

# Kymography with PATKIT

A short introduction to kymography and a  
promissory note

Pertti Palo

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## Land acknowledgement

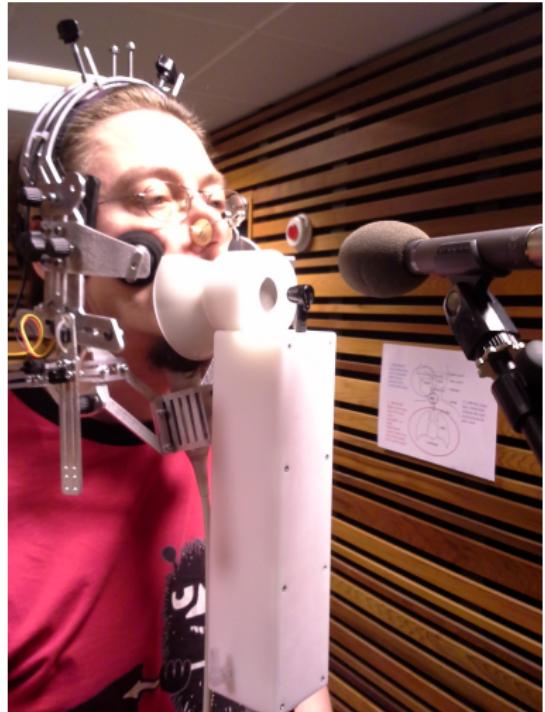
I would like to respectfully acknowledge that I am today on Treaty 6 territory in the land now called Canada. My employer – University of Alberta – is located on land that are traditional homes and gathering places for diverse Indigenous peoples including the Cree, Blackfoot, Métis, Nakota Sioux, Iroquois, Dene, Ojibway/ Saulteaux/Anishinaabe, Inuit, and many others.

I am a fairly recent uninvited guest in these lands and I have only started learning about the histories, languages, and cultures of the local peoples and of their historical and continued contribution to our community and how to build a better future for all of us.

# Outline

- ▶ Land acknowledgement
- ▶ We are here
- ▶ Who am I?
- ▶ What is kymography?
- ▶ Why kymography?
- ▶ What do we need for kymography?
- ▶ What is stroboscopy?
- ▶ What is PATKIT?
- ▶ The promissory note
- ▶ MaTiPSS

# Who is this Pertti Palo?

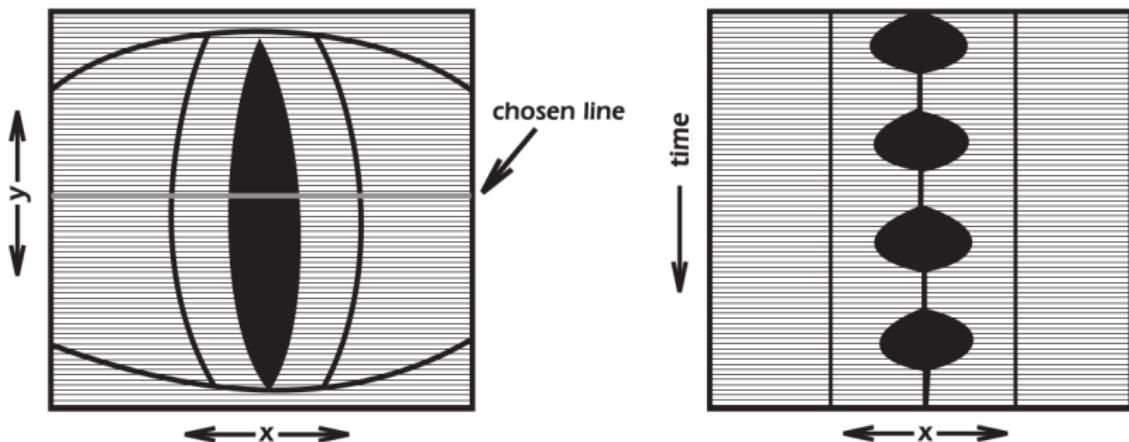


- ▶ I have a couple of degrees in engineering and a PhD in Phonetics.
- ▶ I think of myself as a methods guy and a phonetician.
- ▶ My life also extends to folk music, folk dancing, oral storytelling, wandering (hiking and long distance skiing), role-playing games, crafts (knitting, terrain crafting), and other things.

# What is kymography?

- ▶ Kymography – in general – is a way of presenting motion or vibration as a 2D graph.
- ▶ Historically this has included such things as waveform traces.
- ▶ More specifically in the context of laryngoscopy we usually mean videokymography which is a technique developed by Švec and Schutte (1996).
  - ▶ Essentially it uses a special camera to capture a line or slice of the full view of the camera at an extremely high sample speed and display the result as a two-dimensional image where one axis is time.
- ▶ Kymography can also refer to any such graph produced from an image sequence.

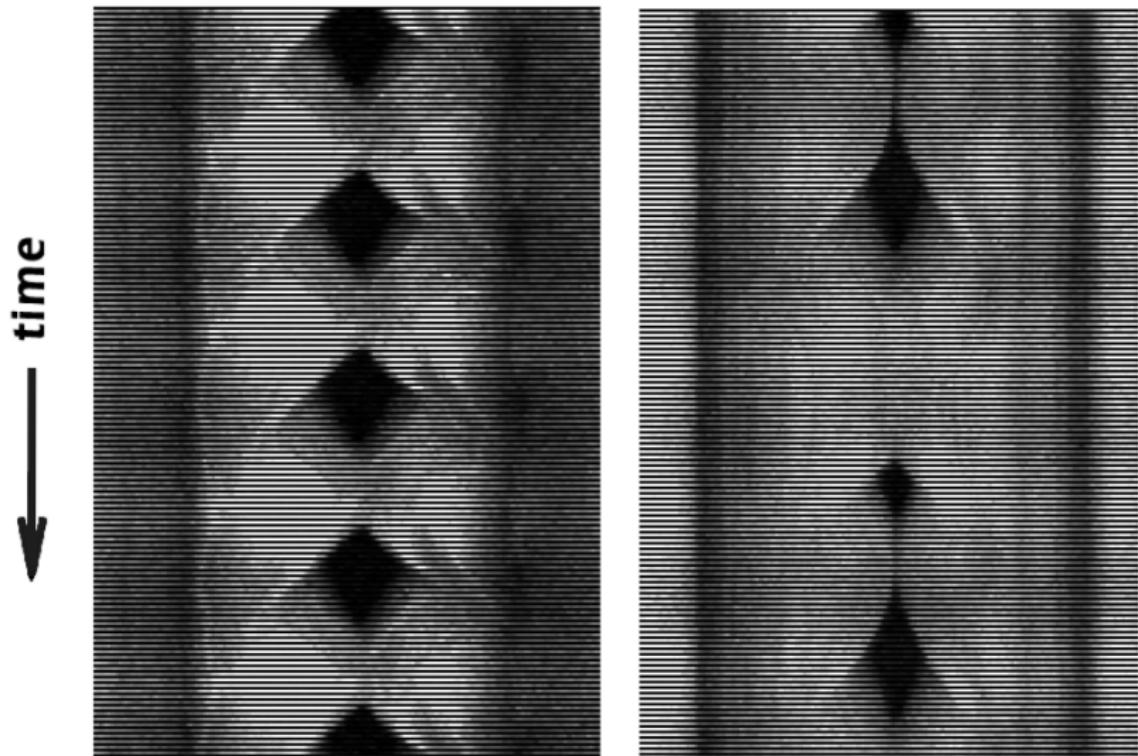
## What is kymography? II



**FIG. 1.** The two modes of the video system. On the left is the normal mode used for visualization of the vocal folds. The whole image recorded by the camera is composed of horizontal lines. In the high-speed line-imaging mode, the system makes it possible to select a single line registering the movements of the vocal folds. The resulting line-imaging view is on the right. The vertical axis now displays time.

Image and caption from Švec and Schutte (1996).

# What is kymography? III



Images from Švec and Schutte (1996).

## Why kymography?

- ▶ If a full frame high speed camera is not available, sampling one line at great speeds can be the solution.
- ▶ Even if a full frame high speed camera is available, kymography can provide a handy way of simplifying analysis.

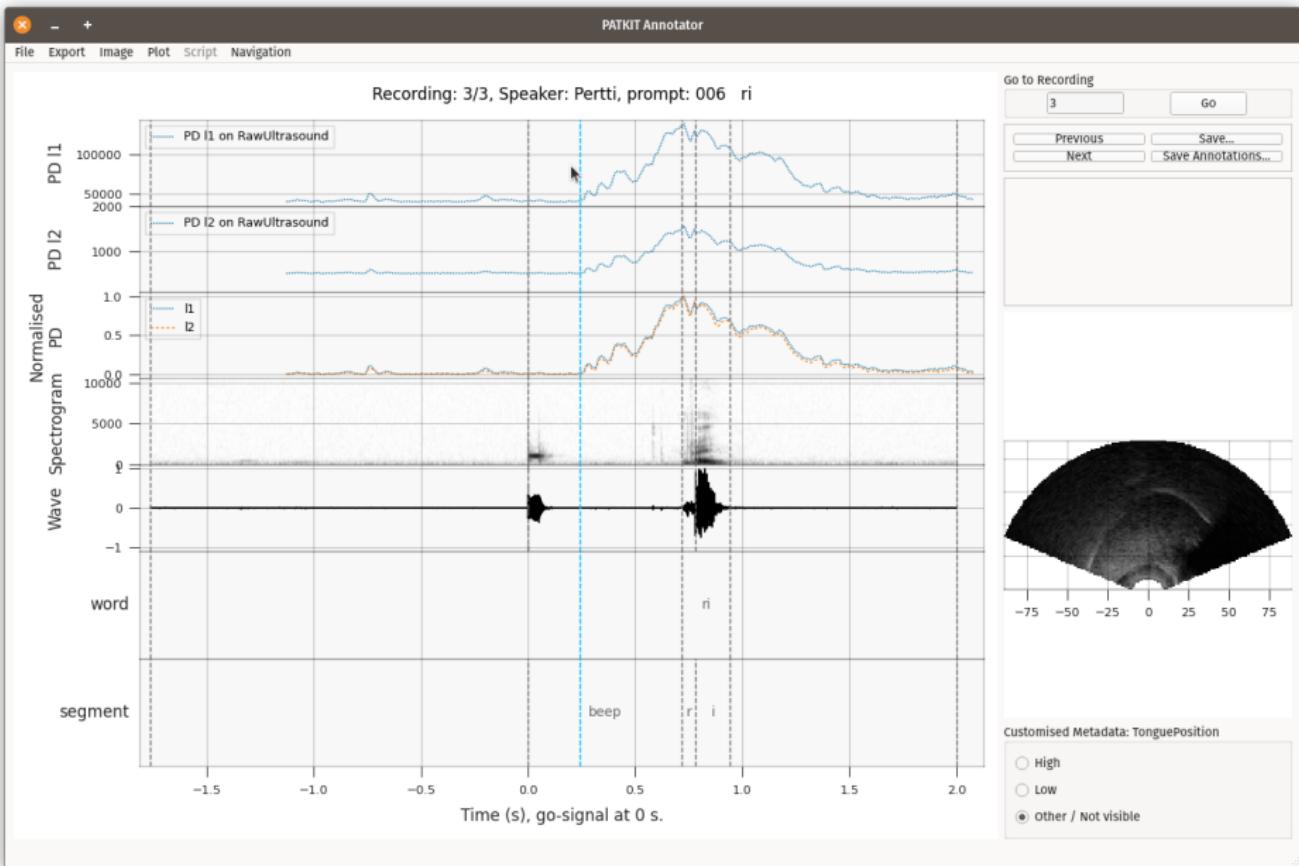
# What do we need for kymography?

- ▶ Ideally, high speed – original was 8000 lines/second – footage of what ever we are studying.
- ▶ Failing that, just video data of what we are studying.
- ▶ This can be regular video data.
- ▶ For periodic and near periodic phenomena video stroboscopy can also be an option.

# What is stroboscopy?

- ▶ Let's have a look at a video  
<https://www.youtube.com/watch?v=g4JBeKvFhz8>  
(WeillCornell Sean Parker Institute for the Voice 2016).
- ▶ Stroboscopy does not work well if e.g. the vocal fold vibration is aperiodic, and gives potentially confusing results if the strobe frequency and vibration frequency are not matched well.

# What is PATKIT?



## The promissory note

- ▶ PATKIT (Palo et al. 2025) **will** in the near future include at least a rudimentary kymograph on arbitrary video data.
- ▶ Concept design and likely tools got selected, if I'd had another half day to work on this it would most likely be done.
- ▶ The caveat is that PATKIT does not magically transform low frame rate or stroboscopic data to high frame rate line scanning data.

## Methods and Techniques in Phonetics of Signing and Speech

- ▶ Conference concentrating on methodology of signing and speech (with broad definitions).
- ▶ 17-18 October 2025
- ▶ University of Alberta, Edmonton, Canada
- ▶ Call for Abstracts will be published soon on Fonetiks newsletter and LinguistList.
- ▶ Ask me for more info.

# Thank you!

For historical reference, as an example of how details matter, and because of the wacky title: Kwan (2016)

## References

- Kwan, A. M. (2016). "Do not kill guinea pig before setting up apparatus": The kymograph's lost educational context. *Teorie vědy / Theory of Science*, 38(3):301–335.
- Palo, P., Moisik, S. R., and Faytak, M. (2025). PATKIT: Phonetic Analysis ToolKIT [Python software package]. Available in a public software repository, accessed 8 February 2025. <https://github.com/giuthas/patkit>.
- Švec, J. G. and Schutte, H. K. (1996). Videokymography: High-speed line scanning of vocal fold vibration. *Journal of Voice*, 10(2):201–205.
- WeillCornell Sean Parker Institute for the Voice (2016). Normal Phonation.