons, specify alignment constraints or relative positions between them, as well as apply any transformation such as scaling or rotation. The AZee template can make use of elements embedded in the layout to instantiate the arguments.

The trivial case is that of the atomic symbol to which we directly associate a fixed AZee expression, with no variable arguments. For example, following the regularity presented in figure 3, we can associate the symbol "☼" with the AZee expression:

```
:soleil
```

Regularities involving variable parts can be encoded graphically with the same recursion for their content. For example, the contextualising bars observed in figure 5 suggest defining the layout in figure 10.a, containing two variable parts *ctxt* and *proc*, respectively above and below the horizontal bar, and associating it with the systematic reading provided by the template below, where the parts between brackets directly correspond to the sub-parts of the same name in the layout:



(a) (b) (c)

FIG. 10. AZVD layouts inspired by VD regularities

```
:context
   'ctxt
   [ctxt]
   'proc
   [proc]
```

Similarly, following the regularity shown in figure 4, the AZVD layout in figure 10.b directly corresponds to the info-about rule and its arguments *topic* and *info*.

Sometimes, more complex AZee templates are needed, but the principle remains the same. For example, the layout in figure 10.c, inspired by the regularity shown in figure 6, generates the following template, where the resulting form is the successive placement of *A* on one side and *B* on the other, with a hold and a blink of the eyes after each (this is generated by the each-of rule), a way in LSF to set up an opposition between the two:

```
:each-of
   'items
   list
      :about-point
         'pt
         ^Lssp
         'locsig
         [A]
      :about-point
         'pt
         ^Rssp
         'locsig
         [B]
```

Note that sometimes, different regular VD layouts were found to produce the same SL forms. For example, context bars were observed with either a horizontal or vertical layout. This is not a problem; several layout *variants* can be defined for a single AZee correspondence.

So far we have ensured that the spontaneously regular VD layouts were included in AZVD, with both a regular reading and a regular drawing. But as we mentioned, these alone will not be enough to constitute

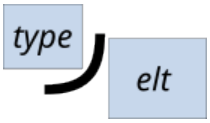


FIG. 11. Layout defined for instance-of(*type*, *elt*)

the surjection required to cover the entire set of possible AZee expressions, as most remain without a graphical antecedent. A trivial way to ensure the surjective function objective is to increase the inventory of available layouts by creating one (at least one, as variants should also be allowed) for each production rule that does not already have a direct antecedent from the previous method. For example, the production rule instance-of can be assigned the layout shown in figure 11, where the parts labeled *type* and *elt* correspond to the two arguments of the rule.

In this complementing stage of the method, the layouts created are a lot more detached from anything observed in regular practices, and sometimes even just the result of arbitrary choices, which may not have as good a leverage towards ease of adoptability as the prior stage. Another problem is that the production rules that are graphically encoded may be more or less known or understood by speakers. That said, they represent empirically found operations of the language and each have an interpretable meaning. So we know that they are somehow relevant to SL structure and thought, and can hope that whether consciously or not, they are internalised by the speakers to an extent significant enough to keep the encoded concepts and relationships apprehensible.

To maximise the practical adoptability of our script, we further proposed that each layout defined also:

- be easy to remember, making it iconic of what it represents when possible;
- preferably represent meaning, unless the ease of representing meaning over simplicity/salience of form ratio is too weak—this occasional phonographic switch has indeed been observed in spontaneous practices (Filhol, 2020a);
- have at least one variant that is easy to draw with a pencil, i.e., be monochrome, and have a low number of strokes with no filled area.

Figure 12 illustrates this proposition with proposed layouts for the main AZee production rules.

These two methods jointly guarantee a surjective function onto the set of possible AZee expressions, whose domain (the set of graphical layouts and icons) is made of elements maximising their adoptability. The set of layouts thus formed, and the ability to combine them to construct arbitrarily complex planar (2D) diagrams, is what we call the "AZee verbalizing diagram" script, or *AZVD* in short. Figure 13 is an example

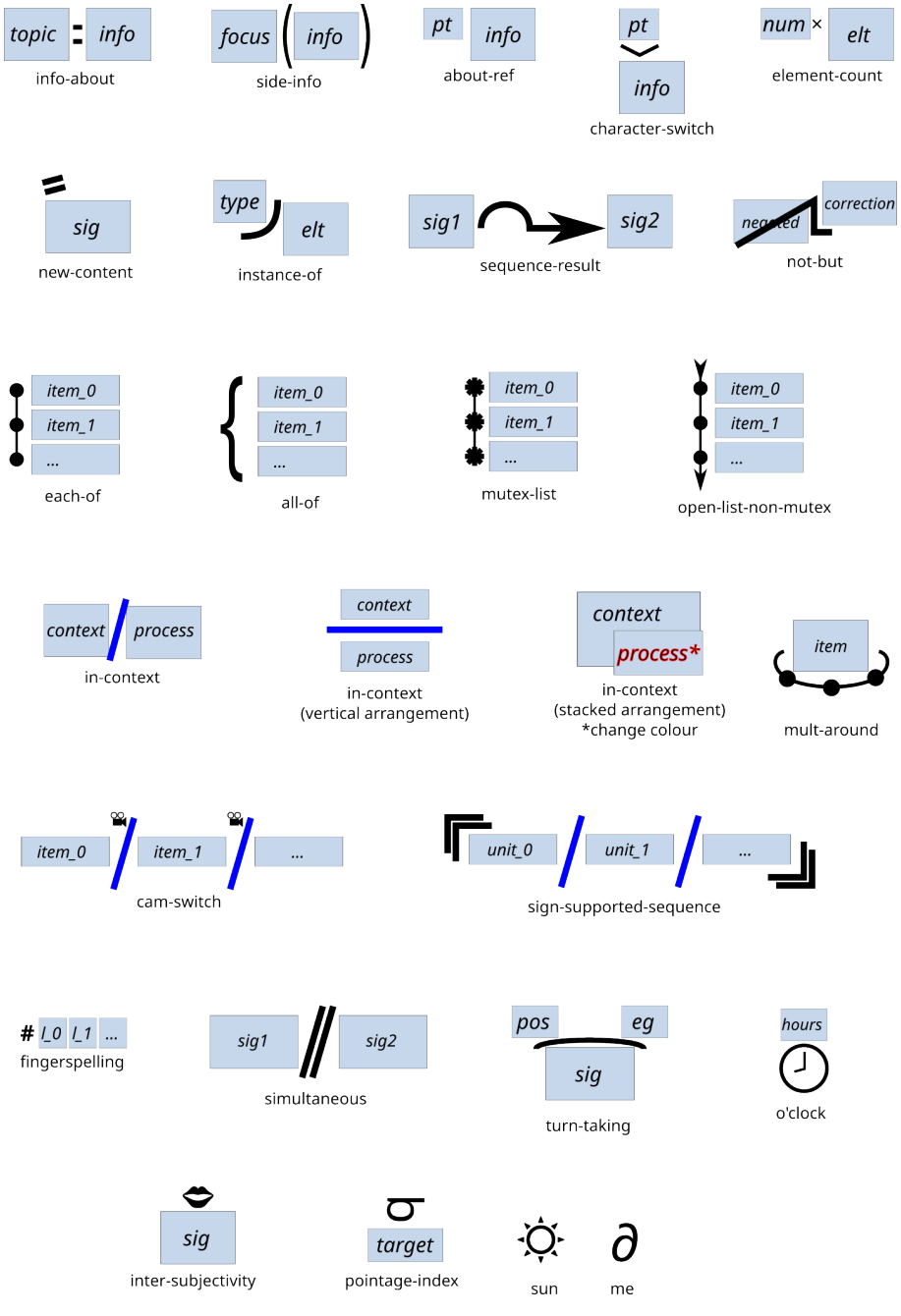


FIG. 12. AZVD layout sheet for the major AZee production rules

of a complete AZVD diagram representing the entry "2B-JP" from the *40 brèves* corpus cited earlier, whose production in LSF lasts 27 seconds.

6. Testing AZVD and Converging on Graphics

The method proposed above to build a standard graphical script is mostly built on theoretical grounds, and some of it can in principle be questioned. For example, it relies on the assumption that including spontaneous regularities is a means to maximise adoptability of the final system. Moreover, it sets an arbitrary goal of complete synthesisability, posed as a desirable feature to ensure by design. While we do hold these two features to be valuable, some empirical evidence of the advantage for users and greater adoptability of such a scheme, compared to others, is needed.

Another major, less theoretical aspect requiring engagement of the signing community is the choice of the graphical layouts themselves when no spontaneous regularity is observed. We proposed a set of icons and layouts (see figures 12 and 13), but that set is admittedly only tentative. The point was to enable first illustrations and a first implementation with usable graphics, only to kick-start the necessary debate on what would actually be preferred, this time with an actual system in the hands of the signers.

To this end, we developed an editing software program (Filhol and Ascheberg, 2024). It has so far only been tried as an AZee editor by experts of that model, and it still requires some development on icon coverage and user interface to become a fully functional AZVD environment. A demonstration video is available online[4], including a final synthesis step but only providing a limited set of graphics.

With an editor, the natural next step is to engage signers of different profiles, whether VD users or not, in an iterative process for developing the script, to evolve it, for example by integrating new desired layouts, abandoning unnecessary variants, etc. This will have to be accompanied by workshops, and a form of assistance with graphics proposal, e.g., incorporating a community-wide upload and up-/downvoting system.

7. Further Script Design and Writing Prospects

While not designed as a writing system, AZVD is usable to render signed output through avatars from editable and lightweight graphics. It therefore allows to encode language productions in a standard 2D format and determines an LSF production for every such encoding, i.e., it is both

4. https://zenodo.org/records/10890951

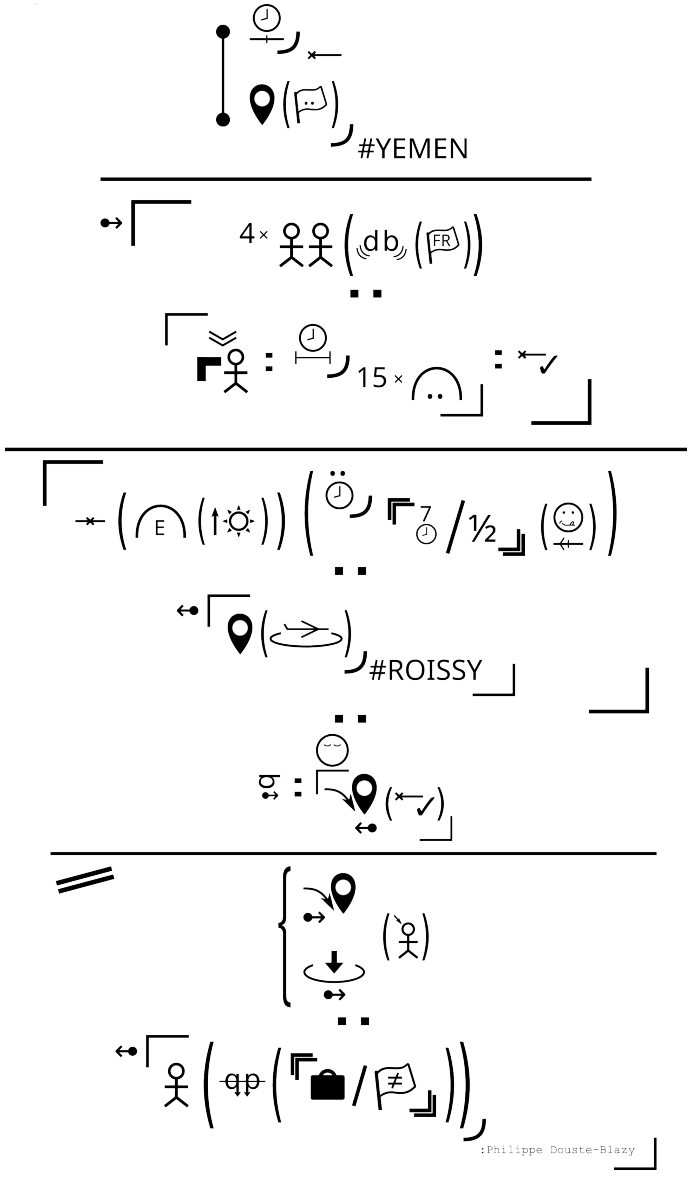


FIG. 13. AZVD for complete news item "2B-JP" of the *40 brèves*

scriptable and readable. To an extent, this already makes it a possible proxy for writing LSF, and we wish to explore this opportunity.

As early as the first mention of a VD–AZee bridge (Filhol, 2020a), we discussed some of the properties that such a script would exhibit. We suggested a strong logo-/phonographic imbalance towards logography, discussed iconicity of the symbols… In the context of using AZVD as a substitute for writing, this section proposes to explore two aspects of it that likely contrast with properties of familiar language scripts, and mentions the potential avenues of evolution towards shaping into an even more appropriate system for this task.

7.1. Serialisation

In the early work cited above, we highlighted that the planar and recursive nature was radically distinct from the linearity of general writing systems, but similar to the mathematical script so not entirely outside of the realm of scripting. Also, this composition is frequent in VD, so it does not inherently impede the adoptability of the script.

But as the discourse grows, the AZVD diagram representing it is bound to extend over an arbitrarily large surface by recursively nesting the layouts that make it up. Scripting long discourses therefore presents a practical problem. Given the necessary limits posed by any supporting medium (screen or paper), some serialisation is required.

An interesting example of application for the script, well suited to address this issue, is video subtitling. Written subtitles break the text into units of limited duration, and their display time is determined by the real time of the corresponding video content. Similarly, a large AZVD instance could be broken into smaller units, each displayed separately in sequence, in an order imposed by the video.

After initial tests inspired by pauses between units of traditional written subtitles, our conjecture is that a most natural segmentation falls within the time interval separating the *context* and *process* of an in-context rule. Applied to figure 13, this would break the diagram at the horizontal bars into four smaller pieces, say A through D from the top down. A side effect is that we also lose the information on the hierarchy between them, namely the original $((A,B),(C,D))$ structure, as opposed to $((A,(B,C)),D)$ for example.

The question is whether it is acceptable to loose this information on the original discourse structure. A favourable case could be made here since the form of in-context is almost just about concatenating with a given separation time, thus the resulting forms are close enough regardless of the nesting structure, and the meaning seems mostly possible to infer from the context.

That said, it is possible that some applications of in-context will not lend themselves to splitting their content into two successive diagrams, for example when they are nested in certain rules that require a simultaneous view of their arguments. It also raises the converse question of whether the chunks after splitting are always of acceptable size as units of our sequence, or if they may require breaking down further.

More research is needed to answer those questions, but the prospect of linearizing the script to make it usable on long discourses while remaining readable and interpretable is very motivating. In a long term, striking this balance can bring a serialised AZVD quite close to a candidate writing system for LSF.

7.2. From Surjection to Injection

In this work, we built AZVD as a surjective function to ensure no loss in the coverage offered by AZee expressions. That said, it is entirely possible that this set is oversized, and that not all theoretically possible AZee expressions are necessary to cover LSF. Research on the constraints that apply to AZee expressions, and on the definition of formal grammars for LSF based on those constraints, is currently under way.

But unless we want to hypothesise LSF might escape any kind of grammatical constraint, it must be considered likely that certain AZee expressions are unacceptable. For example, certain rules might never apply outside of specific expression patterns. In such cases, it could be justified to leave the unattested AZee combinations without a possible graphical antecedent, in other words abandon the surjective property of AZVD (onto AZee), which was initially set as a methodological goal.

Conversely, we can note that the function was not constructed to be an injection, i.e., there can be more than one antecedent for some given results. Indeed, variants may have the same output AZee expression, and complex templates can be expanded into the the layouts of the rules they are defined with, producing the same result. This means that several graphical antecedents in AZVD can have the same AZee output, and therefore ultimately produce the same signed form.

In the long run though, we may question the concurring existence of multiple options to represent the same reading, and ask whether it would on the contrary be preferable to constrain, even standardise the choices of antecedents. If never more than one way of writing a given output is allowed, we will have turned our defining function into an injection, which we did not impose from the start.

Parallels can be drawn with existing scripts, such as orthographic variants that are at the writer's discretion and have no impact on the reading or meaning. For example in French: *clé*/*clef* (key), *cuillère*/*cuiller* (spoon)… yet this is a rather rare phenomenon. We could also mention

typographic variants (a/ɑ, g/ɡ…), case variations (uppercase/lowercase) for letters… Some choices are constrained by grammar, others are aesthetic, whether set for the whole text or free to change. To what extent can we recognise those notions and properties in a script like AZVD, and will the community push towards the same level of normalisation?

8. Conclusion

We have presented the grounds and purpose of AZVD, a graphical system to encode a SL discourse, initially for software editing of signed content. The approach aims to ensure language coverage, make the system fully readable, even synthesisable, and maximise its adoptability, notably by reflecting the regularities observed in spontaneous diagramming practices (VD). As a 2D scriptable and readable representation, we suggested it could be used as a proxy for writing, given the lack of a prior adopted system. We also suggested future work evolutions to pursue: organise community engagement to incorporate their consensus, and work towards two major features generally expected from adopted writing systems and still absent from AZVD, namely serialisation and normalisation. We do hope to open the exciting prospect of AZVD reuse by users, pencil in hand outside the editor's framework and the only goal of synthesising 3D animation content. And then again, the ways in which they will deviate from the specifications will provide new insights to evolve ever more towards an easily adoptable script.

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