Recognizing Communicative Facial Expressions for Discovering Interpersonal Emotions in Group Meetings

Shiro Kumano   Kazuhiro Otsuka
Dan Mikami   Junji Yamato
Communication Science Laboratories,
Nippon Telegraph and
Telephone Corporation

NTT

Abstract

- We propose a novel research framework for exploring how interpersonal emotion is developed in meetings.

- We focus on facial expression (smile) event, **"who is smiling at whom, and how often?"**

- We visualize interpersonal emotion as a graph structure, we call it "interpersonal emotion network"

Motivations, background, and our approach

Past study   - Mostly focused only on individual facial expression (FE) as a window to inner emotion
          - Most meeting analysis studies did not focus on emotional aspect of communication

Our study   - We focus on social communicative approach for facial expression and emotion research
          Facial expression is viewed as communicative act for effective message exchange
          - We focus on smile and its direction as a sign of positive message toward others
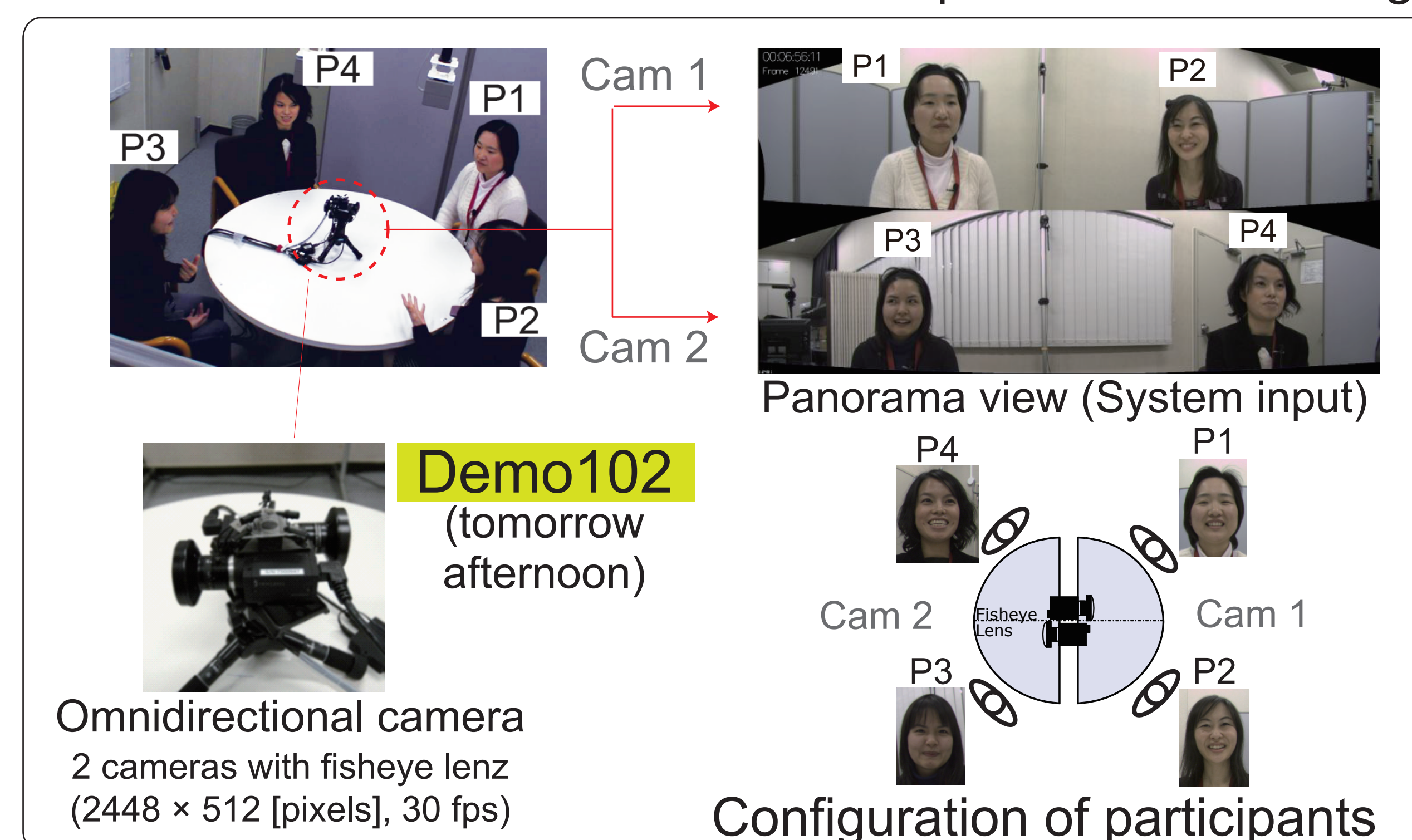
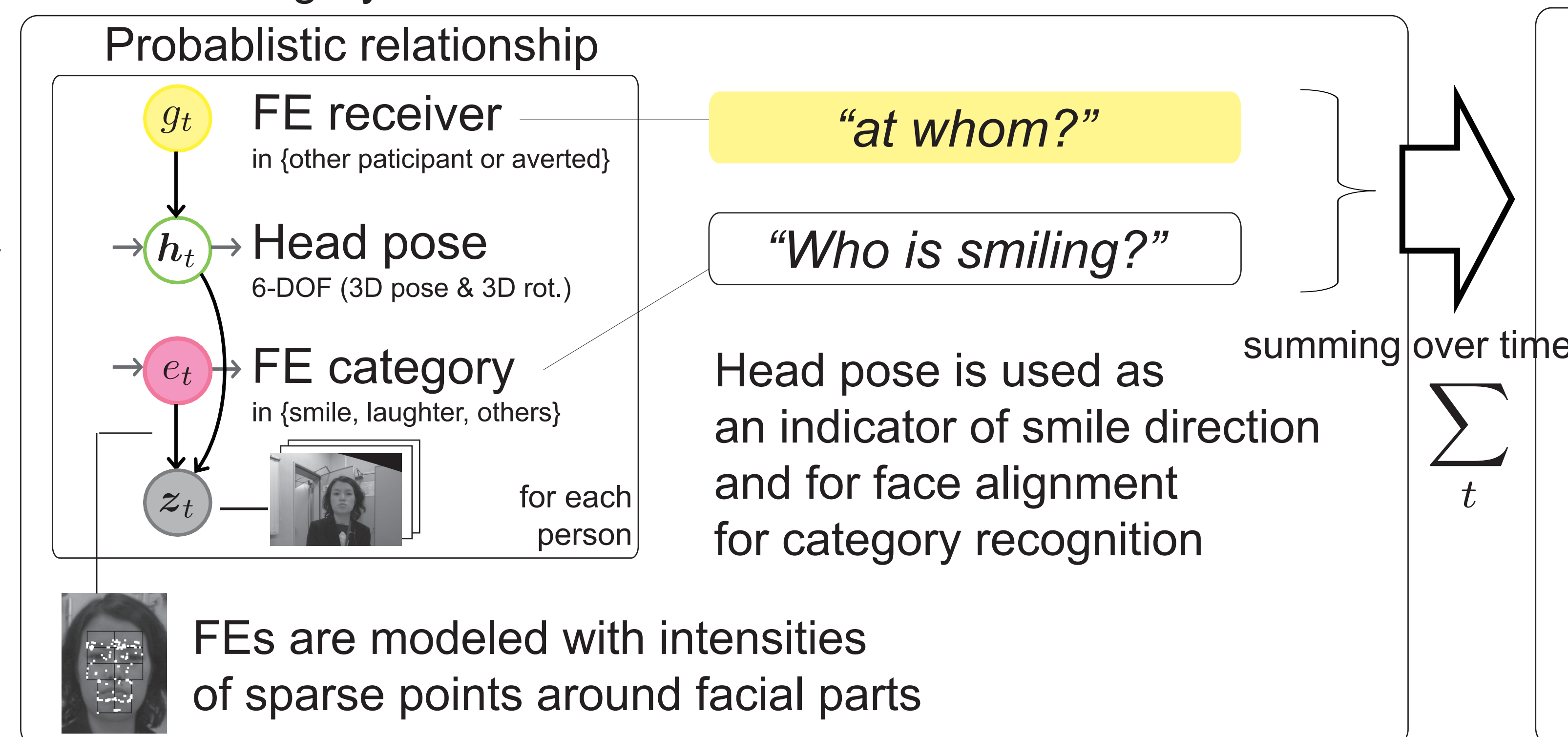"Who is smiling at whom, and how often" → Interpersonal emotions   Novel research framework for meeting analysis
Sender   +   Receiver

Framework

1. Observing meeting scene

Omnidirectional camera is used to capture round meetings.

Demo102 (tomorrow afternoon)

Omnidirectional camera
2 cameras with fisheye lenz
(2448 × 512 [pixels], 30 fps)

Panorama view (System input)

Configuration of participants

2. Recognizing facial expression

FE category and its direction are estimated from video.

Probablistic relationship

g_t → FE receiver
in {other paticipant or averted}   "at whom?"

h_t → Head pose
6-DOF (3D pose & 3D rot.)   "Who is smiling?"

e_t → FE category
in {smile, laughter, others}

Head pose is used as an indicator of smile direction and for face alignment for category recognition

z_t for each person

$\sum_t$ summing over time

FEs are modeled with intensities of sparse points around facial parts

3. Visualizing interpersonal emotion

We propese a new visualization of interpersonal emotion.

Our "interpersonal emotion network", representing how interpersonal emotion is developed over meeting

→ Flow of smiles
Thickness: Amount of smiles

○ Person
Area: Amount of received smiling

An example of interpersonal network
based on "Who is smiling at whom and how often"
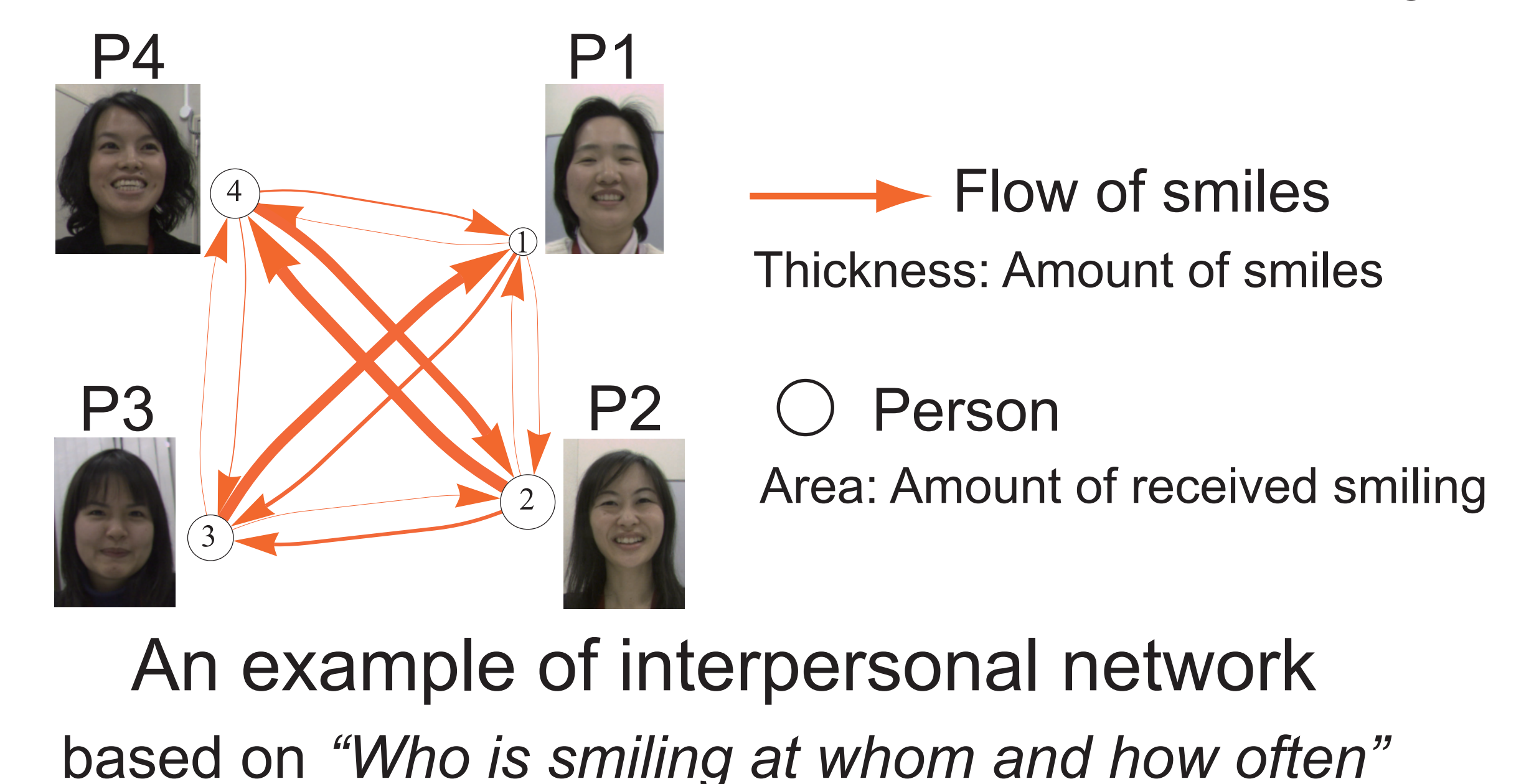
Experiments

Targeted meetings & experimental settings

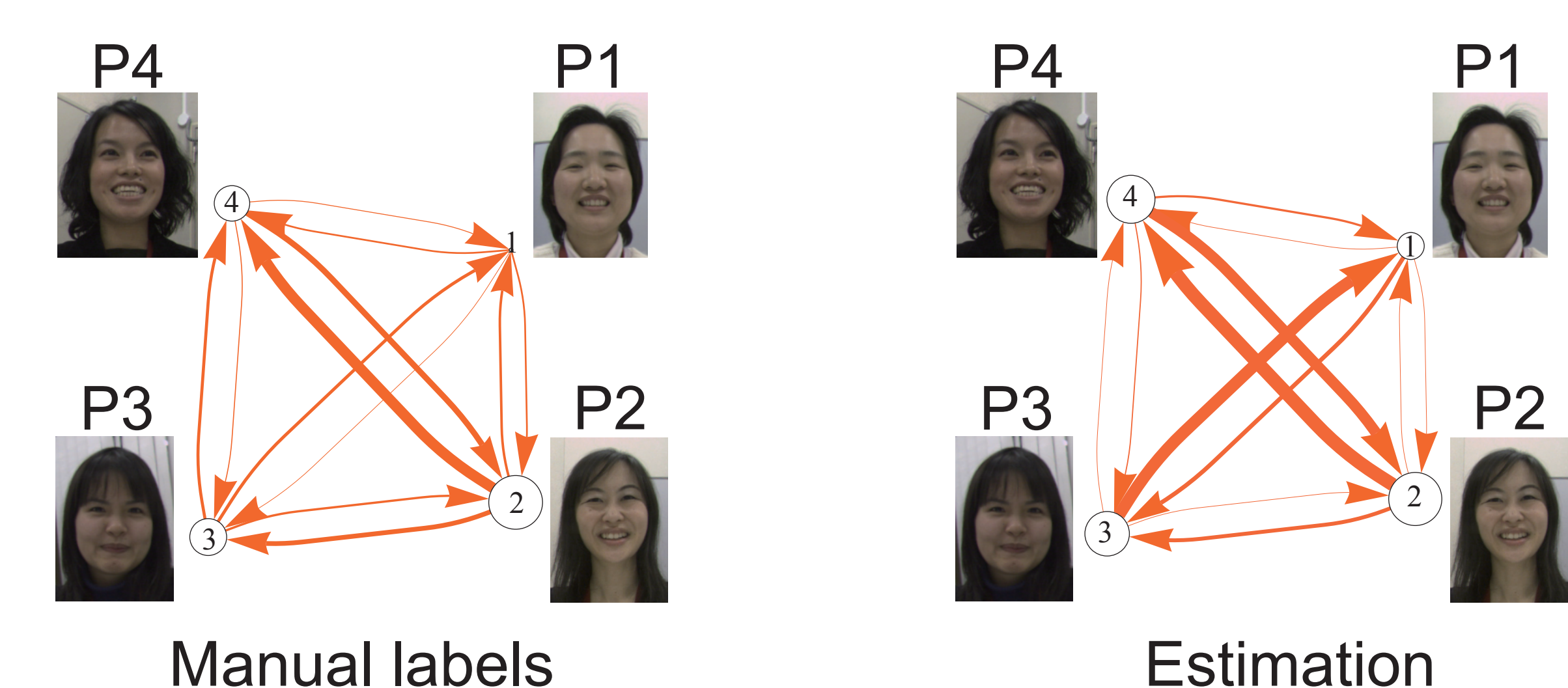| Conversation topic	"Should smoking be fully prohibited in public spaces?"
Time length	6 min = 15,000 frames
Manual labeling	2 labelers common labels are used
FE training	1/3: training, others: test

FE recognition results

Rates
Category

Manual \ Result	Smile	Laughter	Others
Smile	0.81	0.04	0.15
Laughter	0.08	0.83	0.09
Others	0.08	0.06	0.86

Receiver (gaze direction)

Person	P1	P2	P3	P4
Rates	0.38	0.79	0.47	0.60

Example snapshots

S: smile
L: laughter
O: others

{ Labeler 1, Labeler 2 / Result }
(Manual labels)
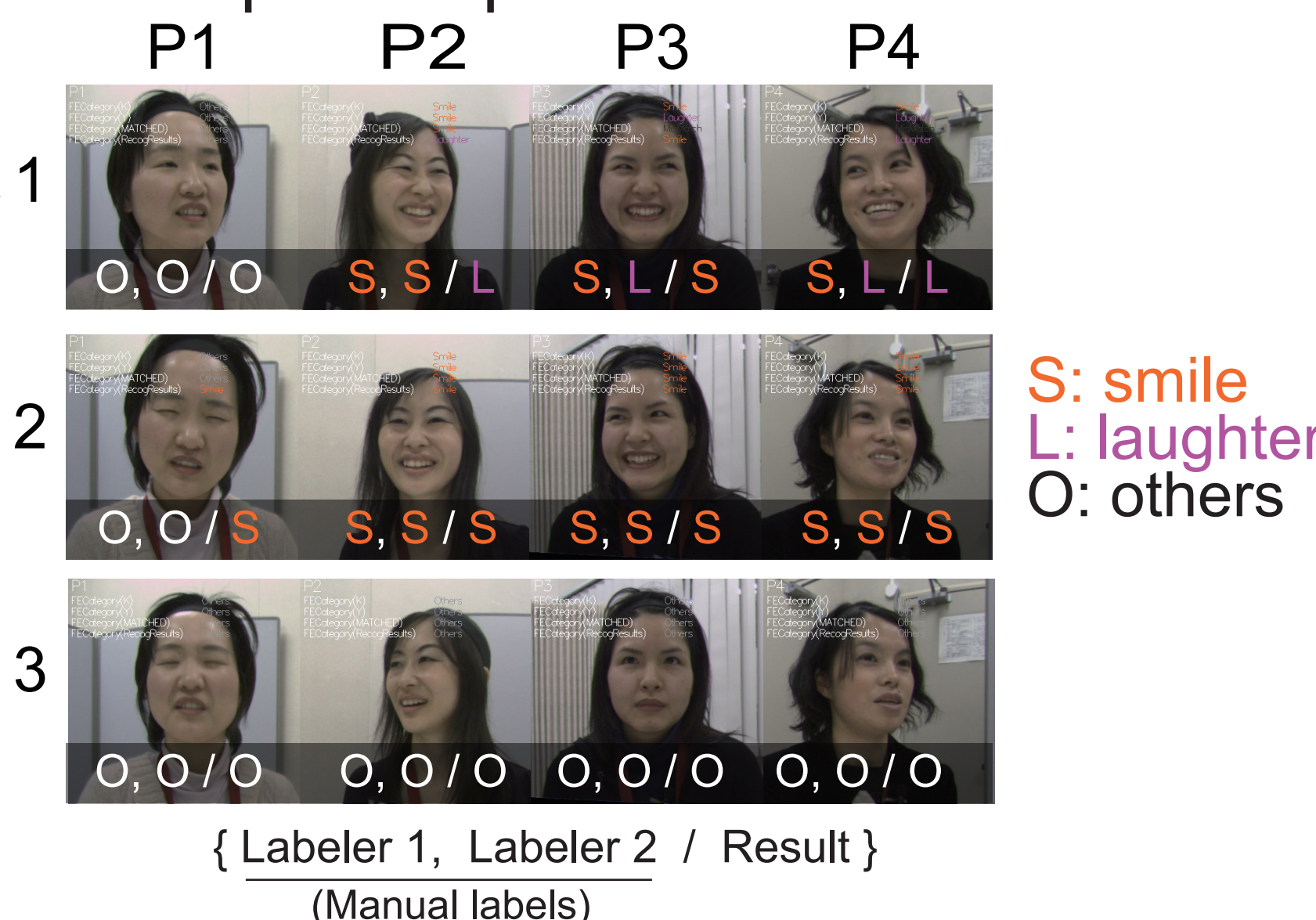
Resulting interpersonal emotion network

Manual labels   Estimation

Suggestions:

- Strong positive emotional links between P2 & P4
- P1 was less emotionally involved in this meeting
- Estimation seems to be erroneous, but well approximated

Future Works

- Improve recognition performance of FE and direction e.g. direct measurement of gaze direction from video
- Increase multiple modality including audio prosody, language and context

- Add more FE categories incluing negative expressions
- Model interpersonal interaction and its dynamics

Contact: Shiro Kumano (e-mail: kumano@eye.brl.ntt.co.jp   URL: http://www.brl.ntt.co.jp/people/kumano/)