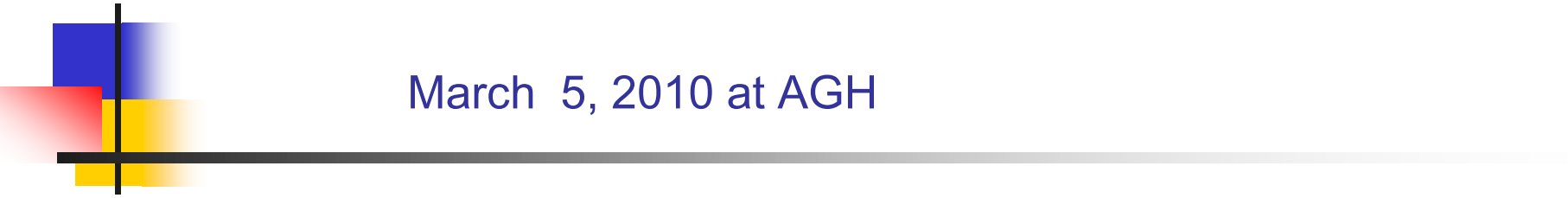
A topic toward advanced AI ; KANSEI



March 5, 2010 at AGH

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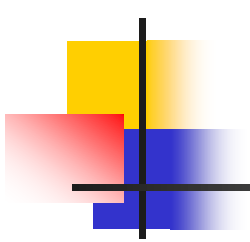


A

1. Background; Advanced AI
2. KANSEI;

   What is Kansei /Kansei Engng. about
3. An Example of Research;

   Approach via Voices : analysis of cry of baby

Advances in AI

- AI =>

Understanding "Object" :

Understanding Speech /Image:
=>Understanding"text"

- Advanced AI =>

Important Issue will be Understanding
"Intention of Object (by designer)"

"intention of Person(=Speaker)";

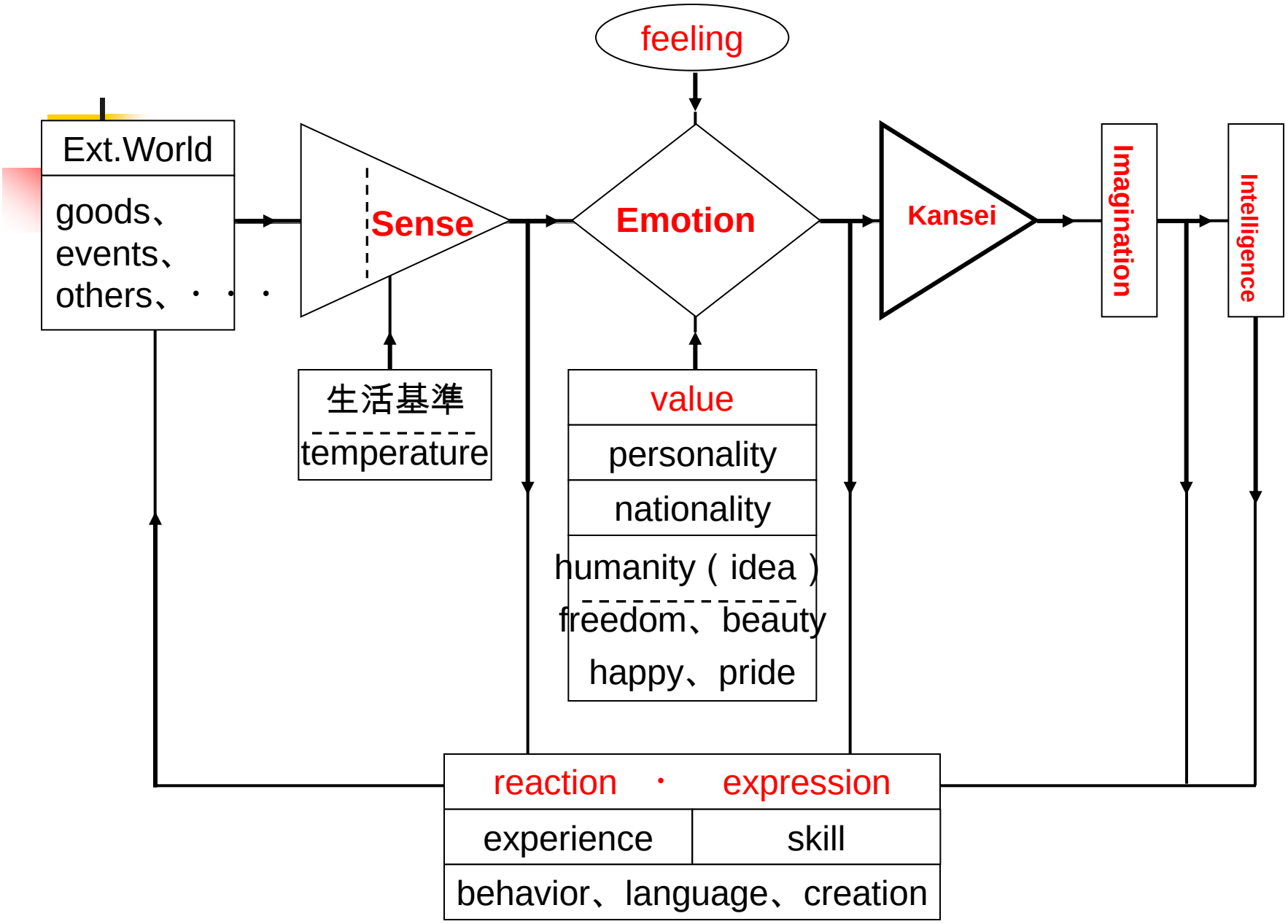
- Understanding intention needs understanding psychology (including emotion) of designer/Speaker:

About KANSEI :

KANSEI is an ability to perceive something impressive (terrible , beautiful, ..) from stimulus

- KANSEI is an ability to respond (to be affected) to(by) some stimulus.
- Vice verse, some stimulus can affect human mind.

- => different ability of human from **Logical INTELLIGENCE.** (See;Photo)
- In language: these ability is represented by adjective or adverb.


feeling
Ext.World
goods、
events、
others、・・・
Sense
Emotion
Kansei
Imagination
Intelligence
生活基準
temperature
value
personality
nationality
humanity (idea)
freedom、beauty
happy、pride
reaction ・ expression
experience
skill
behavior、language、creation

KANSEI Engineering

- Objective of K.E.:

  Provide products and services which induce or germinate something rich/wealthy in mind of users: comfort, pleasure, , , .

- Automobile

Technical issues in KANSEI Engineering

- To develope K.E. systematically, Sound basis on how to

  1) acquire, 2) evaluate and 3) express

  human satisfaction, emotion, and other mental information, which are ambiguous(多義的）, vague(漠然とした）, subtle(かすかな), uncertain in nature .

  For Realizing Real-time Acquisition & Evaluation of Emotion,

=>Nonverbal information; gesture,voice, facial expression, eye/physical movements, and biological signal, smell , , ,.

Classification of Painful Cry of Baby with ADEL

Cry of Baby

Why Baby ?

=> Do not have ability to use language!

=>1) Cry is only way to communicate with surroundings

2) Baby cries differently depending on his emotion/requirement(intention)

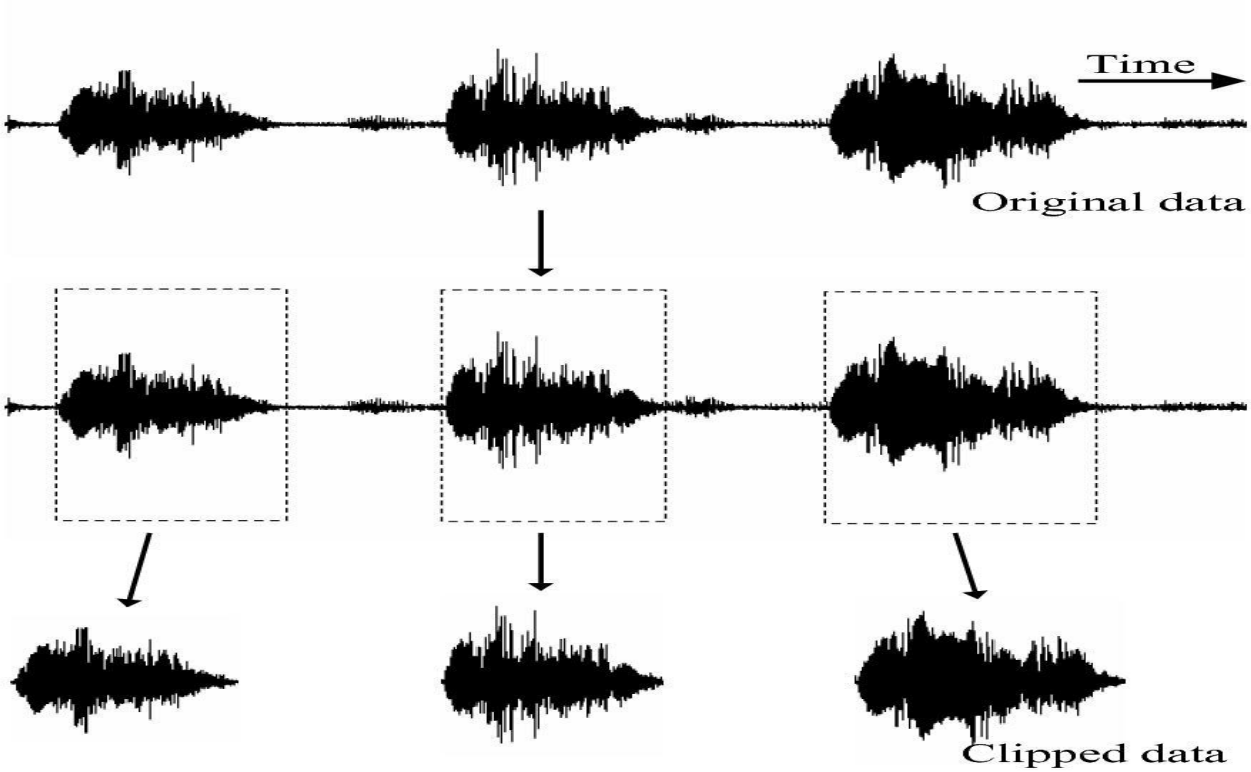
Problem: Discrimination painful Cry and normal Cry by machine

Case study: painful cry due to genetic disease(ADEL)

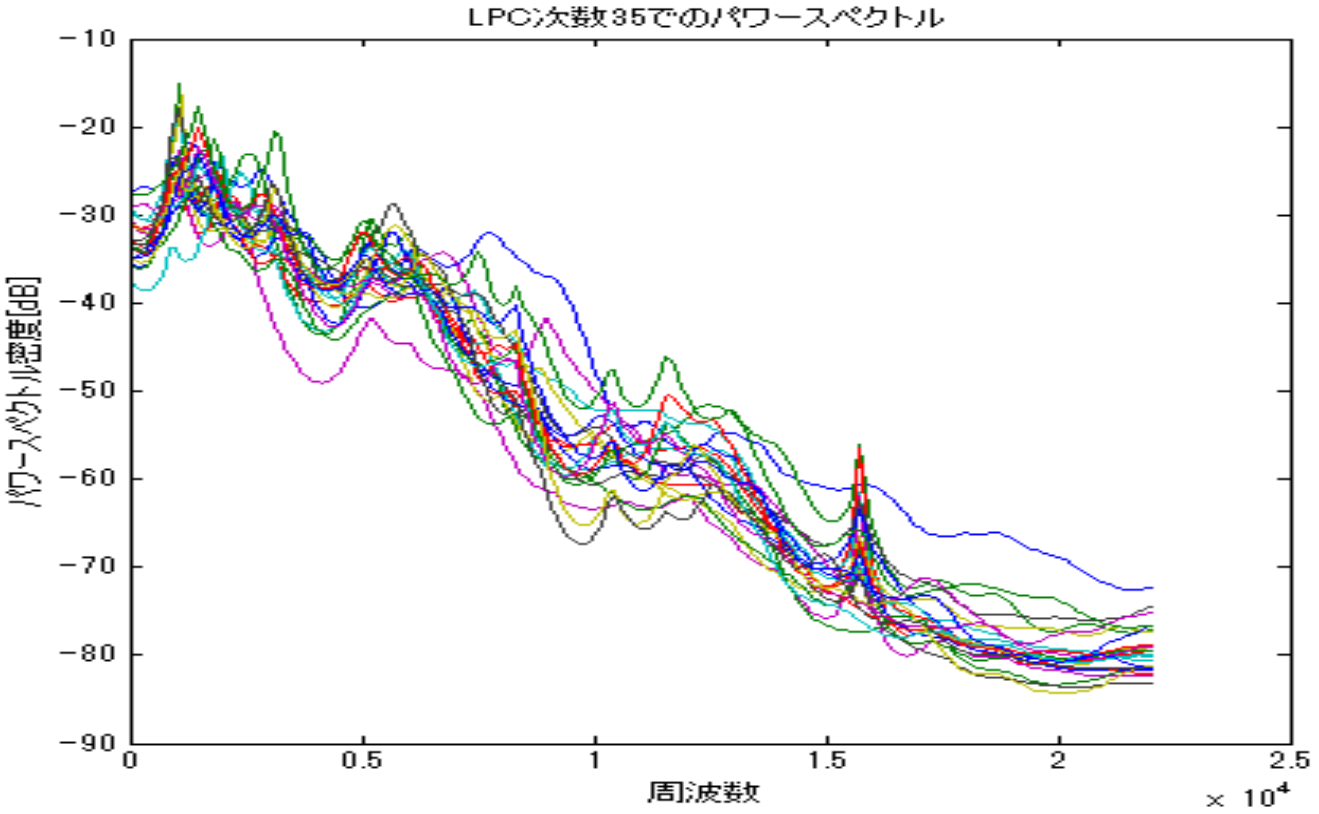
=>ADEL patient has a structual defect in throat, which results in painful cry due to severe difficulty for breathing.

My Proposition becomes to ;
Classification of power spectrum for Cries with ADEL and normal Cries

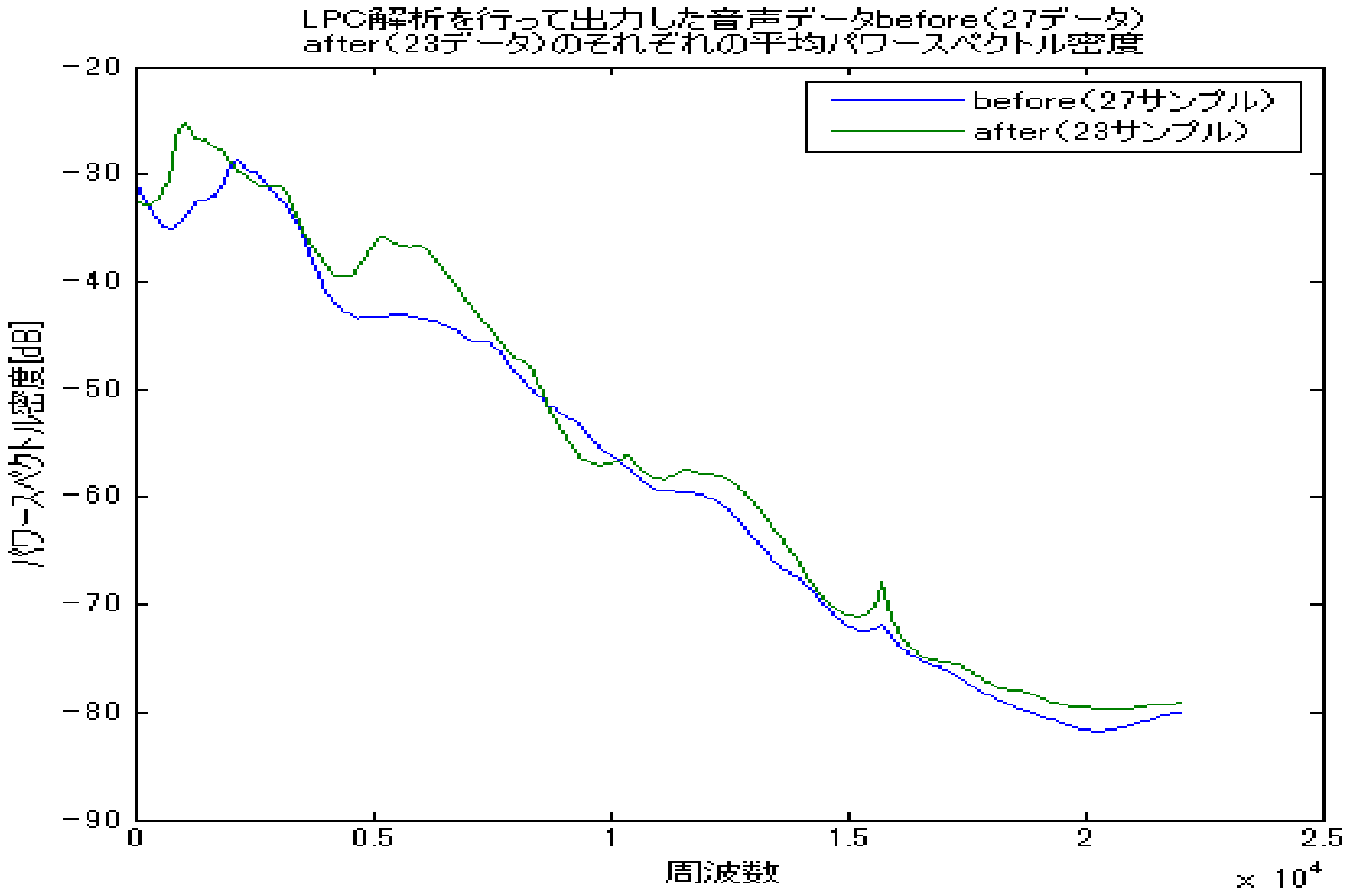
Pre-processing of cry data



Envelope of power spectrum for every sample (by LPC)



Envelope of Power Spectrum by LPC (av.over each class)



Algorithm: Forward Selection of variables using F-Value (FSM)+LDA

1) FSM: Feature Extraction (Dominant frequency points in spectrum for discrimination)=>

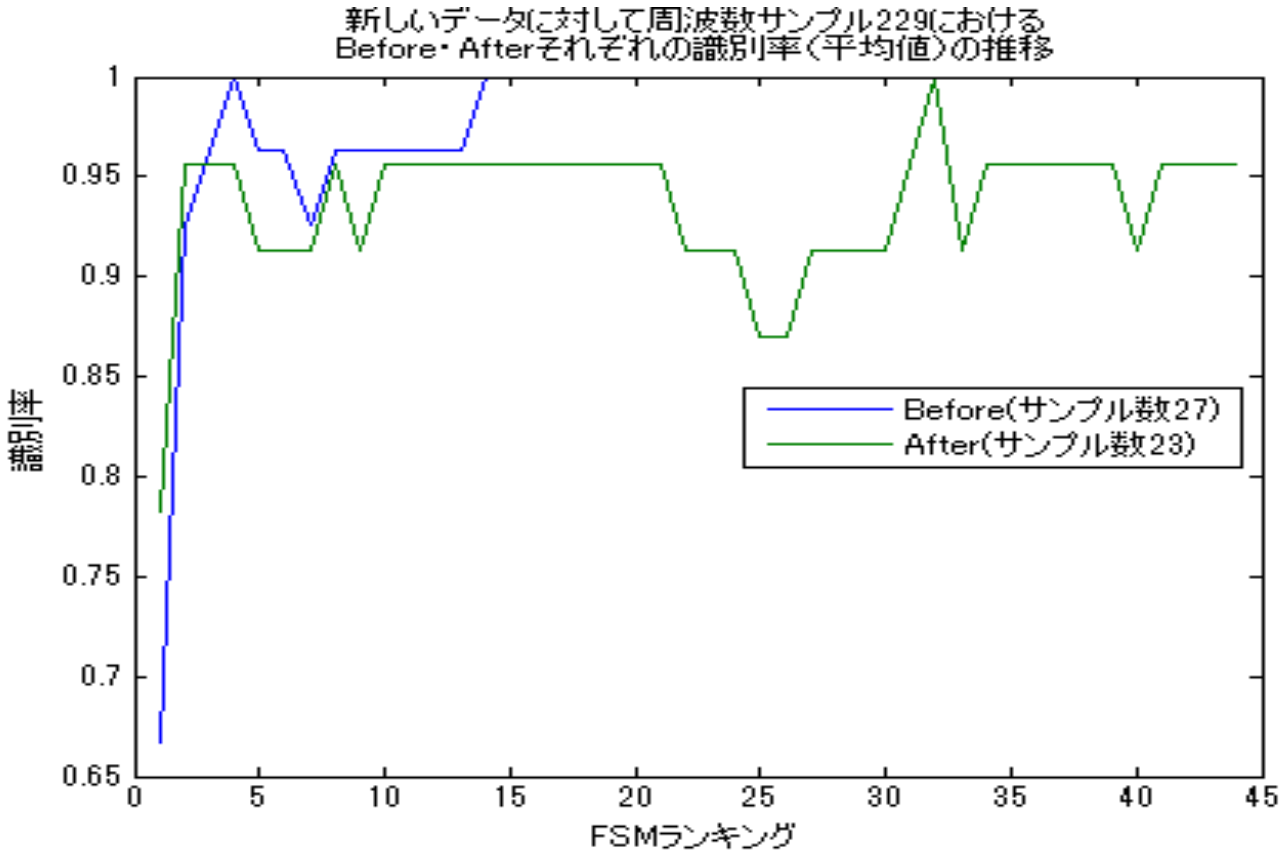
Estimate Order of statistical significance of frequency points for classifying the classes by F-value(*)

2) Linear Discriminant Analysis based on Maharanobis Dist.

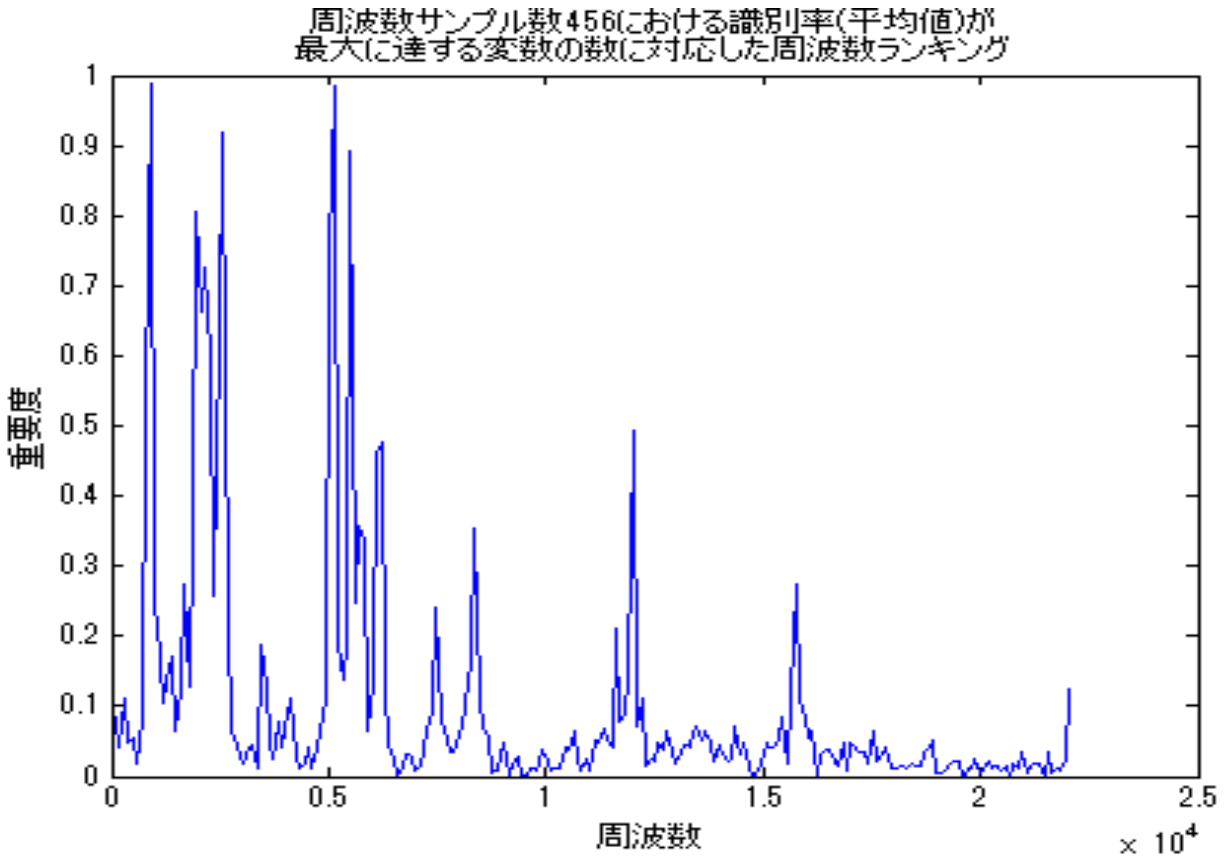
(*) Formula of F-value;

$$F = \frac{(n^{[1]} + n^{[2]} - p - r - 1) n^{[1]} n^{[2]} (D^2_{(p+r)} - D^2_{(p)})}{r\{(n^{[1]} + n^{[2]} - 2)(n^{[1]} + n^{[2]}) + n^{[1]} n^{[2]} D^2_{(p)}\}}$$

Classification Result by LOOCV



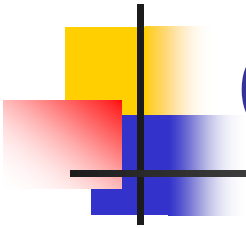
Scoring of Importance of Frequency points for classification



Summary of Result

- We have developed a statistical Method based on F-value which can discriminate painful cries due to ADEL from normal cries.

- Beyond classification problem, we must solve the problem which specify the respective features responsible for pain and structural defect of crying baby separately.



Conclusion

Thank you!!

Let's Update our Understanding with our own KANSEI