Automatic Measurement of Vocal Fold Features in Videokymographic Images

Jiří Sedlář *ÚTIA, MFF*

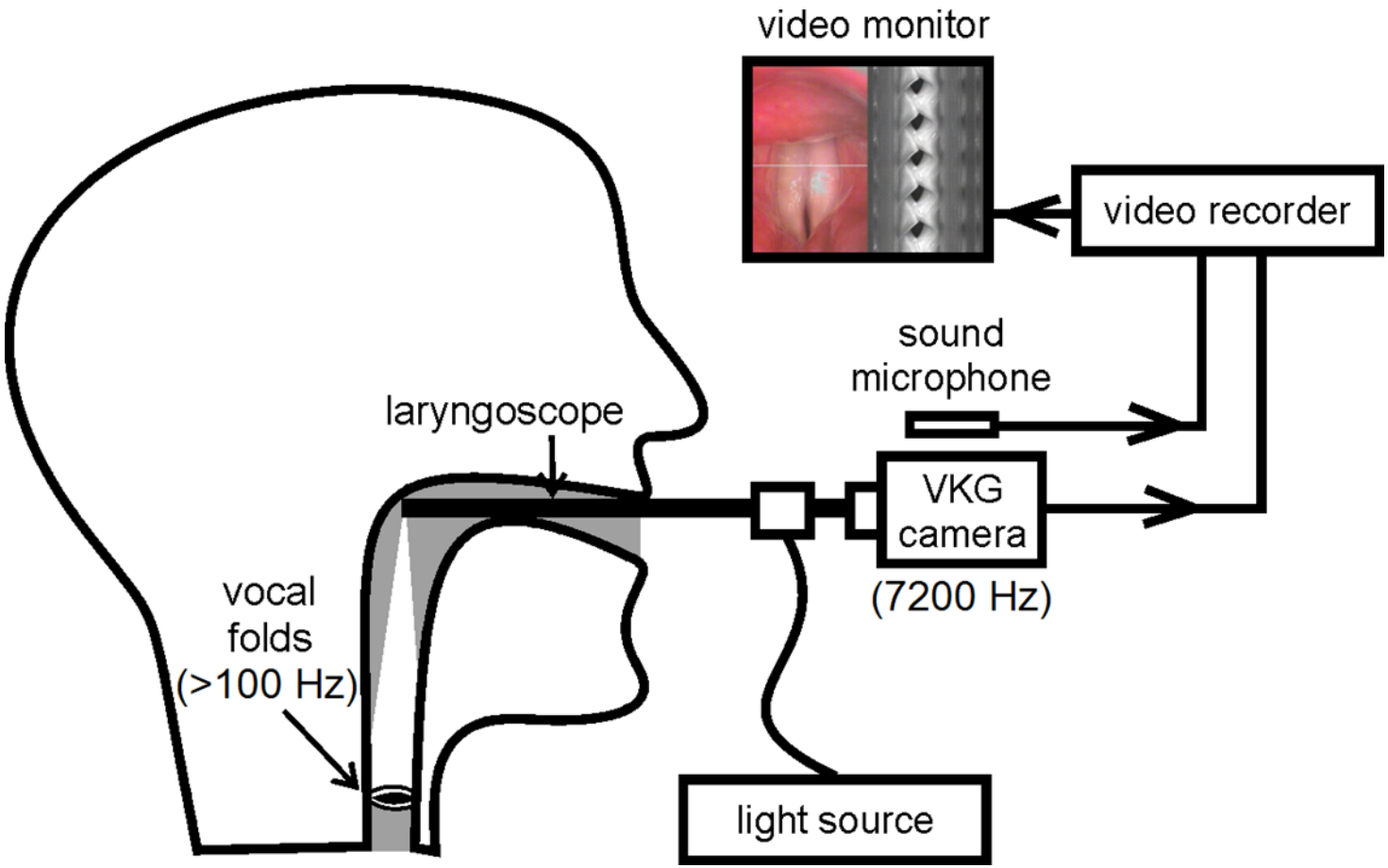
Jan G. Švec *UP* **Barbara Zitová** *ÚTIA*

Jan Flusser *ÚTIA* **Adam Novozámský** *ÚTIA*

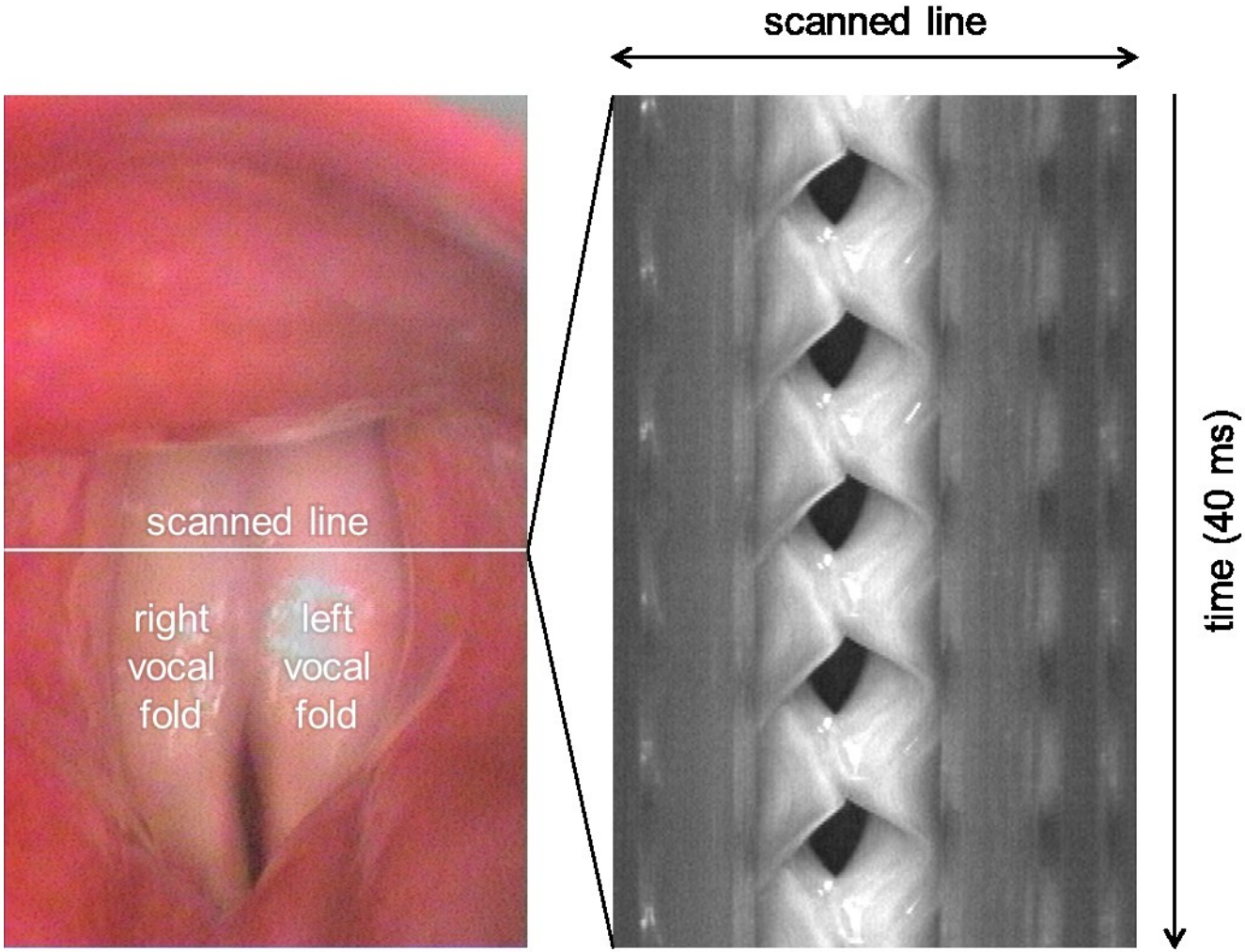
David Hauzar *MFF* **Aleš Zita** *MFF*

ÚTIA: Institute of Information Theory and Automation, Academy of Sciences of the Czech Republic, Prague
MFF: Faculty of Mathematics and Physics, Charles University, Prague
UP: Department of Biophysics, Faculty of Science, Palacký University, Olomouc

laryngoscopic examination



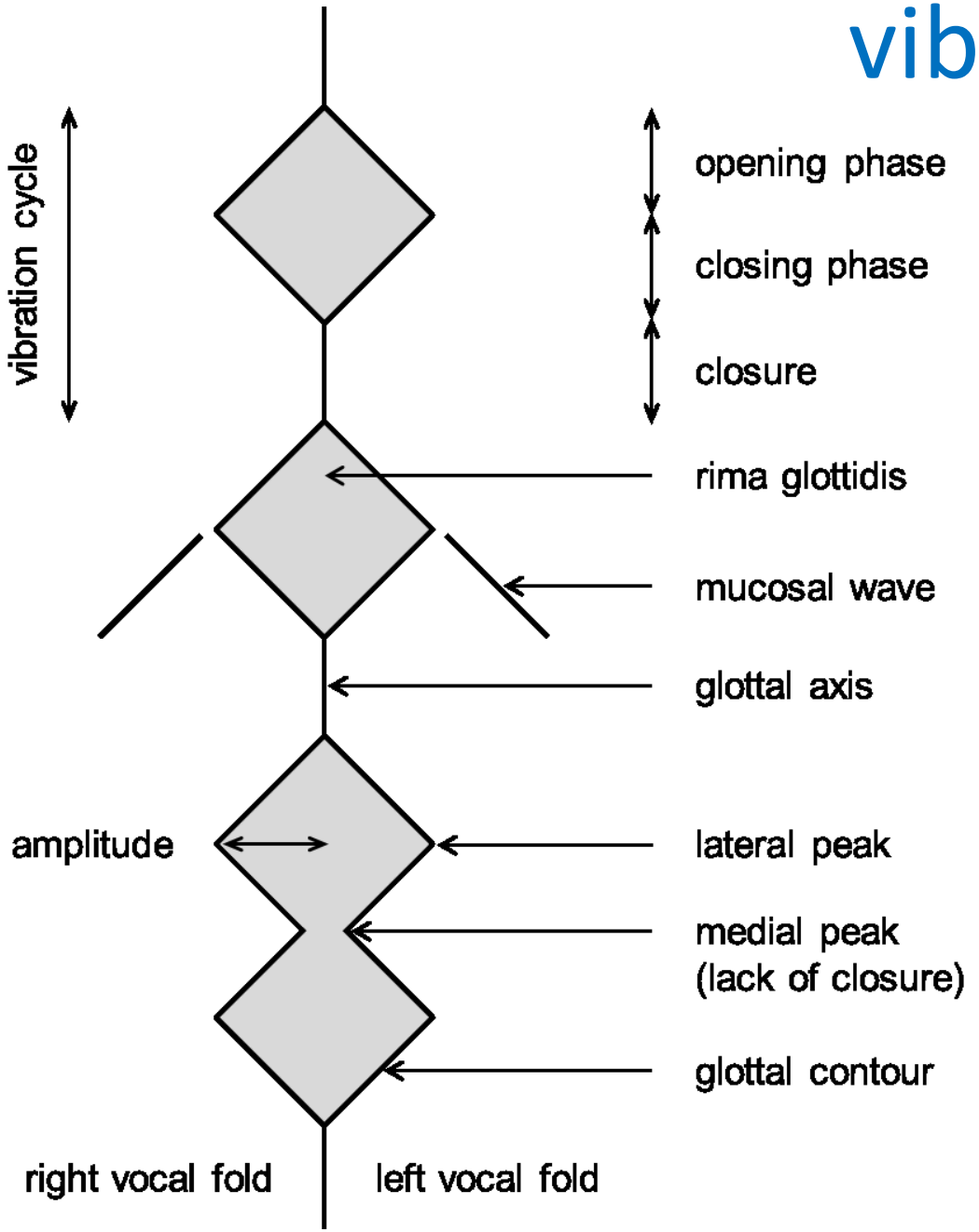
videokymographic image



vocal folds

videokymogram

vibration features



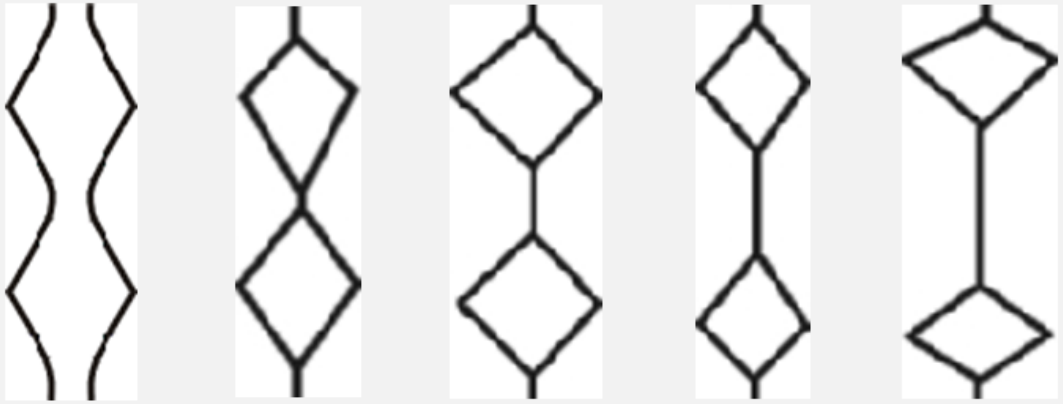
evaluation sheet

VKG Evaluation Sheet: Closure

Specify the measured value or select category below

CQ = closure / cycle duration

Duration of closure



no closure	1-20%	20-40%	40-60%	>60%	NA
○	○	○	○	○	○

evaluation sheet

Open shape: skewing

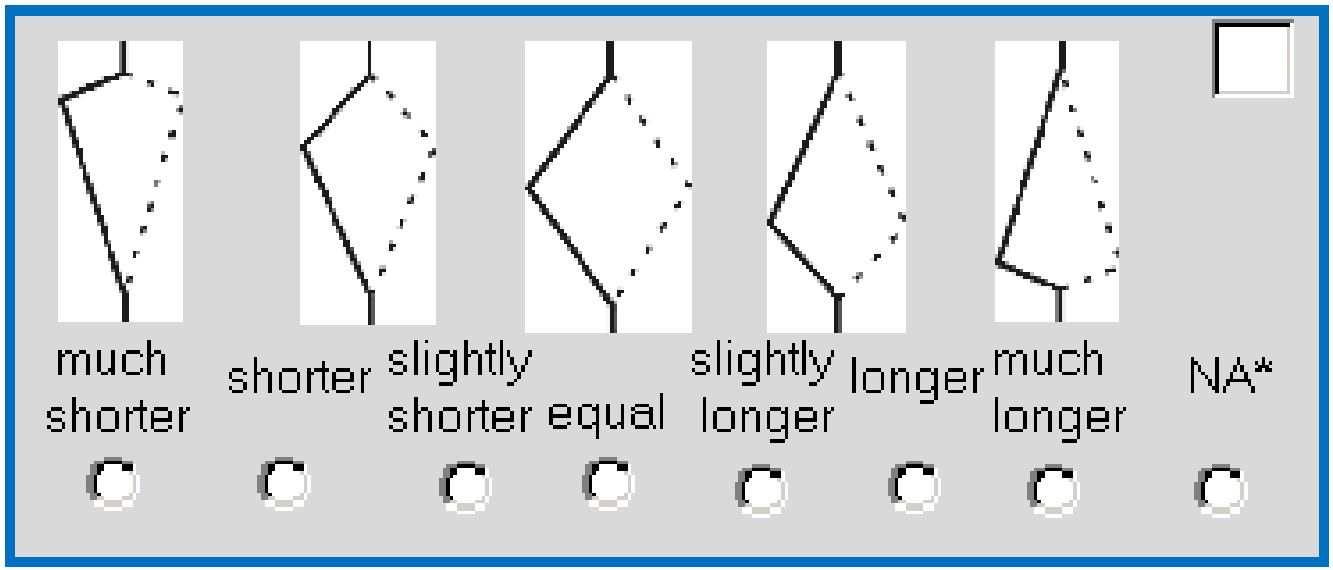
SQ= opening/ closing duration. Apllies to glottal contour.

R

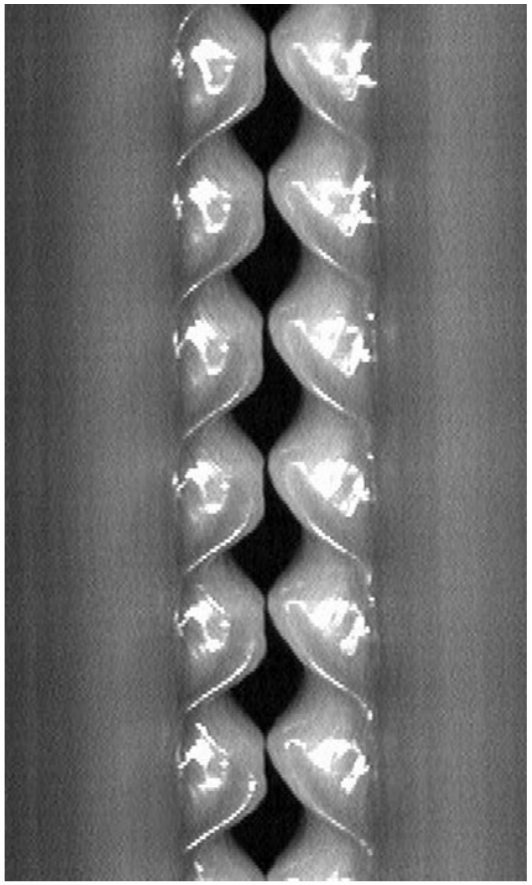
Specify the measured value SQ

Or select a category below

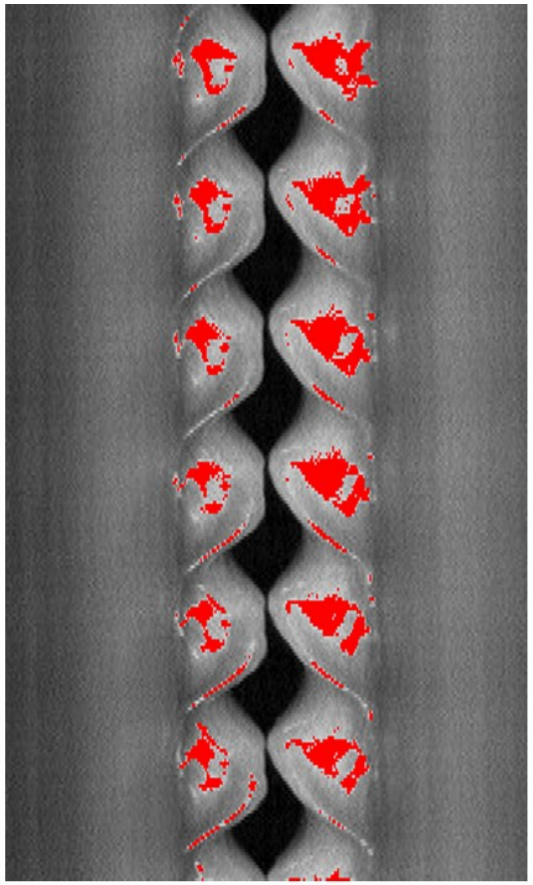
Opening versus closing duration



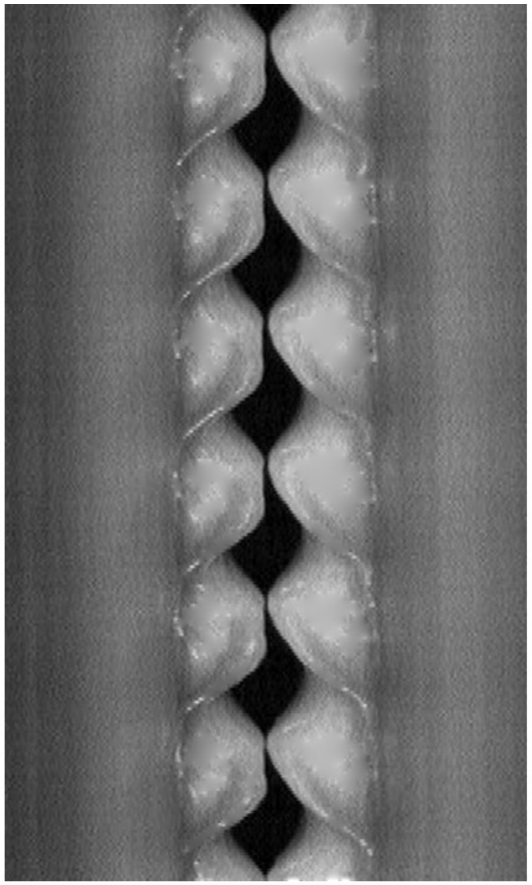
reflections



vocal folds
with reflections

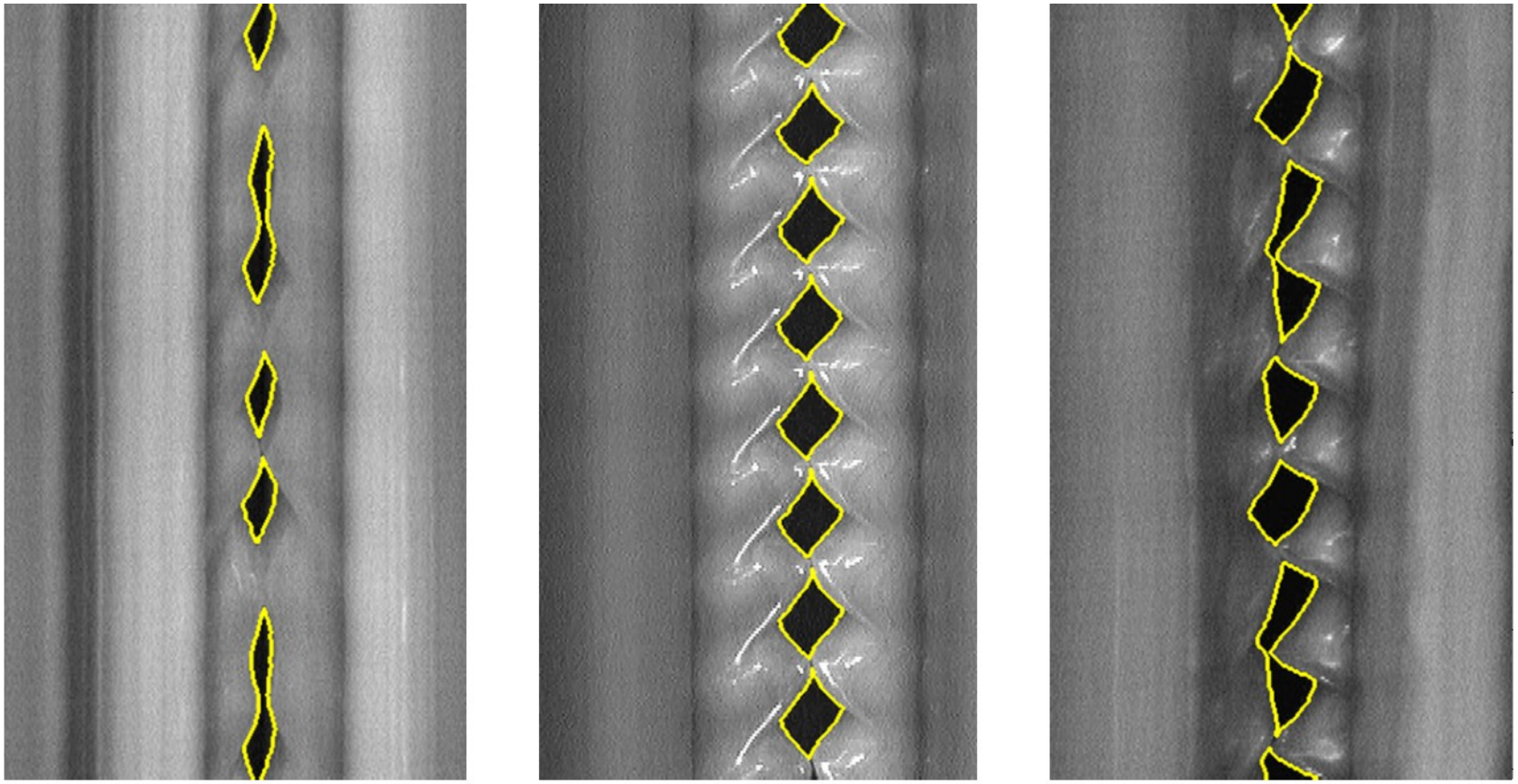


detected reflections
(red)



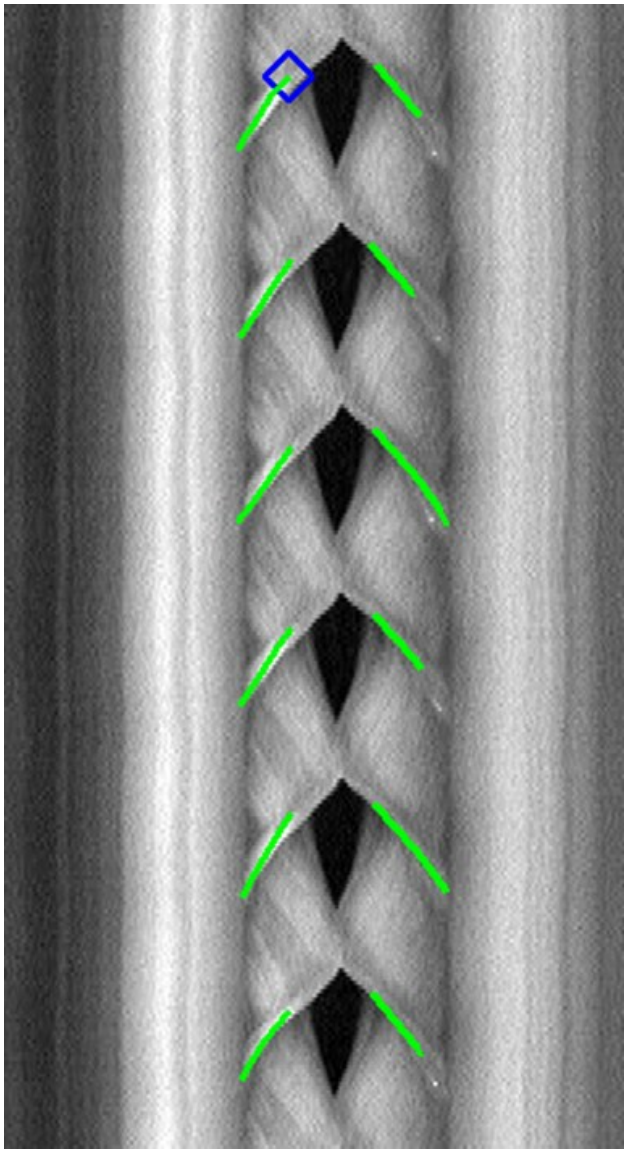
erased reflections

rima glottidis



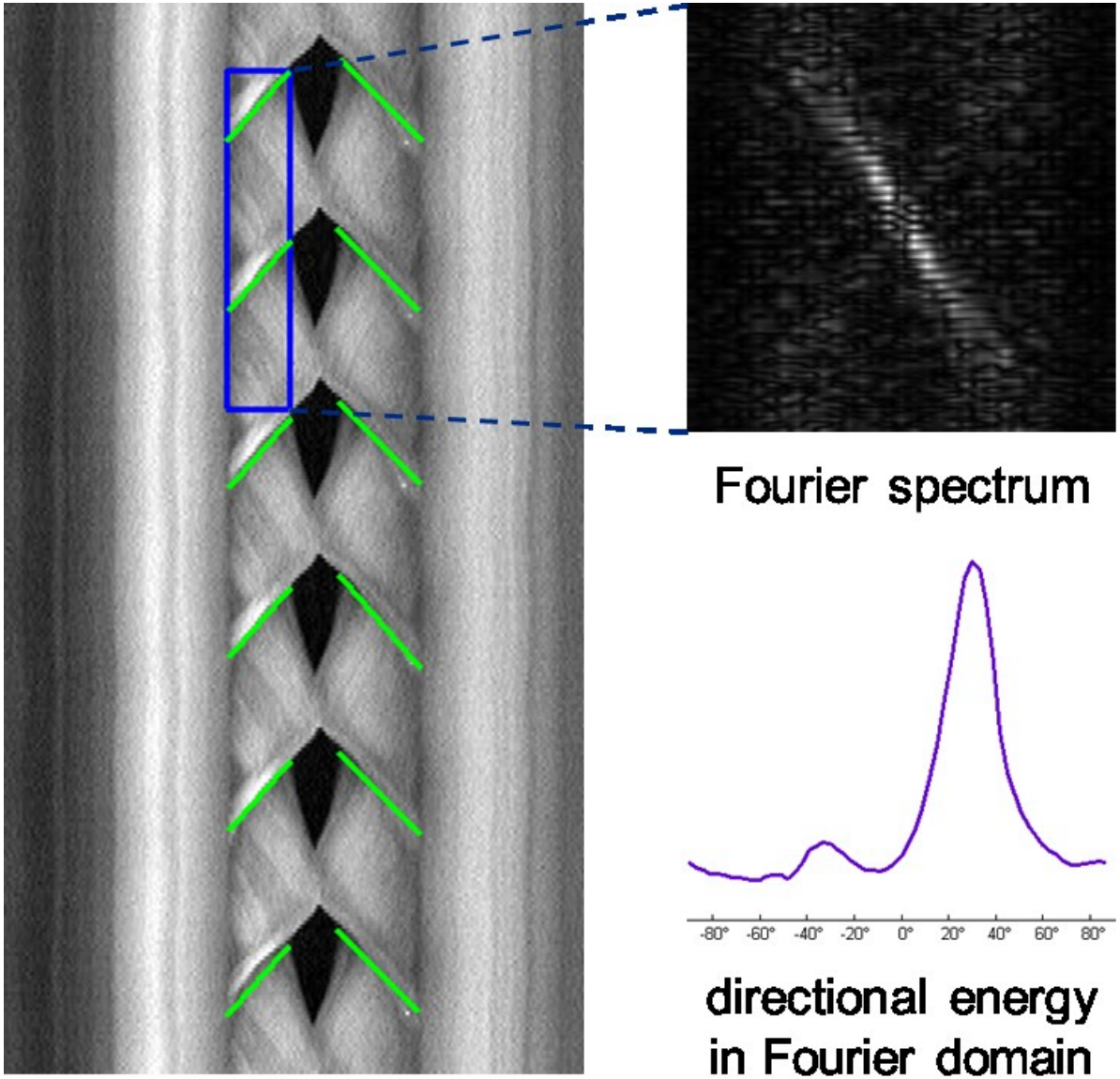
detected glottal contours (yellow)

mucosal waves



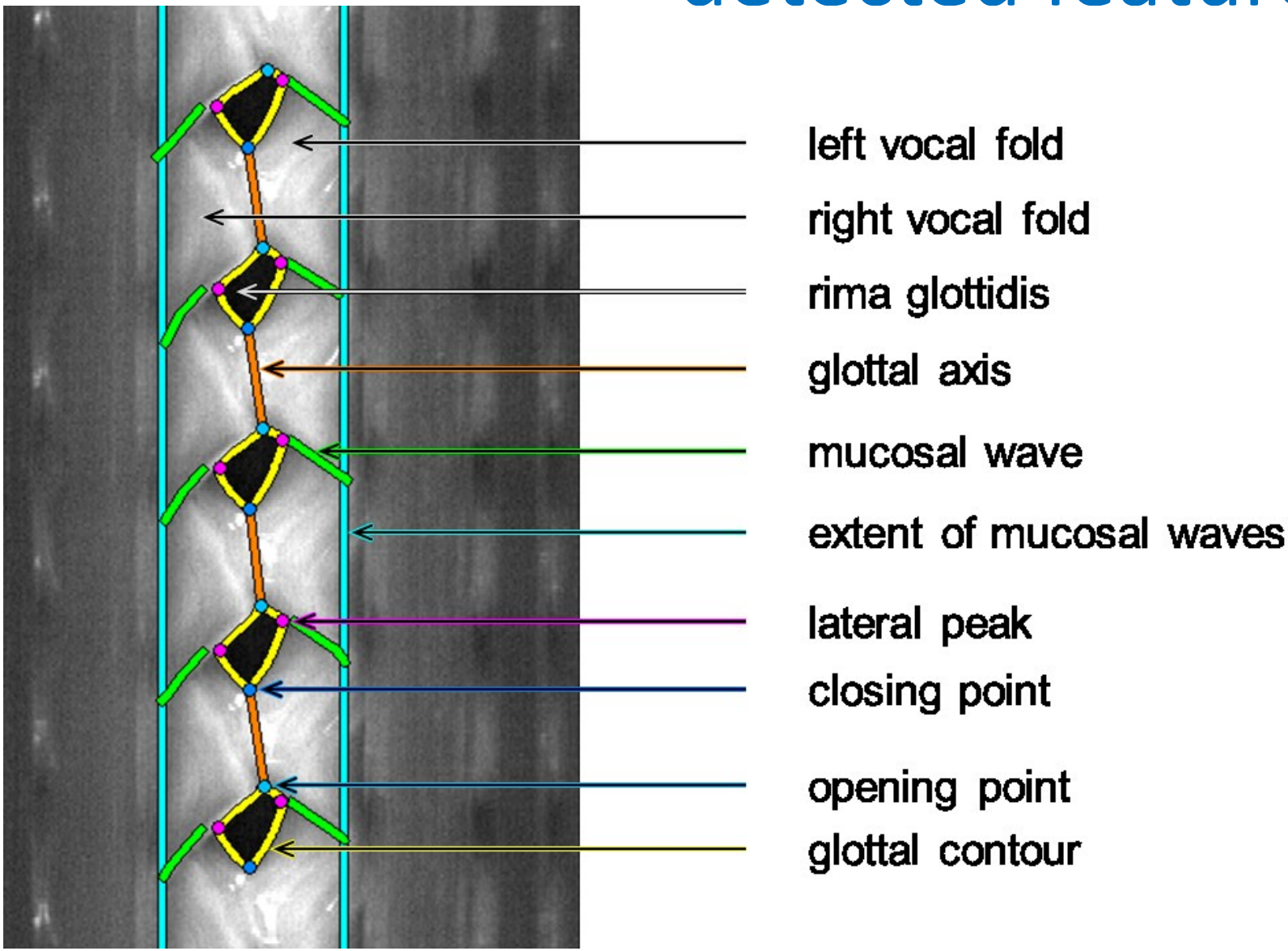
cross-correlation

mucosal waves



Fourier transform

detected features



comparison

parameter	automatic—visual match	visual—visual match
number of cycles (right)	92 %	92.1 %
number of cycles (left)	92 %	93.2 %
closure quotient	92 %	91.6 %

comparison of automatic and visual evaluations for three exactly defined parameters on a set of 50 videokymograms visually analyzed by 18 evaluators

references

Sedlář, J., Novozámský, A., Švec, J.G., Zitová, B., Flusser, J.
Measurement of Vocal Fold Features in Videokymography Images.
Abstract in: Proc. BioImage Informatics 2012, p. 53, Max Plank Inst. MCG, Dresden, Sep 16-19, 2012.

Hauzar, D.
Zpracování digitálních snímků videokymografických záznamů jako podpůrný nástroj pro diagnostiku hlasivek.
Master thesis, Charles University, Prague, 2010.

Zita, A.
Zpracování videokymografických záznamů.
Bachelor thesis, Charles University, Prague, 2011.

Hampala, V.
Vizuální hodnocení videokymograckých snímků u hlasových poruch.
Master thesis, Palacký University, Olomouc, 2011.

references

Švec, J.G., Šram, F., Schutte, H.K.
Videokymography in voice disorders: What to look for?
Annals of Otology, Rhinology and Laryngology 116 (3):172-180, 2007.

Qiu, Q., Schutte, H. K.
Real-time kymographic imaging for visualizing human vocal-fold vibratory function.
Rev.Sci.Instrum. 78 (2):Art. No. 024302, 2007.

Švec, J.G., Šram, F., Schutte, H.K.
Videokymography.
In: The Larynx. Third Edition. Volume I, edited by M.P.Fried and A.Ferlito, San Diego, CA: Plural Publishing, 2009, p. 253-274.

Tao, W., Jin, H., Zhang, Y., Liu, L., Wang, D.
Image Thresholding Using Graph Cuts.
IEEE Transactions on Systems, Man and Cybernetics, Part A: Systems and Humans, vol.38, no.5, pp.1181-1195, Sept. 2008.

sedlar@utia.cz