New Technology for fNIRS

The First Software

for fNIRS Visualization and
Vector-Based Approach

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To significantly expand the possibility of fNIRS,

"fNIRS Visualization Software"

1. The software automatically shows an orthogonal vector coordinate plane defined by the ΔO and ΔD axes.
2. The new fNIRS index will be easily calculated from the OxyHb and DeoxyHb data.
3. Just a few simple steps to generate.

This software "fNIRS Visualization Software", which was developed by KatoBrain Co., Ltd., is a software to give some visualization aspects and to calculate useful new indices for fNIRS data.
Since this program is made in JAVA, it should be possible to run in any computer. However, at this point, we are mainly testing to run the program in Windows 10, and partially in Mac OS 10.

Our booth staff will demonstrate the software when available.

fNIRS 2D vector plane.

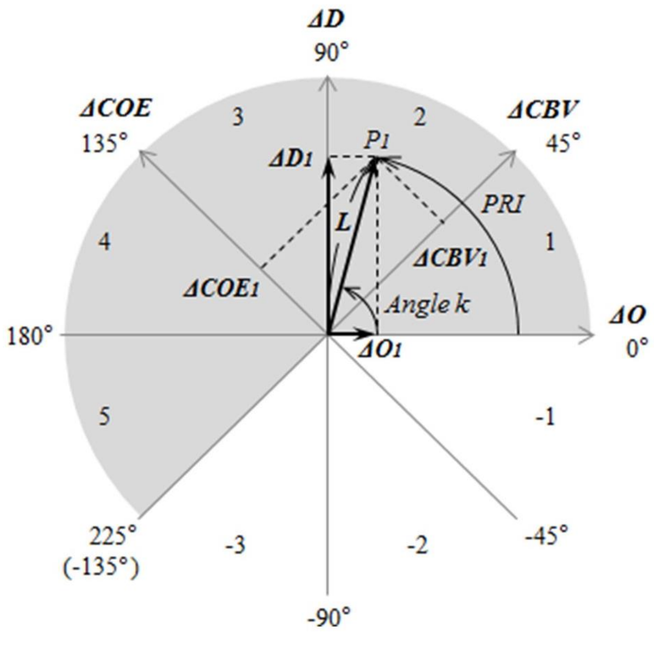


Figure shows an orthogonal vector coordinate plane defined by the ΔO and ΔD axes. Rotating this vector plane 45 degrees counterclockwise results in an orthogonal vector coordinate plane defined by the ΔCBV and ΔCOE axes. For ΔCOE, a positive value indicates hypoxic change from ΔCOE = 0, whereas a negative value indicates hyperoxic change. The angle *k*, indicating the phase, is defined by the following equation:

$$\Delta CBV = \frac{1}{\sqrt{2}}(\Delta D + \Delta O)$$

$$\Delta COE = \frac{1}{\sqrt{2}}(\Delta D - \Delta O)$$

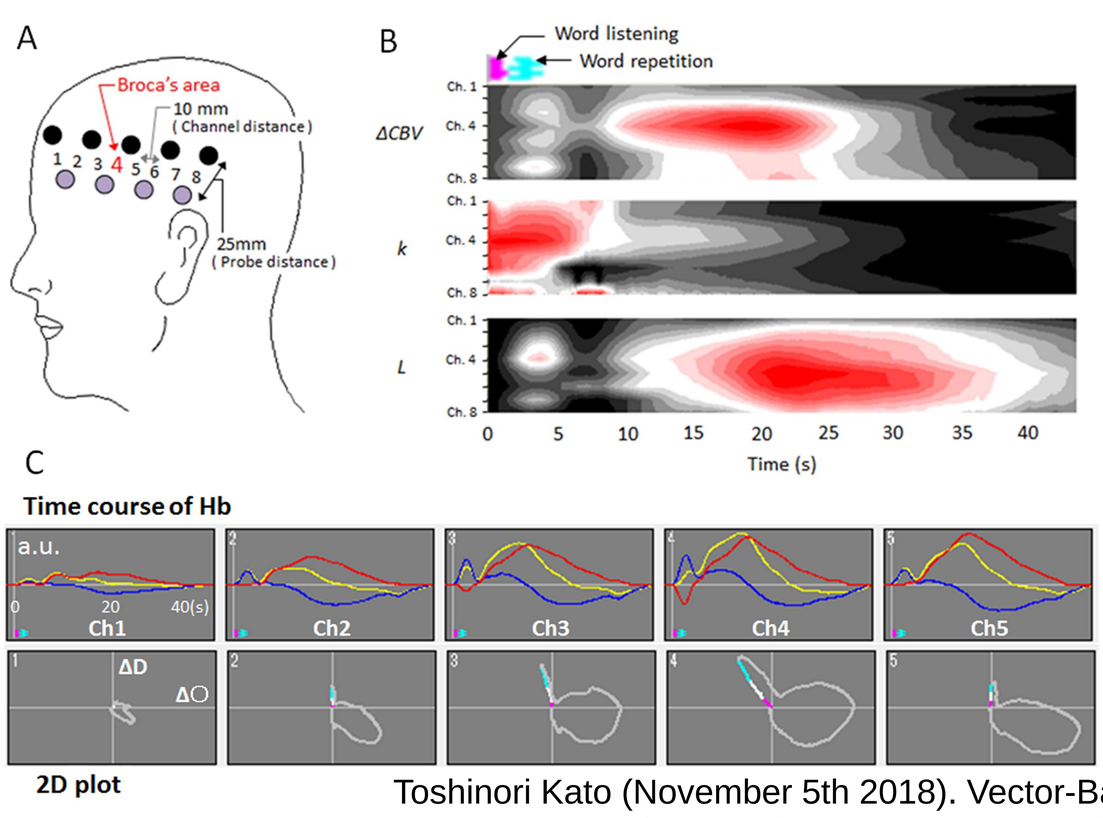
$$k = Arc\tan\left(\frac{\Delta D}{\Delta O}\right) = Arc\tan\left(\frac{\Delta COE}{\Delta CBV}\right) + 45° \quad (-135° \leqq k \leqq 225°)$$

This method provides a quantitative measure of oxygen metabolism, offering the advantage of measurements expressed in units of degrees. Moreover, measurements are determined from ratios of change rather than the actual extent of change in the levels of Hb.

The scalar *L*, drawn from the origin to the coordinates of an arbitrary point on the vector plane, indicates the amplitude of a vector, reflecting the amount of change in Hb.
L can be described by the following equation:

$$L = \frac{1}{\sqrt{2}}\sqrt{(\Delta COE)^2 + (\Delta CBV)^2}$$

Spatiotemporal Imaging of New Indices for a Verbal Task



(A) Channel positions. Broca's area corresponds to channel 4.
(B) Pink shows the duration of word listening (average 1.2 seconds), and blue shows the duration of word repetition (average 1.1 seconds).
For ΔCBV, red indicates positive vector changes, whereas black indicates negative vector changes. For the angle *k*, black indicates *k* = 0, whereas red indicates the maximum angle *k* (180 degrees). For *L*, black indicates 0, whereas red indicates the peak value.
(C)Time courses of hemoglobin components and their two dimentional vector cordinates. Oxyhemoglobin (OxyHb) (red), deoxyhemoglobin (deoxyHb) (blue), and total hemoglobin (total Hb) (yellow). Arbitary unit (a.u.).

Reference paper will be available for download from Nov. 5

Toshinori Kato

Vector-Based Approach for the Detection of Initial Dips using fNIRS.

DOI: 10.5772/intechopen.80888

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Using Functional Near-Infrared Spectroscopy [Working Title], IntechOpen, DOI: 10.5772/intechopen.80888. Available from:
https://www.intechopen.com/online-first/vector-based-approach-for-the-detection-of-initial-dips-using-functional-near-infrared-spectroscopy/