



Nakamoto Lab

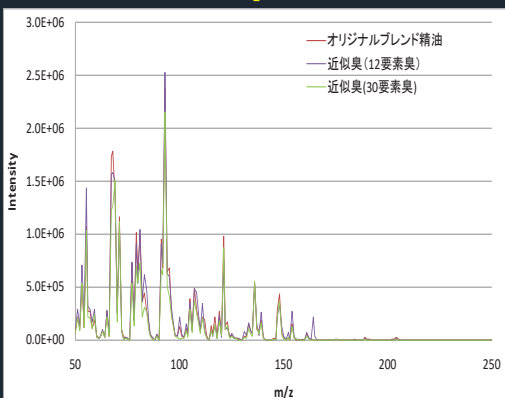
Human Olfactory Interface

Intelligent Information Processing Research Core,
Laboratory for Future Interdisciplinary Research of Science
and Technology

http://silvia.mn.ee.titech.ac.jp/html_en/index_en.html

- Olfactory display
- Exploration of odor components
- Odor sensing system
- Prediction of odor impression

■ Exploration of odor components



Various odors are reproduced using odor basis vectors.

Mass spectrum of reproduced odor

$$[V] = [W] \times [H]$$

Data matrix Coefficient Matrix Set of odor basis vectors

■ 20 component olfactory display



Odor reproduction using a small set of odor components

■ Essential oil libraries 100

Odor reproduction from web-site

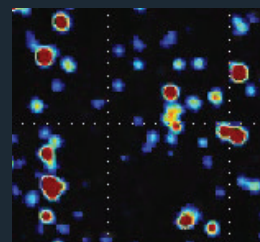
精油 100選	柑橘系 Citrus	エキゾチック Exotic
スパイス Spice	樹脂系 Resin	花卉 Flower
樹木 Woody	ハーブ Herb	Essential Oil Library 100



■ Odor sensing system

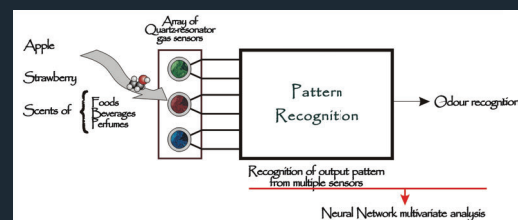


Quartz-resonator sensor

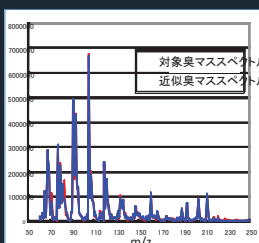


Odor biosensor using cells expressing OR

Output pattern of multiple sensors is recognized by multivariate analysis or deep learning.



■ Prediction of odor impression using deep learning



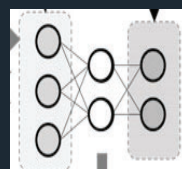
MS data (Mass spectrum)

Feature extraction of mass spectrum

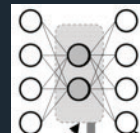


Mass spectrum feature vector

Mapping between feature vectors using the multilayer perceptron



Transformation from feature vectors to descriptor scores for sensory testing data



Sensory test feature vector

Odor impressions expressed in descriptor scores

trans-2-Hexenal	
Cool	1
Warm	1
Light	2
Heavy	2
Sweet	4
Rose	0
Pepper	1
Almond	4
...	