

<sup>2</sup><http://www.livones.net/>

For the practical matter of installing the keyboard on a computer, we ran into an interesting problem that many endangered languages are bound to face. While MacOS accepted the keyboard to be installed under the Livonian language, Windows forced us to have our keyboard install itself as a Latvian keyboard. This is because Microsoft maintains their own list of numerical language codes<sup>3</sup>. This list does not recognize Livonian at all as a language.

### 3 Layout for phones

For Android and iOS (see Figure 2), we included the special characters under their unaccented counterparts. In some languages, such as Finnish, the accented letters appear as their own dedicated keys (*ä*, *ö* and *å*). However, this is not a practical solution for Livonian because the layout has altogether 28 different accented characters. What increases the number of characters in Livonian is the orthographic decision of marking long vowels with a macron (*ē* vs. *e*). As all vowels in Livonian can be made long, this means that macron can be added to all vowels, even the ones that already have an accent (*ō* vs *õ*).

tierōdadrōt				tierābi			tierāviļa		
q	w	e	r	t	y	u	i	o	p
a	s	d	f	g	h	j	k	l	
↩	z	x	c	v	b	n	m	↩	
123	🌐	vait	,	.	↩				

Figure 2: The keyboard on phones

As opposed to the computer layouts, the mobile keyboards need to be able to predict text. Currently, we use the Livonian words from the Finnish-Livonian dictionary<sup>4</sup> to predict text. This is not an optimal solution as we can only recommend lemmas as opposed to inflectional forms. However, inflectional forms are problematic from the point of view of normativity. Even if we had access to data with inflections, not all inflectional forms have been studied well enough to derive a normative recommendation for them despite of the relatively extensive linguistic research on Livonian (cf. (Tuisk and Pajusalu, 2018)). Naturally, there are several dialectal ways of inflecting words, but the normative forms are yet to be established by the Livonian Institute.

Recommending forms that are dialectal or erroneous can be harmful for the language in the long run (cf. (Zeps, 1974)). This is a serious problem because a great part of the Livonian speaking community is not fluent in the language in the L1 level. This means that using a corpus-driven approach to derive the recommendations might result in non-normative or "bad" Livonian (cf. (Hämäläinen, 2021)).

### 4 Conclusions and future work

In this paper, we have described our practical work in building the most essential tool for any language in the modern era, namely a keyboard. We have described some of the challenges that are hindering the development such as the lack of recognition of Livonian by large companies and the reliability of any existing corpora as being representative of "good" or normative Livonian. Also, the language is under a process of getting normative forms, which means that currently it is not always clear what should be considered "good" and "bad" Livonian.

Our immediate future direction is to develop spell checkers in close collaboration with the language community. Although, it is to be remembered that the spell checkers can only recommend corrections for the forms that have already been established in the normative language. There is an extensive work on rule-based morphology for Livonian that has been conducted in the past (Rueter, 2014). We plan to build the spell checking using this resource as a starting point.

<sup>3</sup>[https://docs.microsoft.com/en-us/openspecs/windows\\_protocols/ms-lcid/70feba9f-294e-491e-b6eb-56532684c37f](https://docs.microsoft.com/en-us/openspecs/windows_protocols/ms-lcid/70feba9f-294e-491e-b6eb-56532684c37f)

<sup>4</sup><https://gtsvn.uit.no/langtech/trunk/words/dicts/finliv/>

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