A sneak preview of Flexicon's morpho-encabulator

By Stig Stevenson & Rance Rasmusen, Flexicon Corporation

The following article is a transcript of a keynote address presented at the Festschrift symposium on Languages and Linguistics for Jane Simpson on 30th June 2022.

1 Introduction by the chair, Prof Carmel O'Shannessy

As CEO of the tech-giant *Flexicon*, Stig Stevenson really needs no introduction. Flexicon is of course the world's leading producer of Augmentative and Alternative Communications devices.

What is perhaps less well known about Stig Stevenson is that for a very short time he was enrolled as a PhD candidate at the University of Sydney, studying with Jane Simpson. I believe the project was to produce a morpholoptic encabulator[1] for Warlpiri, using LFG as the underlying architecture. Alas Stig's candidature was terminated before confirmation. Fortunately, he quickly found employment at Appen where he rose through the ranks, becoming a major shareholder, securing a seat on their board of directors. In 2005, he broke ranks with Appen. From there he commenced his own start up, Flexicon, which has now grown to be one of the largest tech companies in Silicon Valley. So we're very excited to have Stig zoom in to present to us today, particularly as its very late at night in California at moment. So without further ado let's hear from Stig Stevenson with his '*Sneak preview of Flexicon's morpho-encabulator*'.

2 Stig Stevenson's address

Thank you Carmel for the introduction. Firstly, I'd like to say how thrilled I was to be asked to speak on this most auspicious occasion. Professor Simpson – Jane – if I may, it's so wonderful to see you, and David, and so many familiar faces here today. Congratulations on a stellar career. I hope you will forgive me for having my candidature terminated so prematurely. I would also like to acknowledge Jane and so many of the linguists here in the room. Many of your students have gone on to have illustrious careers here at Flexicon, and at other tech companies here in Silicon Valley. Linguistics is of course our bread and butter and we're always keen to provide opportunities for high quality graduates. In fact, we have Fred Finkelstein and Rance Rasmusen working for us, both of whom used to be in the Transient Building at the University of Sydney. Fred is on our board of directors while Rance heads up the testing laboratories. We'll be hearing from Rance rather shortly.

Have you ever felt that you've wanted to say something but the words you are after just aren't there? Sometimes the item is at the tip-of-your-tongue but you just can't retrieve it. Alternatively, you might be trying to write something but even visiting a thesaurus doesn't help you fill the lexical gap you seem to have encountered. Here at Flexicon we're developing technical solutions that should help to ensure that lexical deficits are a thing of the past.

[1] For more information on encabulators see Newits (2022) and Quick (1944).

For some time now work has been proceeding on bringing to perfection the crudely conceived idea of a morpholoptic parser that would not only provide a lexical override function for use in meromorphic stem detractors, but would also be capable of automatically syncretising multiexponent penambulators. Such an instrument is Flexicon's morpho-encabulator.

Basically the only new principle involved is that instead of optimal morphomic density being derived from the syntagmatic and paradigmatic properties of the lexico-syntax, it is generated by the modial interaction of morphosylapsis and phonastic diflaction.

The initial prototype (see Figure 1) had a base plate of pre-ungulated flexitate encased within a specious logarithmic housing in such a way that the two Simpson bearings were in a direct line with the velocimetric core. The latter consisted simply of six duplimetric farzletops, so fitted to the ambicrecial morphlactic input processor, such that spline gurgling was effectively eliminated. The main processor was of the regular i-core-alpha type placed in panconflactic demi-clovoid slots gouged into baseplate of the encabulator housing – every seventh inducer being connected by a non-reversible tremie pipe to the heat-sink. Because the differential girdle spring fleens at around 25000 RPM, heat-sinking is managed by hydrocoptic fans fitted onto the 'up' end of each penambulator.

Figure 1: Flexicon's initial prototype for the morpho-encabulator

The morpho-encabulator has now reached a high level of development, and it is being successfully used in the operation of paraflinions. Moreover, whenever lexifaction is required, it may also be employed in conjunction with a glowned reciprocation dingle-arm, so as to reduce sinusoidal defrimulation.

OK, so I realise that I am mostly addressing a roomful of linguists, and that you might not be convinced by all the big words, or perhaps you are generally underwhelmed by all the technological bells and whistles. So for the next part of the presentation, I'm going to ground these developments within advances in morphological theory.

Until recently developmental progressions in morphoencabulation have been largely hamstrung by a dogged over-reliance on antiquated notions like the morpheme. As you will all know, morpheme-based accounts of derivation rest on idealised 1:1 form-meaning

mappings, which are have difficulty accounting for stem alternations, zero morphs, empty morphs and cumulative exponence, all of which pose problems for item-and-arrangement models of derivation. For example, consider the following data in (1).

(1)

verb	**adj**	**adj**
forget	forgettable	unforgettable
imagine	imaginable	unimaginable
flap	?flappable	unflappable

A morphemic based approach would struggle to explain why *unflappable* is a reasonable word, while *flappable* sounds so odd. Furthermore, historical evidence suggests the adjective *unflappable* can't possibly have been built up by the addition of derivational morphemes, one after the other. With the meaning 'Not subject to nervous excitement or anxiety; imperturbable' the OED suggests *unflappable* first appeared in 1958 with reference to British prime minister Harold Macmillan, yet *flappable* does not appear in the OED and Wiktionary lists it as a backformation from *unflappable*. Exceeding rare earlier attestations of *flappable* relate to mechanisms for the flapping of wings. The sense '*A state of worry, agitation, fuss, or excitement*, from which *unflappable* derives is a noun, and should not therefore provide a suitable base for the deverbaliser *-able*. While *unflappable* is clearly derived from *flap*, somehow, the route from *flap* to *unflappable* evidently did not transpire by the addition of a morpheme *un-* to the base *flappable*, and nor was *flappable* derived by the addition of a deverbal morpheme *-able* from the noun *flap*.

These sorts of issues are less of a problem in word-and-paradigm approaches to morphology as they less closely wedded to matching morphs to meanings. The theoretical underpinnings for the *morpho-encabulator* lie in an offshoot of construction grammar known as Construction Morphology, particularly the variety proposed by Gert Booij (Booij 2012; Booij 2013).

In Construction Morphology we would have the two word-schema templates in (2) and (3), which can then be conflated giving a unified complex word schema, as shown in (4).

(2) $[\text{V-able}]_{A}$ 'able to be Ved'

(3) $[\text{un-A}]_{A}$ 'not A'

(4) $[\text{un-A}]_{A} + [\text{V-able}]_{A} = [\text{un}[\text{V-able}]_{A}]_{A}$

So far so good. But what Booij proposes that these unified word schemas needn't take only bonafide lexical entries as input. They can also be built up from possible words. If 'possible words' are permitted as intermediate steps then *unflappable* needn't rest on the existence of *flappable* as an actual word – as long as serves as a 'possible' word.

Booij (2007: 38) gives various examples from Dutch in which the negated *on*-adjectives in the third columns of Tables (5) and (7) are clearly derived from verbs in the left hand columns, yet some of the deverbal adjectives ending in *-baar* and *-elijk* (in the middle columns) are really only possible words.

(5)

verb	**deverbal adjective**	***on*-adjective**
bedwing 'suppress'	*bedwing-baar* 'suppressable'	*on-bedwing-baar* 'unsuppressable'
bestel 'deliver'	*bestel-baar* 'deliverable'	*on-bestel-baar* 'undeliverable'
blus 'extinguish'	*blus-baar* 'extinguishable'	*on-blus-baar* 'unextinguishable'
verwoest 'destroy'	*verwoest-baar* 'destroyable'	*on-verwoest-baar* 'undestroyable'

(6) $[\text{on-A}]_A + [\text{V-baar}]_A = [\text{on}[[\text{V-baar}]_A]_A$

(7)

verb	**deverbal adjective**	**on-adjective**
beschrijf 'describe'	*beschrijf-elijk* 'describable'	*on-beschrijf-elijk* 'undescribable'
herroep 'revoke'	*herroepp-elijk* 'revocable'	*on-herroep-elijk* 'irrevocable'
meet 'measure'	*met-elijk* 'measurable'	*on-met-elijk* 'immeasurable'

(8) $[\text{on-A}]_A + [\text{V-elijk}]_A = [\text{on}[[\text{V-elijk}]_A]_A$

If we can unify simple word schemas (as exemplified by those on the right sides of examples (6) and (8)), and if we can allow complex possible words as intermediate steps, then morphologically complexity needn't be built up cumulatively from components that are meaningful all the way along the line.

So if we wish to derive *encapsulate* from *capsule*, we can do this through the unification of two simple schemas on the left side of example (9), which will then produce the complex schema on the right hand side.

(9) $[\text{en-V}]_V + [\text{X-ate}]_V = [\text{en}[\text{X-ate}]_V]_V$

Note this doesn't require *capsulate* be an actual word, only a possible word. If we can do this, we can use the same schema for *encabulate*. This will give us *encabulate* via *cabulate,* from *cabula*. From there, the orthodox nominal derivations in (10) and (11), can be unified so as to give the complex construction in (12).

(10) $[\text{X-ate}]_V \leftrightarrow [\text{X-ator}]_N$

'*X*' 'one who *x*es', 'Instrument for *x*ing'

(11) $[\text{X}]_N \leftrightarrow [\text{morphoX}]_N$

'*X*' '*x* is concerned with *form*'

(12) $[\text{morpho}[[\text{en}[\text{X-ate}]_V]_V \text{ or}]_N]_N$

Thus, *morpho-encabulator* is built up through unified word-schemas from the root *cabula.* You might be asking whether *cabula* is a bonafide root. The point is it doesn't need to be. These word schemas seem to be able accept a variety of possible roots. Here at Flexicon we've subjected these schemas to a barrage of testing, from a large variety of languages with

a range of different typological profiles. As well as genuine bonafide roots, unified word schemas will also accept quasi-roots, faux-roots, and even dud-roots. But as well as the root-and-stem technology, these word-schemas also account for other types of liminal morphology such as affixoids, as well as types of morphosyntactic phenomena. Thus, at Flexicon we've instigated extensive field-tests on Wackernagel's demi-clitics, and the results have been most encouraging.

Well now that you understand the theoretical principles underpinning the morpho-encabulator's development, we'll now pass you on to our lead technician, Rance Rasmusen, who will demonstrate its functionality.

3 Functionality, calibration and operation – by Rance Rasmusen

Thanks Stig, and hello Professor Simpson. Congratulations on your retirement. I'm glad to be able to join you, even if only rather briefly. Well now that you know a bit about how the Morpho-encabulator works, let's take a look at its functionality, calibration and operation.

For the purpose of obscurity we have removed the casing and exposed the heart of the morphencabulator, the morphosylaptic modial interactor (see Figure 2). Both morphosylapsis and phonastic diflaction are calibrated with controlling software we call the SEQR engine [Schematic Expansion of Quantised Roots]. SEQR basically takes a bi-pronged approach that draws on the flexibility of macroflastic plastonancy and the rigidity of schematographic doculexy.

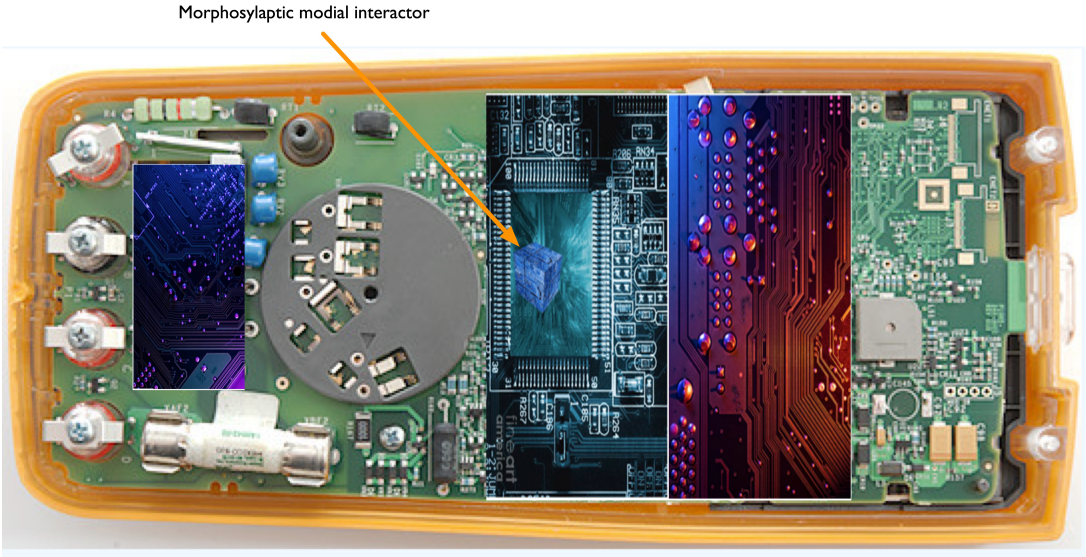

Figure 2 The heart of the morphoencabulator

You can see on the base of the unit there are range of inputs including HDMI, USB3, an SD card slot, and it also has Bluetooth connectivity which allow you to connect with a range of visualisers including these augmented reality smart-glasses.

Begin the calibration by selecting *language*, *genre type*, *schematic output limiter*, *phonotactic displacement*, and *morpho-encabulator run-test*. Connect the lexometric sensors to the aft-end of the moxy-interuptor, using special adaptor NFW, making sure that the osmolality of the multiexponent penambulators is not extrapolated. Run-test outputs will be

displayed in secret code on the morpho-encabulator display, or whichever display you have interfaced with. It's a simple head-code, anyone can catch it.

Use the geiger-scale on the encabulator display to measure the rench and output of the phonastic diflaction flux-muster. If it is above 10 syllabifications per lexeme reset the penamubulators to increase the phonotactic displacement. If it's less that 10 syllabifications per lexeme then phonastic diflaction should be within the specified tolerance limits for high quality morpholoptic parsing.

Be sure to watch out for sigmoid rumbling below the beltline, which the user might experience as a burping or a hiccupping noise. It's relatively harmless but it can induce mild discomfort for the user. To service this fault, refer to the Morpho-encabulator Diagnostic Procedures Manual. Perform test ME10 and recalibrate according to the described troubleshooting procedure.

4 Recent tests and future development – by Stig Stevenson

Thank you Rance.

Well there you have it, at least the story so far. We're in advanced stages of stages of testing – in a range of languages including Georgian, Straits Salish and West Greenlandic. And the feedback we've received from the speakers of these languages has been most enthusiastic. From what you have seen the geigerscale allows us to constrain schematic expansion to whatever limit is appropriate for the language and genre type. If the SEQR engine were to operate without such constraints the risk would be unbridled jargomancy. Basically, it helps us to eliminate cranberrilic morpholopers.

It's a bright future for the morphoencubulator. Perhaps the most exciting application of this technology is that the lexical override function, as applied to merophorphic stem detractors, helps combat anomia, which is a symptom experienced by patients with certain forms of aphasia and various neurogenerative diseases like dementia. Randomised trials are underway of our new lexometric implant technology that allows the morpho-encabulator to interface directly with left inferior frontal gyrus, as well as those portions of the temporal and parietal lobes that mediate lexical access.

References

Booij, Geert. 2007. Construction morphology and the lexicon. In *Selected proceedings of the 5th Décembrettes: Morphology in Toulouse*, 34–44.

Booij, Geert. 2012. *The Grammar of Words: An Introduction to Linguistic Morphology*. Third edition. Oxford: Oxford University Press.

Booij, Geert. 2013. Morphology in Construction Grammar. In Thomas Hoffmann & Graeme Trousdale (eds.), *The Oxford Handbook of Construction Grammar*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780195396683.013.0014.

Newitz, Annalee. 2022. Return of the encabulator. *New Scientist* 254(3392). 28. https://doi.org/10.1016/S0262-4079(22)01122-8.

Quick, John Hellins. 1944. The turbo-encabulator in industry. *Students' Quarterly Journal* 15(58). 22.