Towards Context Aware Emotional Intelligence in Machines:

Computing Contextual Appropriateness of Emotions

Michal Ptaszynski, Pawel Dybala, Wenhan Shi, Rafal Rzepka, Kenji Araki

Language Media Laboratory
Hokkaido University, Japan

Presentation Outline

Introduction

We are all busy people

Too much work

stress

Annoying coworkers

Over-time

Need someone to talk to

An intelligent agent-companion

A companion available 24 / 7 / 365

Introduction

When do we need to talk?

Upset

Heart-broken

Angry

Emotional

Bored

etc.

Happy

What do we expect?

Emotion Management

- Sympathy / Empathy
- Consolation
- Cheer
- Praise
- Counsel
- etc.

Introduction

When do we need to talk?

What do we expect?

We need conversational agents to be emotionally intelligent!

Bored

Happy

Emotional

etc.

- Consolation
- Praise
- Counsel
- etc.

Emotional Intelligence

Intelligence – one or many?

1983. Howard Gardner – "IQ tells you nothing!". [1]
(Theory of multiple intelligences)
<u>There are many kinds of intelligence</u>: logical, linguistic, spatial, musical, kinesthetic, naturalist, intrapersonal and interpersonal…

1990. Peter Salovey & John D. Mayer – **Emotional Intelligence** [2]
The ability to <u>recognize, monitor one's own and others' emotions</u>, to discriminate among them and <u>to use this information to guide one's thinking and actions</u>.

1. Gardner, Howard (1983). Frames of mind: The theory of multiple intelligences. New York: Basic Books
2. Salovey, P. & Mayer, J.D. (1990) "Emotional intelligence" Imagination, Cognition, and Personality, 9, 185-211

Emotional Intelligence

Emotional Intelligence Framework

I Perception, appraisal, and expression of emotion

・ Ability to recognize emotion in one's physical and psychological states, in other people and objects.

・ Ability to discriminate between accurate and inaccurate, appropriate and inappropriate, honest and dishonest, expressions of emotions.

・ Ability to express emotions accurately, and to express needs related to them.

II Emotional facilitation of thinking

・ Ability to redirect and prioritize one's thinking based on the feelings associated with objects, events, and other people.

・ Ability to generate or emulate vivid emotions to facilitate judgments and memories concerning feelings.

・ Ability to capitalize on mood swings to take multiple points of view; ability to integrate these mood-induced perspectives.

・ Ability to use emotional states to facilitate problem solving and creativity.

III Understanding and analyzing emotional information; employing emotional knowledge

・ Ability to understand how different emotions are related.

・ Ability to perceive the causes and consequences of emotions.

・ Ability to interpret complex emotions, such as emotional blends and contradictory feeling states.

・ Ability to understand and predict likely transitions between emotions.

IV Regulation of emotion

・ Ability to be open to feelings, both those that are pleasant and those that are unpleasant.

・ Ability to monitor and reflect on emotions.

・ Ability to engage, prolong, or detach from an emotional state, depending upon its judged informativeness or utility.

・ Ability to manage emotion in oneself and others.

John D. Mayer and Peter Salovey. *What is emotional intelligence?*, Emotional Development and Emotional Intelligence:3-31, 1997.

Emotional Intelligence

Emotional Intelligence Framework

I Perception, appraisal, and expression of emotion
・ Ability to recognize emotion in one's physical and psychological states, in other people and objects.
・ Ability to discriminate between accurate and inaccurate, appropriate and inappropriate, honest and dishonest, expressions of emotions.
・ Ability to express emotions accurately, and to express needs related to them.

II Emotional facilitation of thinking
・ Ability to redirect and prioritize one's thinking based on the feelings associated with objects, events, and other people.
・ Ability to generate or emulate vivid emotions to facilitate judgments and memories concerning feelings.
・ Ability to capitalize on mood swings to take multiple points of view; ability to integrate these mood-induced perspectives.
・ Ability to use emotional states to facilitate problem solving and creativity.

III Understanding and analyzing emotional information; employing emotional knowledge
・ Ability to understand how different emotions are related.
・ Ability to perceive the causes and consequences of emotions.

[callout] manage emotion in oneself and others.

and contradictory feeling states.
...ions.

[callout] Emotion management is the final ability!

・ Ability to monitor and reflect on emotions.
・ Ability to engage, prolong, or detach from an emotional ... or utility.
・ Ability to manage emotion in oneself and others.

8

John D. Mayer and Peter Salovey. *What is emotional intelligence?*, Emotional Development and Emotional Intelligence:3-31, 1997.

Emotional Intelligence

Emotional Intelligence Framework

I Perception, appraisal, and expression of emotion
・ Ability to recognize emotion in one's physical and psyc
・ Ability to discriminate between accurate and inaccurat   nest, expressions of
    emotions.

> After 25 years of Affective Computing we're still here!!

                                                      to express needs related to them.

> recognize emotions

・ Ability to redirect and prioritize one's thinking based on the feelings associated with objects, events, and other people.
・ Ability to generate or emulate vivid emotions to facilitate judgments and memories concerning feelings.
・ Ability to capitalize on mood swings to take multiple points of view; ability to integrate these mood-induced perspectives.
・ Ability to use emotional states to facilitate problem solving and creativity.

III Understanding and analyzing emotional information; employing emotional knowledge
・ Ability to understand how different emotions are related.
・ Ability to perceive the causes and consequences of emotions.
・ Ability to interpret complex emotions, such as emotional blends and contradictory feeling states.
・ Ability to understand and predict likely transitions between emotions.

IV Regulation of emotion
・ Ability to be open to feelings, both those that are pleasa
・ Ability to monitor and reflect on emotions.
・ Ability to engage, prolong, or detach from an emotional   or utility.
・ Ability to manage emotion in oneself and others.

> Emotion management is the final ability!

John D. Mayer and Peter Salovey. *What is emotional intelligence?*, Emotional Development and Emotional Intelligence:3-31, 1997.

Emotional Intelligence

Emotional Intelligence Framework

I Perception, appraisal, and expression of emotion
・Ability to recognize emotion in one's physical and psychological states, in other people and objects.
・Ability to discriminate between accurate and inaccurate, appropriate and inappropriate, honest and dishonest, expressions of emotions.
・Ability to express emotions accurately, and to express needs related to the

discriminate between […]
appropriate and inappropriate […]
expressions of emotions

It's time to go one step further!

…ciated with objects, events, and other people
…memories concerning feelings.
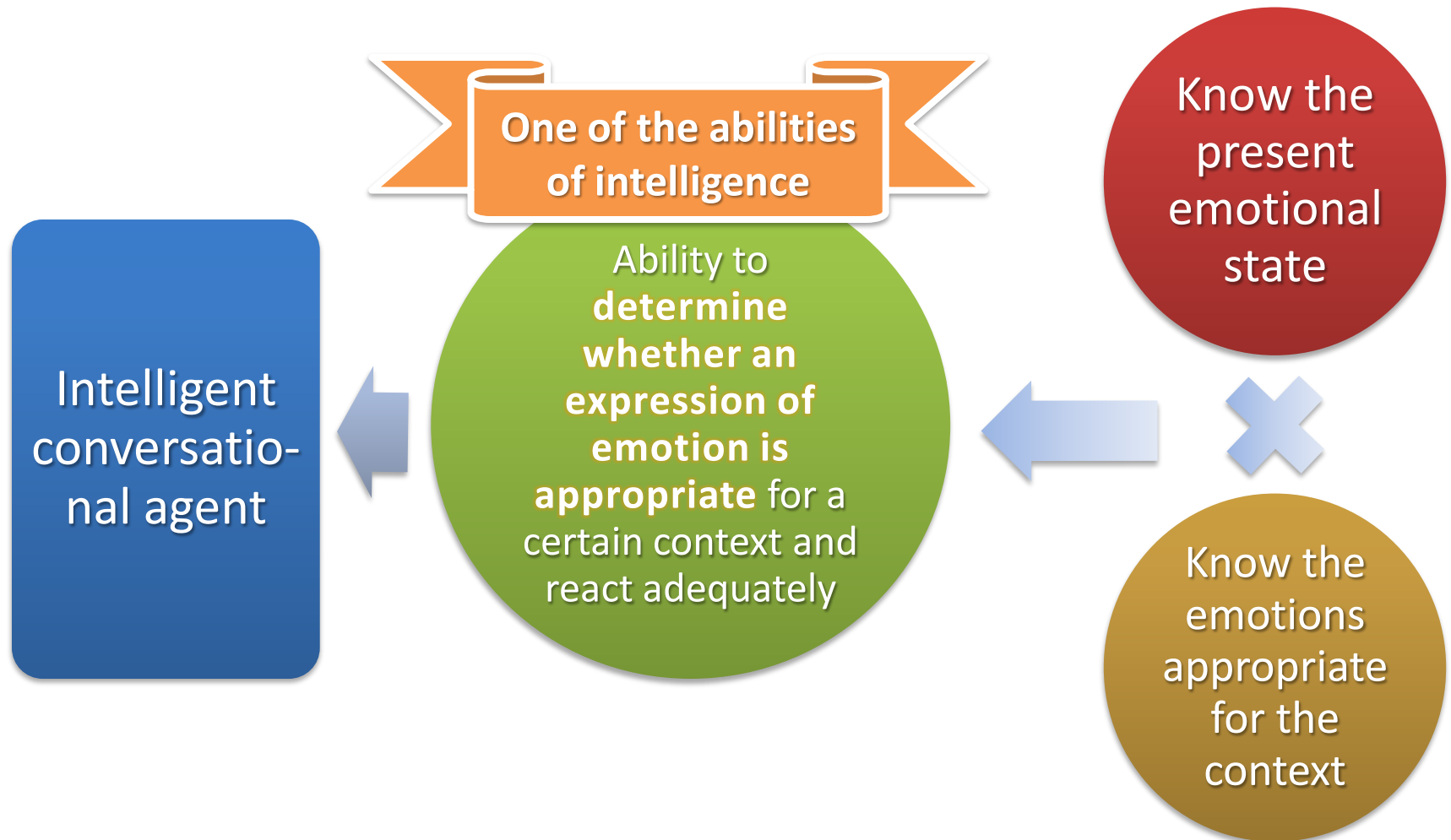…y to integrate these mood-induced perspectives.

…al knowledge
・Ability to understand how different emotions are related.
・Ability to perceive the causes and consequences of emotions.
・Ability to interpret complex emotions, such as emotional blends and contradictory feeling states.
・Ability to understand and predict likely transitions between emotions.
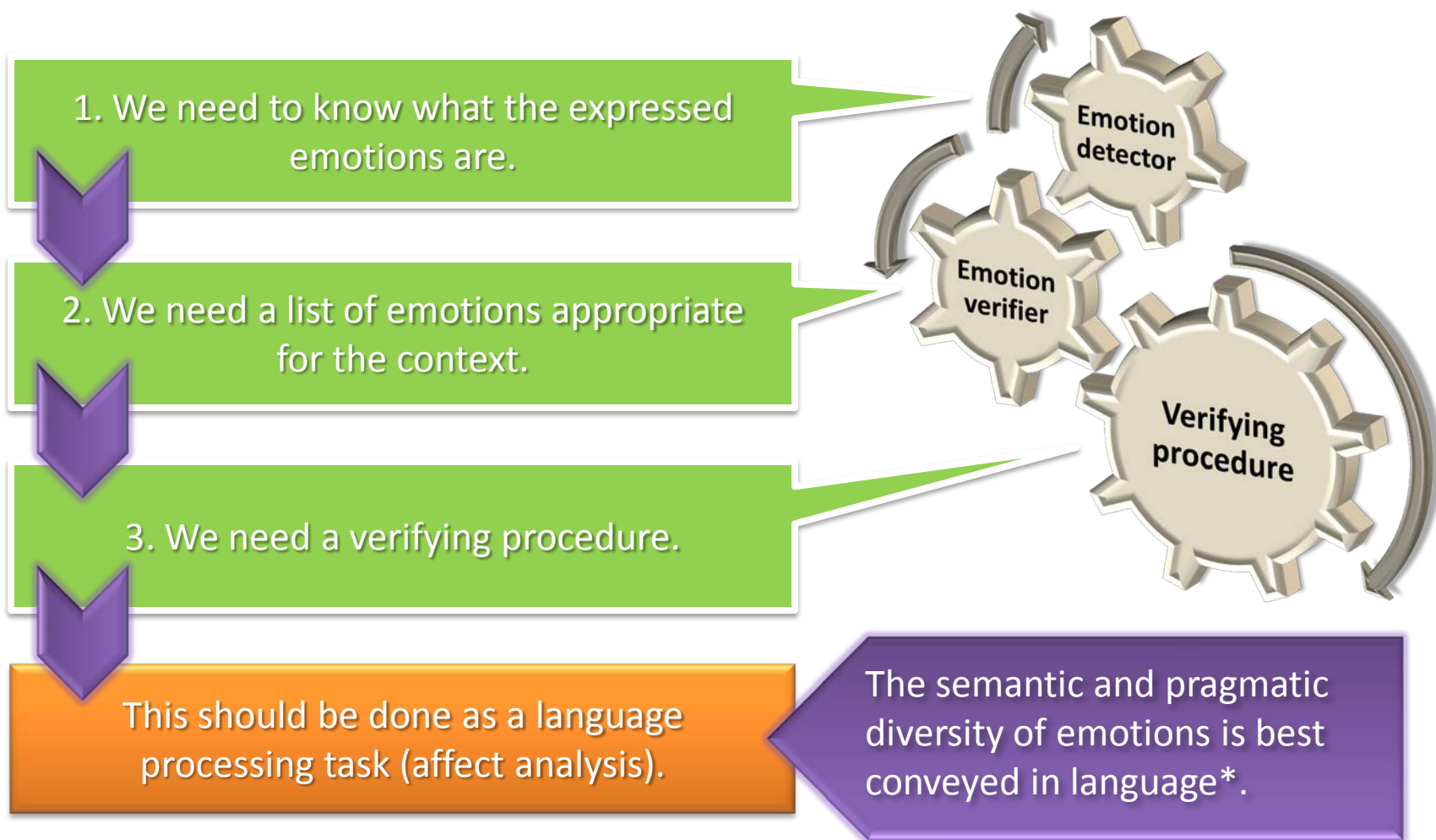
IV Regulation of emotion
・Ability to be open to feelings, both those that are pleasa…
・Ability to monitor and reflect on emotions.
・Ability to engage, prolong, or detach from an emotional…or utility.
・Ability to manage emotion in oneself and others.

Emotion management is the final ability!

John D. Mayer and Peter Salovey. *What is emotional intelligence?*, Emotional Development and Emotional Intelligence:3-31, 1997.

Appropriateness of Emotions

One of the abilities of intelligence

Ability to **determine whether an expression of emotion is appropriate** for a certain context and react adequately

Intelligent conversatio-nal agent

Know the present emotional state

Know the emotions appropriate for the context

System Features – Main Assumptions

1. We need to know what the expressed emotions are.

2. We need a list of emotions appropriate for the context.

3. We need a verifying procedure.

This should be done as a language processing task (affect analysis).

Emotion detector

Emotion verifier

Verifying procedure

The semantic and pragmatic diversity of emotions is best conveyed in language*.

*) Robert C. Solomon. *The Passions: Emotions and the Meaning of Life*, Hackett Publishing, 1993.
Schrauf, Robert W. and Julia Sanchez (2004). *The preponderance of negative emotion words across generations and across cultures.*
Journal of Multilingual and Multicultural Development, 25(2-3), 266-284.

Specificities of the Japanese language

Agglutinative language

- Morpheme : the smallest linguistic unit with semantic meaning
- Sentences are formed by joining morphemes together
- Syntax and semantics are closer than in, e.g. English

Emotion Detector
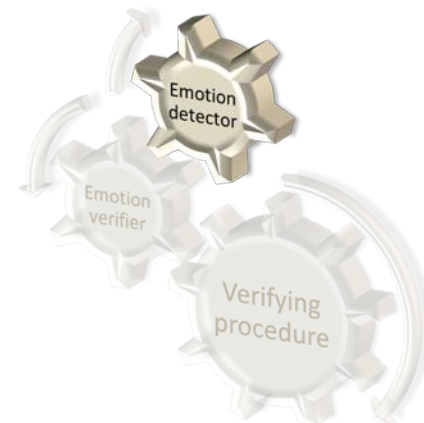
- Usual approach to affect analysis:
  - One database of emotive words*
  - Processing (Matching input using Web mining, word statistics, etc.)
  - Example: "John is a nice person."
    Emotive expression: "nice"
    emotion: liking, fondness

    …but that's just a *declarative sentence*.
    In a real conversation:
    "Oh, but John is such a nice person !"

*) For example: WordNet Affect in English: Strapparava, C., Valitutti, A.: *An Affective Extension of WordNet*, Proceedings of LREC'04, pp.1083-1086.(2004)
 In Japanese: manually build: Seiji Tsuchiya, Eriko Yoshimura, Hirokazu Watabe and Tsukasa Kawaoka, Proposal of Method to Judge Speaker's Emotion Based on Association
 Mechanism, KES2007, Vol.1, pp.847-857, 2007;   enriched with Web minig: Ryoko Tokuhisa, Kentaro Inui, and Yuji Matsumoto. Emotion classification using
 massive examples extracted from the Web. In Proceedings of the 22nd International Conference on Computational Linguistics (COLING-2008), pp881-888, Aug. 2008

Emotion Detector

- Our approach to affect analysis:

In language there are:

1. Emotive expressions*

2. Emotiveness indicators. "Emotemes" –
   Japanese emotive morphemes**

   "Oh, but John is such a nice person !"

   "Oh, but John is such a rude person !"

*) A. Nakamura, *Kanjō hyōgen jiten* (Dictionary of Emotive Expressions), Tokyodo Publishing, Tokyo (1993)
**) M. Ptaszyński, *Moeru gengo - Intānetto kei-jiban no ue no nihongo kaiwa ni okeru kanjōhyōgen no kōzō to kigōrontekikinō no bunseki – "2channeru" denshikeijiban o rei toshite* –(Boisterous language. Analysis of structures and semiotic functions of emotive expressions in conversation on Japanese Internet bulletin board forum - 2channel -), UAM, Poznań (2006)
 Michal Ptaszynski, Pawel Dybala, Rafal Rzepka and Kenji Araki. *Effective Analysis of Emotiveness in Utterances based on Features of Lexical and Non-Lexical Layer of Speech*. In Proceedings of NLP2008, pp 171-174, 2008.
Michal Ptaszynski, Pawel Dybala, Rafal Rzepka and Kenji Araki. *Affecting Corpora:Experiments with Automatic Affect Annotation System - A Case Study of the 2channel Forum -*, The Conference of the Pacific Association for Computational Linguistics (PACLING-09), September 1-4, 2009, Hokkaido University, Sapporo, Japan

Emotion Detector

Gathered manually (907 items)
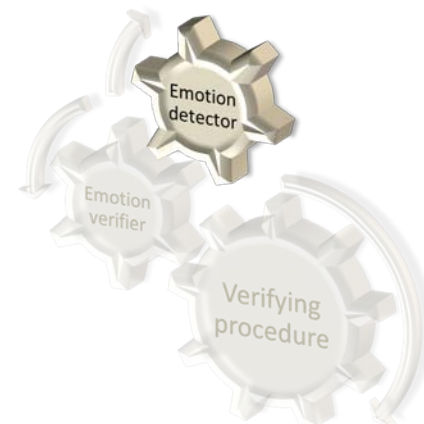
Nakamura's dictionary (2100 items)
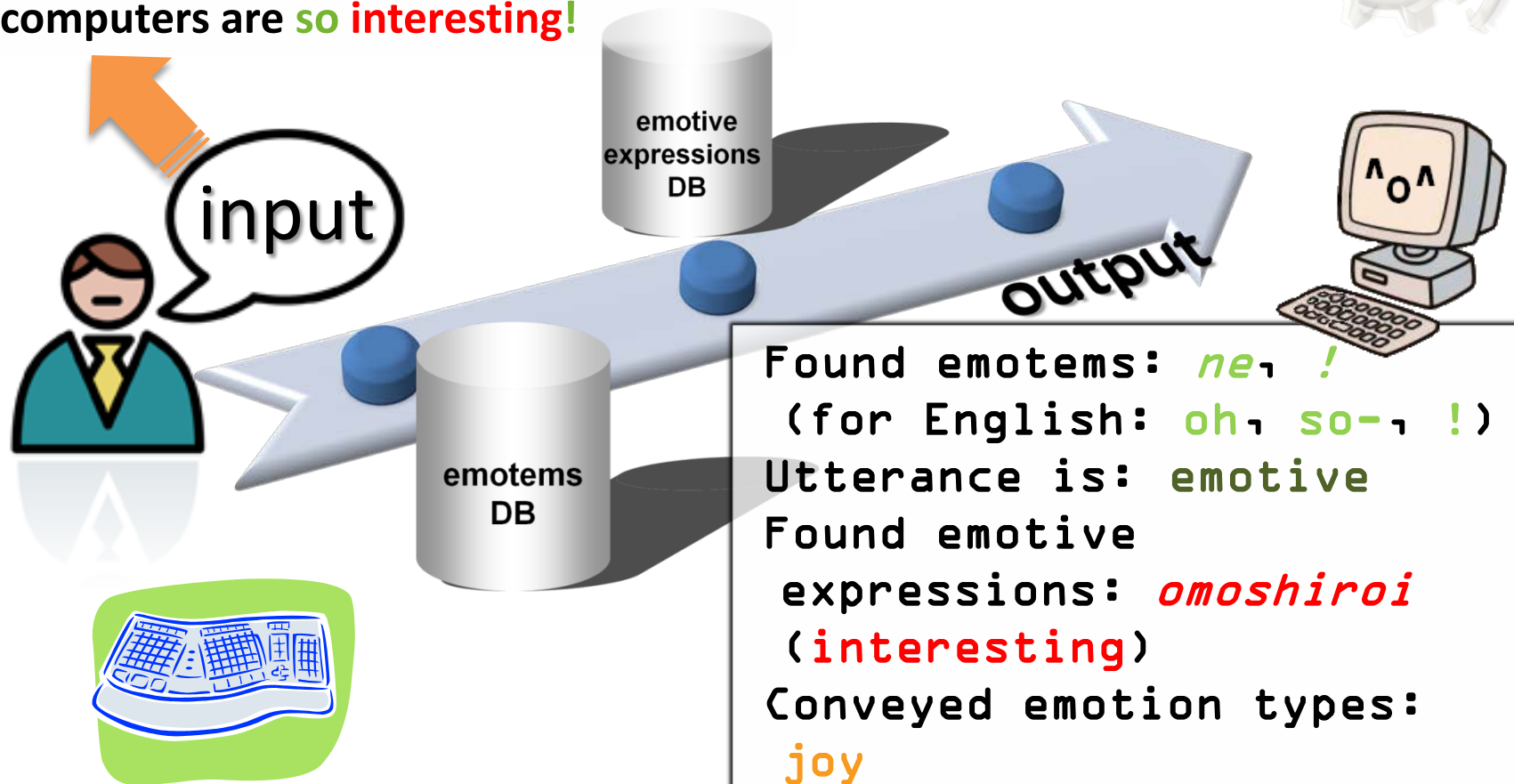
10-type emotion classification:
1. Joy, delight
2. Anger
3. Sorrow, sadness, gloom
4. Fear
5. Shame, shyness, bashfulness
6. Liking, fondness
7. Dislike, detestation
8. Excitement
9. Relief
10. Surprise, amazement

emotems DB

exclamatives
すげぇ *sugee* (great!)
うおぉ *wooo* (whoa!)

mimetics (*gitaigo*)
ワクワク *wakuwaku* (heart pounding)
ドキドキ *dokidoki* (go pit-a-pat)

vulgarities
−やがる *–yagaru* (fu**ing do sth)
くそ *kuso* (shit)
馬鹿 *baka* (stupid)

hypocorystics
−ちゃん *–chan* (name suffix)

textual representations of voice modulation and body language (emoticons)
"!" , "??", "...", (T_T), (-д-;), _|￣|O

emotive expressions DB

nouns
愛情 *aijou* (love)
安心 *anshin* (relief)
恐怖 *kyofu* (fear)

verbs
喜ぶ *yorokobu* (be glad)
悲しむ *kanashimu* (feel sad)
むかつく *mukatsuku* (get angry)

phrases / idioms
虫酸が走る *mushizu ga hashiru* (give *one* the creeps)
心が解ける *kokoro ga tokeru* (*one's* heart is melting in relief)
歓天喜地 *kantenkichi* (delight larger than Haven and Earth)

adjectives
嬉しい *ureshii* (happy)
悔しい *kuyashii* (mortifying)
怖い *kowai* (scary)

Emotion Detector

コンピュータは面白いですね!
Konpyuuta wa omoshiroi desu ne!
Oh, computers are so interesting!

input

emotive expressions DB

emotems DB

output

```
Found emotems: ne、 !
 (for English: oh、 so-、 !)
Utterance is: emotive
Found emotive
 expressions: omoshiroi
 (interesting)
Conveyed emotion types:
 joy
```

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Positive vs. negative is not enough
  - Is this particular "positive"/"negative" appropriate for this context?
    - John was in a bad mood during the party last night...

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Positive vs. negative is not enough
  - Is this particular "positive"/"negative" appropriate for this context?
    - John was in a bad mood during the party last night because he was given the sack and his girlfriend left. (Negative, but appropriate)

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Positive vs. negative is not enough
  - Is this particular "positive"/"negative" appropriate for this context?
    - John was in a bad mood during the party last night because he was given the sack and his girlfriend left. (Negative, but appropriate)
    - Mary looks happy…

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Positive vs. negative is not enough
  - Is this particular "positive"/"negative" appropriate for this context?
    - John was in a bad mood during the party last night because he was given the sack and his girlfriend left. (Negative, but appropriate)
    - Mary looks happy because she left John for a richer boyfriend and managed to steal John's project. (Positive, but inappropriate)

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Positive vs. negative is not enough
  - Is this particular "positive"/"negative" appropriate for this context?
    - John was in a bad mood during the party last night because he was given the sack and his girlfriend left. (Negative, but appropriate)
    - Mary looks happy because she left John for a richer boyfriend and managed to steal John's project. (Positive, but inappropriate)

[Expression of emotion] [causal form] [**cause of the emotion**]

Contextual Appropriateness of Emotions

Japanese tend to express emotions after expressing the cause.

今日は彼女とデートに行って楽しかった！ *Kyo wa kanojo to deeto ni itte tanoshikatta!*
"Today I went on a date with my girlfriend – it was fun!" or
   "I had so much fun because I went on a date with my girlfriend today!"

Emotions are often expressed after morphemes of causality [1]

Causality morphemes in Japanese: ***-kara, -node, -te, -to, -tara*** **(90% of all)**[2]***,-ba, -nara, -noga, -kotoga, -kotowa, -nowa***

1) Yoshitaka Yamashita. *Kara, Node, Te-Conjunctions which express cause or reason in Japanese* (in Japanese). Journal of the International Student Center, 3, Hokkiado University, 1999.
2) Wenhan Shi, Rafal Rzepka and Kenji Araki. *Emotive Information Discovery from User Textual Input Using Causal Associations from the Internet* (in Japanese). FIT-08,pp.267-268,2008.
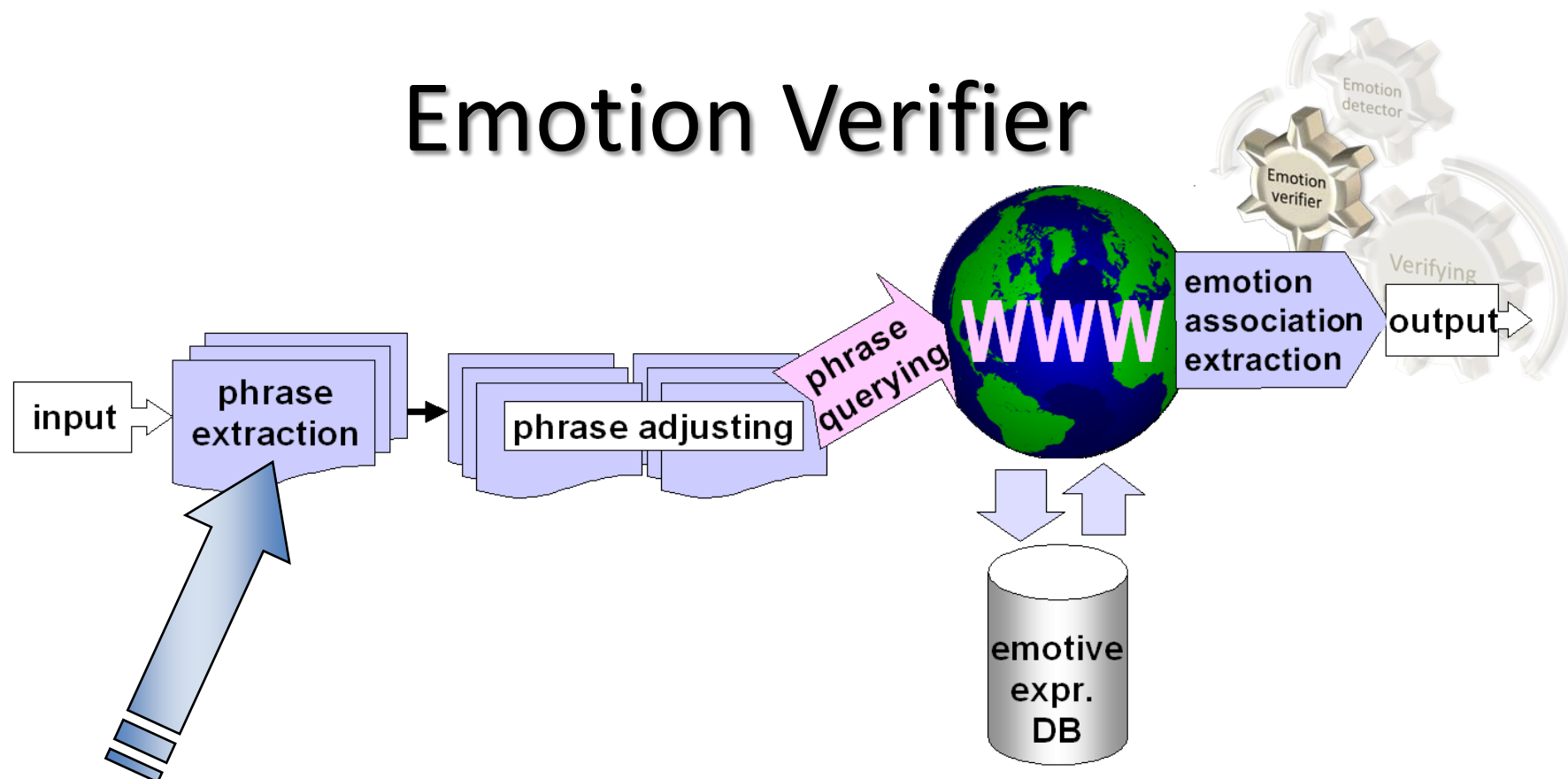
Emotion Verifier
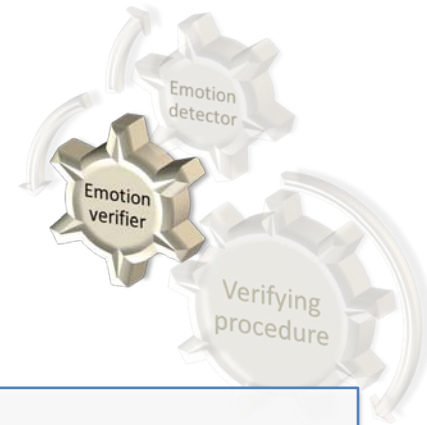
Assumption:

- On the Internet there are many sentences.
- There are many people with similar experiences.
- People express their emotions for those experiences.
- **The most frequent emotions are the most natural and appropriate for the context.**

Emotion Verifier

I'm depressed because I was given the sack and my girlfriend left…

"to be given the sack and be left by a girlfriend"
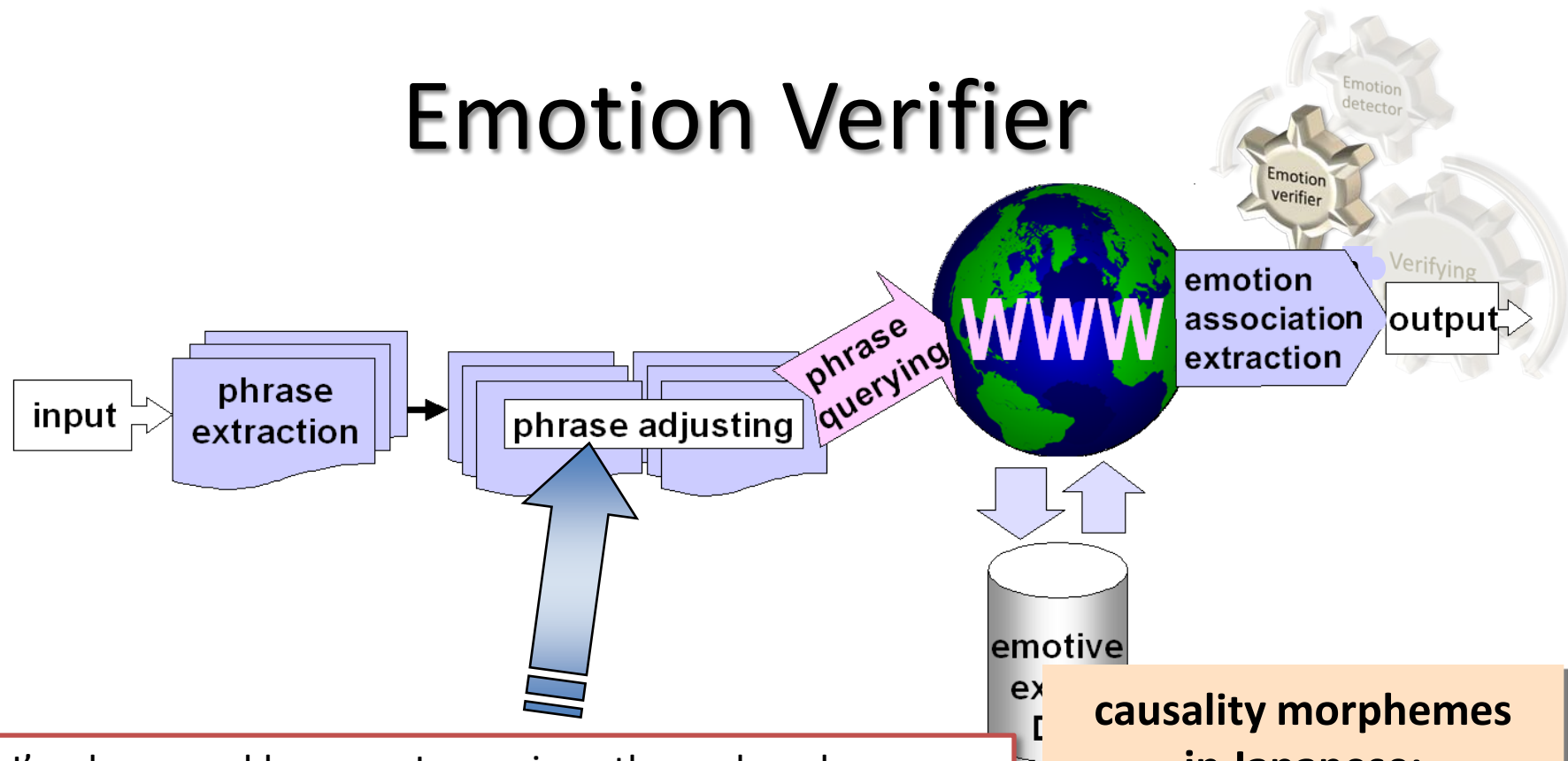"to be given the sack and be left by"
"to be given the sack"
"to be left by a girlfriend"

Longest n-gram

(n-1)-gram

⋮

trigram

Emotion Verifier

I'm depressed because I was given the sack and my girlfriend left…
"because I was given the sack and was left by a girl"
        "because I was given the sack"
        "if I was given the sack"
        "since I was given the sack"
                "because I was left by a girl"
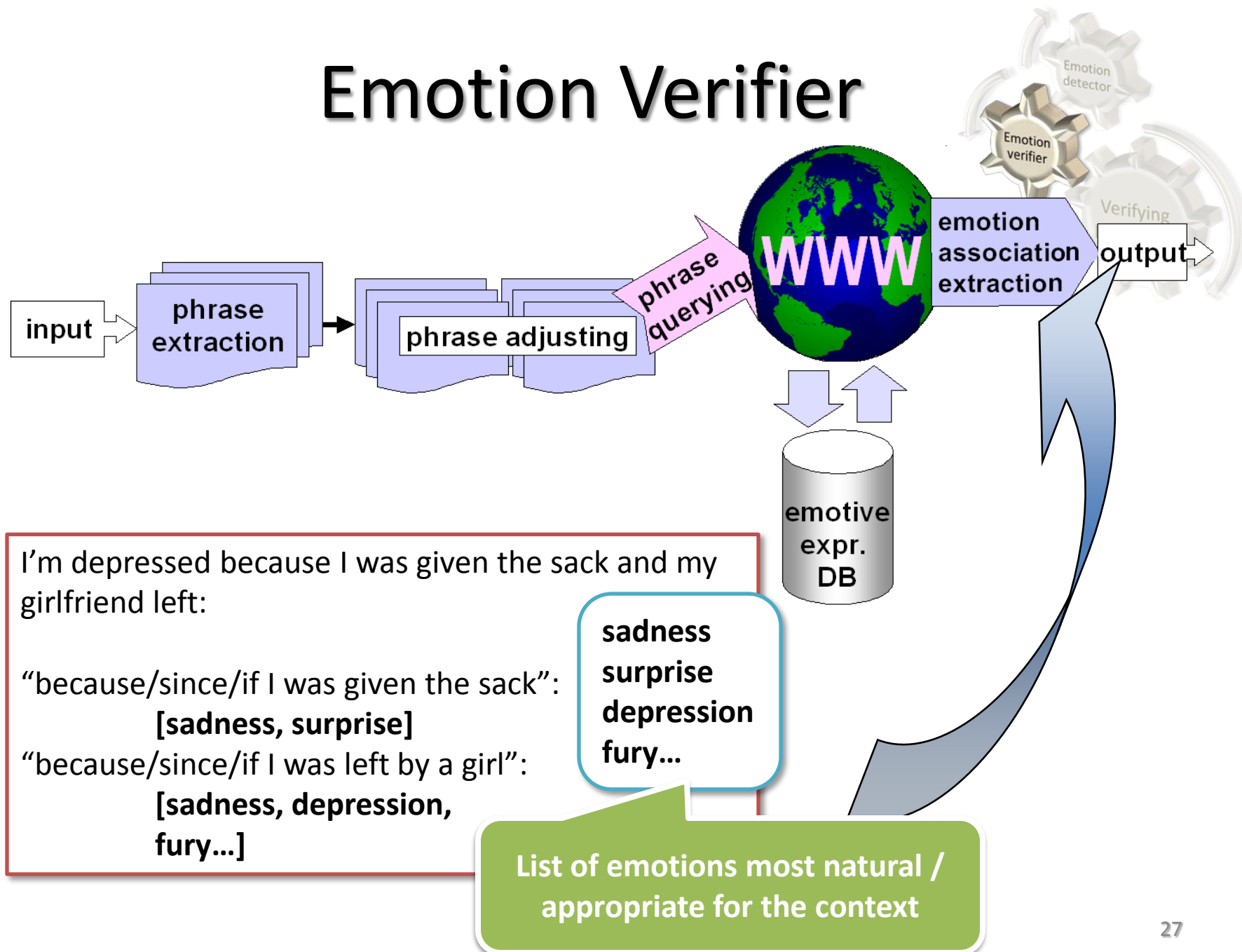   "since I was left by a girl"
                "If I was…."

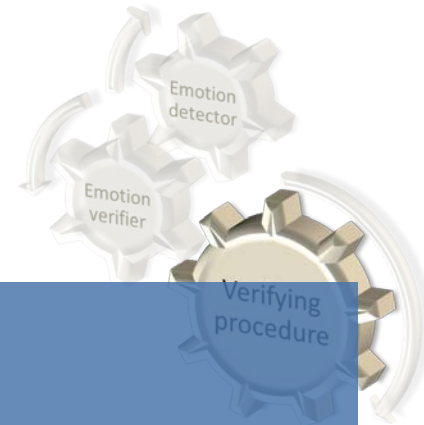**causality morphemes in Japanese:**
-te, -to, -node, -kara, -tara

Causality forms in English:
If-, because-, since-, -so, -therefore…

Emotion Verifier

I'm depressed because I was given the sack and my girlfriend left:

"because/since/if I was given the sack":
[sadness, surprise]
"because/since/if I was left by a girl":
[sadness, depression, fury...]

sadness
surprise
depression
fury...

List of emotions most natural / appropriate for the context

Verifying Procedure

コンピュータは面白いですね!

Konpyuuta wa omoshiroi desu ne!

Oh, computers are so interesting!

ML-Ask:

- Joy

Web-mining (list of natural emotions):

- Joy
- Surprise
- Excitement…

1. If an emotion type specified by ML-Ask appears on the list, it is appropriate.

Verifying Procedure
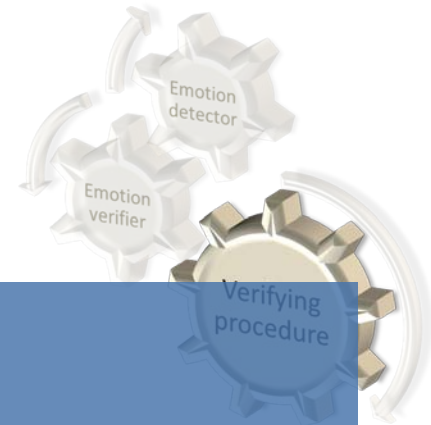
駄洒落がすきなんですね

Dajare ga suki nan desu ne.

Oh, so you like puns, don't you?
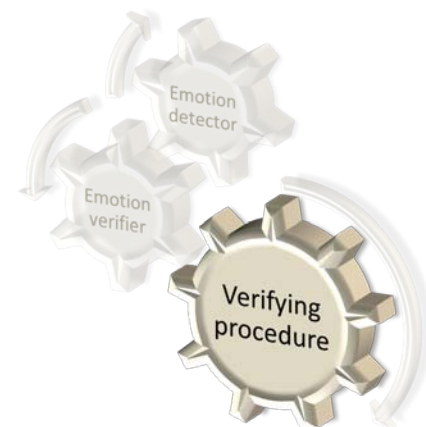
ML-Ask:

- Liking

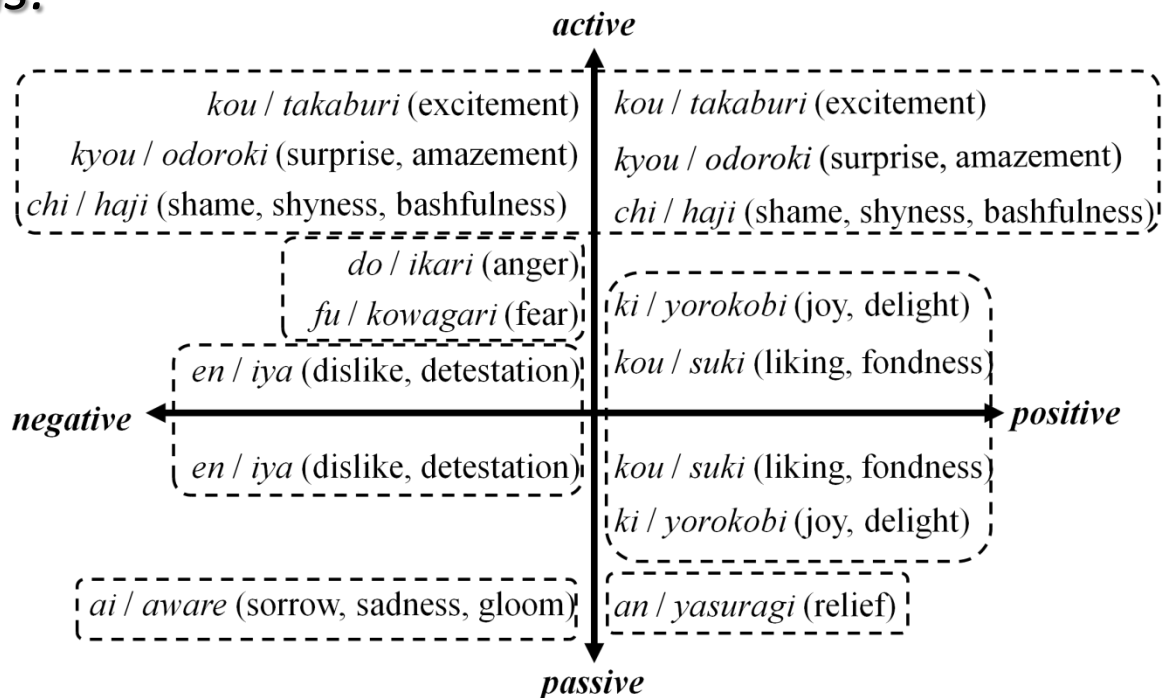## Web-mining (list of natural emotions):

- Joy
- Surprise
- ...

What if they don't match perfectly?
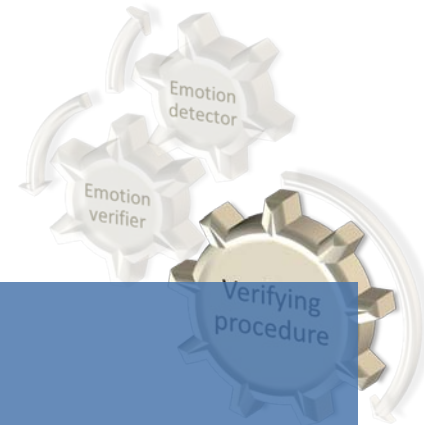
Verifying Procedure

- ## 2-dimensional model of affect

"All emotions can be described in a space of two-dimensions: valence polarity (positive / negative) and activation (active / passive)."

Nakamura's emotion types mapped on Russell's model (all possibilities)

active

kou / takaburi (excitement)　*kou / takaburi* (excitement)
kyou / odoroki (surprise, amazement)　*kyou / odoroki* (surprise, amazement)
chi / haji (shame, shyness, bashfulness)　*chi / haji* (shame, shyness, bashfulness)

do / ikari (anger)
fu / kowagari (fear)　*ki / yorokobi* (joy, delight)
en / iya (dislike, detestation)　*kou / suki* (liking, fondness)

negative ← → *positive*

en / iya (dislike, detestation)　*kou / suki* (liking, fondness)
ki / yorokobi (joy, delight)

ai / aware (sorrow, sadness, gloom)　*an / yasuragi* (relief)

passive

H. Schlosberg. *The description of facial expressions in terms of two dimensions.* Journal of Experimental Psychology, 44:229-237. 1952.
James A. Russell. *A circumplex model of affect.* Journal of Personality and Social Psychology, 39(6):1161-1178. 1980.

Verifying Procedure

駄洒落がすきなんですね

Dajare ga suki nan desu ne.

Oh, so you like puns, don't you?

ML-Ask:	Web-mining (list of natural emotions):
• Liking	• Joy
	• Surprise
	• …

2. If in the same Russell space then appropriate.
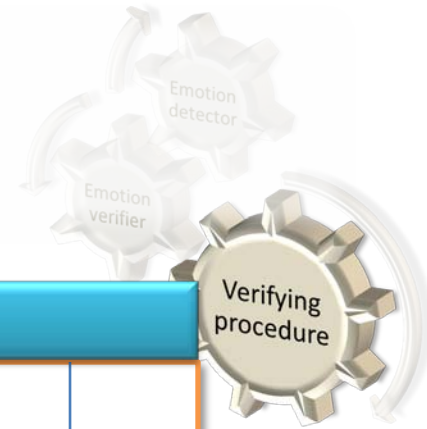
Verifying Procedure

	Negative	Positive
Appropriate	User: I hate him for making a fool of me in front of everyone. `ML-Ask: dislike;` `Web mining: anger, dislike` Agent: Yeah, you have a reason to be angry. **[empathy]**	User: I'm so happy I passed the exam! `ML-Ask: joy;` `Web mining: joy, excitement` Agent: Yeah! That's great! **[sympathy]**
Inappropriate	User: I'd be happy if that bastard was hit by a car! `ML-Ask: joy;` `Web mining: fear, sadness` Agent: Is that what you really feel? **[counsel]**	User: I won the Loebner prize, but I feel so bored. `ML-Ask: dislike, depression;` `Web mining: excitement, joy` Agent: You should be happy! **[consolation]**

Every case can be considered as one of 4 situations

Verifying Procedure

...Or in 8
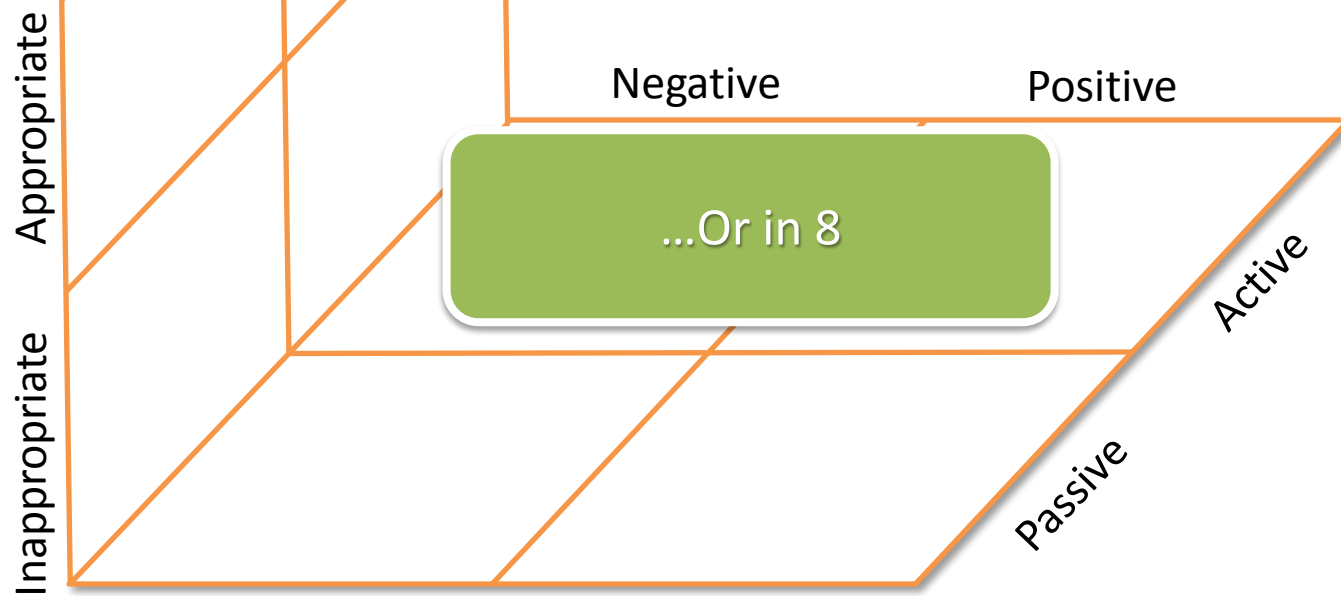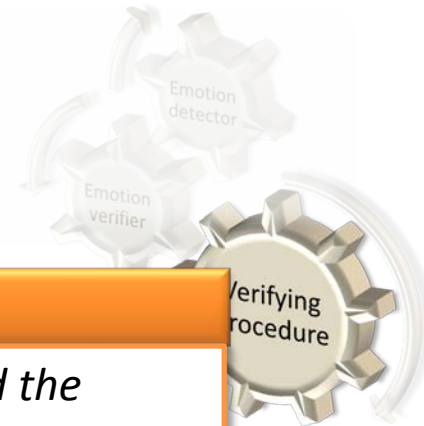
Verifying procedure

Emotions that appeared (expressed)

**Emotions that should be expressed (appropriate)**

...Or in 100

Verifying procedure

Emotion detector

Emotion verifier

Verifying procedure

Appropriate **hate**	Appropriate **joy**

User: *I hate him for making a fool of me in front of* everyone.
`ML-Ask:dislike;`
`Web mining:anger, dislike`
Agent: *You have a reason to be angry.*
`[empathy]`
	User: *I'm so happy I passed the exam!*
	`ML-Ask:joy;`
	`Web mining:joy, excitement`
	Agent: *Yeah! That's great!*
	
	`[sympathy]`

Inappropriate joy	**Inappropriate boredom/dislike**

User: *I'd be happy*
if that bastard was hit by a car!
`ML-Ask:joy;`
`Web mining:fear, sadness`
Agent: *Is that what you really feel?*
`[counsel]`
	User: *I feel so bored for winning the prize.*
	`ML-Ask:dislike, depression;`
	`Web mining:excitement, joy`
	Agent: *You should be happy!*
	`[consolation]`

Appropriate

Inappropriate

Evaluation experiment

- 13 user-participants
- 2 conversational agents
  - Modalin: modality[1]
  - Pundalin: modality + puns[2]
- 10-turn conversation
- 26 conversations (6 had no specified emotions) -> 20 conversation sets
- affect analysis, verification
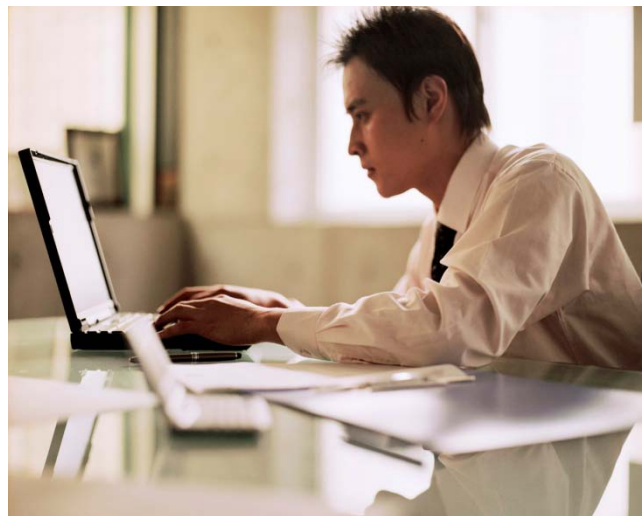
1) Shinsuke Higuchi, Rafal Rzepka and Kenji Araki. *A Casual Conversation System Using Modality and Word Associations Retrieved from the Web*. In Proceedings of the EMNLP 2008, pages 382-390, 2008.
2) Pawel Dybala, Michal Ptaszynski, Shinsuke Higuchi, Rafal Rzepka and Kenji Araki. *Humor Prevails! – Implementing a Joke Generator into a Conversational System*, LNAI 5360:214-225, Springer-Verlag, 2008.

Evaluation experiment

- Results of verification procedure – evaluated by a questionnaire
- Questionnaire:
  - Are the emotions positive / negative?
  - What were the emotion types?
  - Were the emotions appropriate for the situation?
- 20 sets / Every set evaluated by 10 people (≠users)
- Overall 200 different evaluations
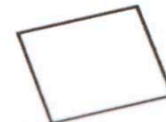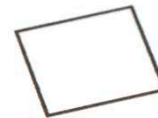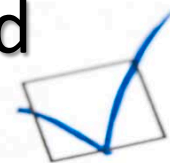
Results

- Number of people who agreed with the system per case.

No. of people	Modalin				Pundalin			
	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.
A	**5**	3	2	0	**5**	2	2	1
B	4	**5**	1	0	**5**	1	2	2
C	2	**4**	3	1	1	2	**5**	2
D	**5**	1	2	2	1	3	**4**	2

No. of people	Overall results				Summary	
	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	Rigorous (10– 4 ppl.)	Optimistic (10–1 ppl.)
A	**10**	5	4	1	75%	95%
B	**9**	6	3	2	75%	90%
C	3	6	**8**	3	45%	85%
D	**6**	4	**6**	4	50%	80%

- Evaluated items:

  A) Emotion valence recognition by ML-Ask

  B) Emotion type recognition by ML-Ask

  C) Appropriateness verification of emotion types

  D) Appropriateness verification of emotion valence

Results

	Modalin				Pundalin			
No. of people	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.
A	**5**	3	2	0	**5**	2	2	1
B	4	**5**	1	0	**5**	1	2	2
C	2	**4**	3	1	1	2	**5**	2
D	**5**	1	2	2	1	3	**4**	2

	Overall results				Summary	
No. of people	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	Rigorous (10– 4 ppl.)	Optimistic (10–1 ppl.)
A	**10**	5	4	1	75%	95%
B	**9**	6	3	2	75%	90%
C	3	6	**8**	3	45%	85%
D	**6**	4	**6**	4	50%	80%

- A perfect "10" is hard, but…

① If at least 1 person agrees – its already a human level (often in affect analysis research) [1, 2, 3]

② If 4 people out of 10 agree it's a considerable common-sense

③ For 10 people = 10 points, 0 people = 0 points

1) Ryoko Tokuhisa, Kentaro Inui, Yuji Matsumoto. *Emotion Classification Using Massive Examples Extracted from the Web*, In Proc. of Coling 2008,pp.881-888,2008.
2) Endo, D., Saito, S. and Yamamoto, K. *Kakariuke kankei wo riyo shita kanjoseikihyogen no chushutsu.*(*Extracting expressions evoking emotions using dependency structure*), Proceedings of The Twelve Annual Meeting of The Association for Natural Language Processing. 2006
3) Tsuchiya, Seiji, Yoshimura, Eriko, Watabe, Hirokazu and Kawaoka, Tsukasa. *The Method of the Emotion Judgment Based on an Association Mechanism.* Journal of Natural Language Processing, Vol.14, No.3, The Association for Natural Language Processing. 2007

Results

① Optimistic (1 person)
- A) 95%
- B) 90%
- C) 85%
- D) 80%

② Rigorous (4 people)
- A) 75%
- B) 75%
- C) 45%
- D) 50%

③ Points
- A) 63%
- B) 55%
- C) 36%
- D) 45%

	Modalin				Pundalin			
No. of people	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.
A	5	3	2	0	5	2	2	1
B	4	5	1	0	5	1	2	2
C	2	4	3	1	1	2	5	2
D	5	1	2	2	1	3	4	2

	Overall results				Summary	
No. of people	10-7 ppl.	6-4 ppl.	3-1 ppl.	0 ppl.	Rigorous (10–4 ppl.)	Optimistic (10–1 ppl.)
A	10	5	4	1	75%	95%
B	9	6	3	2	75%	90%
C	3	6	8	3	45%	85%
D	6	4	6	4	50%	80%

Conclusions

Computing contextual appropriateness of emotions is a feasible task.

Presented method uses:

Affect analysis system
to recognize user's emotions…

Web mining technique
to verify their contextual appropriateness

Conclusions

- Agent equipped with our system can determine what communication strategy is the most desirable

- Applications

  – Personal conversational agent (free counselor for stress management, 24h/7/365)

  – Toy-companion for kids (as a part of education & safety application)

Future Work

- Improve ML-Ask
  - Add Contextual Valence Shifters (see ARCOE-09)
  - Enlarge databases
  - Disambiguate emotive type affiliation of emotemes
- Improve Web mining
  - Mine only specified areas (blogs, forums)
- Experiments on different corpora
  - natural conversations, forums, chat-room logs
- Implementation in conversational agent
  - specify the conversational strategies for each case

Future Work

Implement other abilities from the Emotional Intelligence Framework:

<u>I Perception, appraisal, and expression of emotion</u>

・Ability to recognize emotion in one's physical and psychological states, in other people and objects.

・Ability to discriminate between accurate and inaccurate, appropriate and inappropriate, honest and dishonest, expressions of emotions.

・Ability to express emotions accurately, and to express needs related to them.

<u>II Emotional facilitation of thinking</u>

・Ability to redirect and prioritize one's thinking based on the feelings associated with objects, events, and other people.

・Ability to generate or emulate vivid emotions to facilitate judgments and memories concerning feelings.

・Ability to capitalize on mood swings to take multiple points of view; ability to integrate these mood-induced perspectives.

・Ability to use emotional states to facilitate problem solving and creativity.

<u>III Understanding and analyzing emotional information; employing emotional knowledge</u>

・Ability to understand how different emotions are related.

・Ability to perceive the causes and consequences of emotions.

・Ability to interpret complex emotions, such as emotional blends and contradictory feeling states.

・Ability to understand and predict likely transitions between emotions.

<u>IV Regulation of emotion</u>

・Ability to be open to feelings, both those that are pleasant and those that are unpleasant.

・Ability to monitor and reflect on emotions.

・Ability to engage, prolong, or detach from an emotional state, depending upon its judged informativeness or utility.

・Ability to manage emotion in oneself and others.
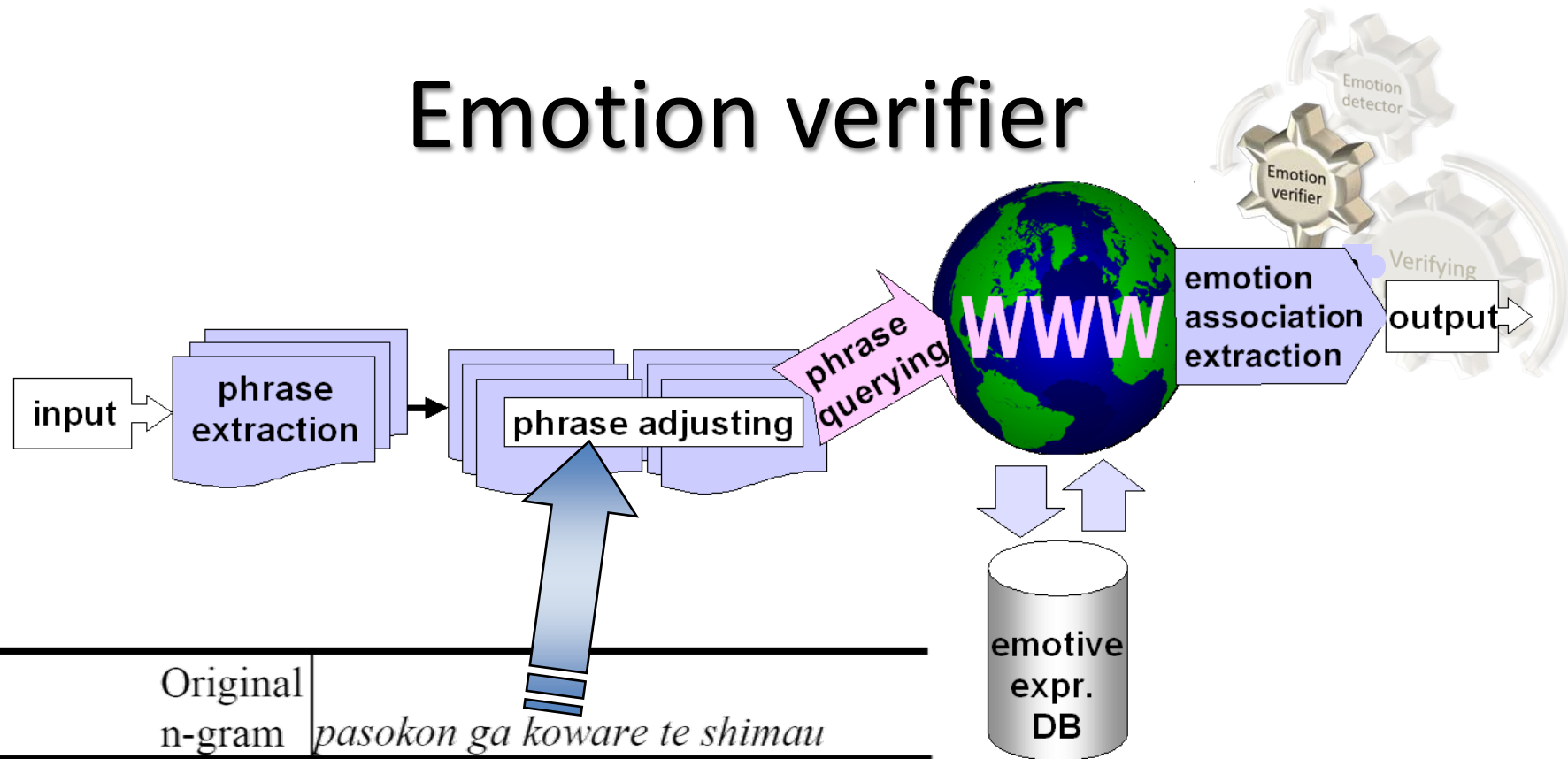
44

Thank you for your attention!

Michal PTASZYNSKI
Language Media Laboratory
Graduate School of Information Science and Technology
Hokkaido University
Address: Kita-ku, Kita 14 Nishi 9, 060-0814 Sapporo, Japan
E-mail: ptaszynski@media.eng.hokudai.ac.jp

Emotion Verifier
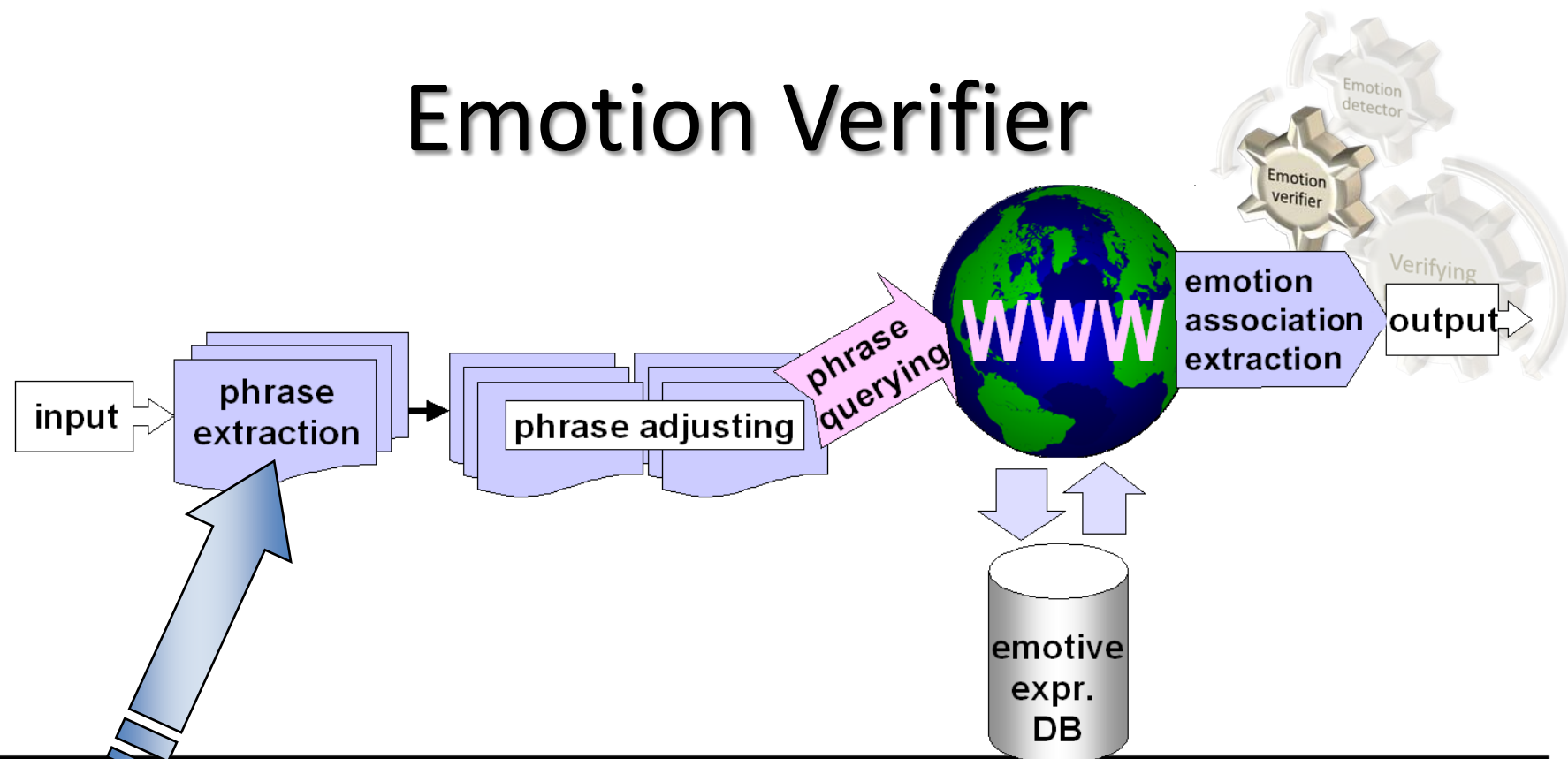
Original utterance	*Aa, pasokon ga kowarete shimatta…*(Oh no, the PC has broken…)		
longest n-gram (here: hexagram)	*Aa* [interjection] *pasokon* [noun] *ga* [particle] *kowareru* [verb] *te* [verb connector] *shimau* [perfect form]		
pentagram	*pasokon ga koware te shimau*		
tetragram	*Aa, pasokon ga kowareru*		
trigrams	*pasokon ga kowareru*	*koware te shimau*	

Emotion verifier

input → phrase extraction → phrase adjusting → phrase querying → **WWW** → emotion association extraction → output

emotive expr. DB

		Original n-gram	*pasokon ga koware te shimau*
n-gram phrase adjusting	(morpheme modification)	/ -te /	*pasokon ga koware te shima- tte*
		/ -to /	*pasokon ga koware te shimau to*
		/ -node /	*pasokon ga koware te shimau node*
		/ -kara /	*pasokon ga koware te shimau kara*
		...	...

morphemes of causality:
-te, -to, -node, -kara, -tara

Emotion verifier

input

phrase extraction

phrase adjusting

phrase querying

WWW

emotion association extraction

output

Emotion detector

Emotion verifier

Verifying

emotive expr. DB
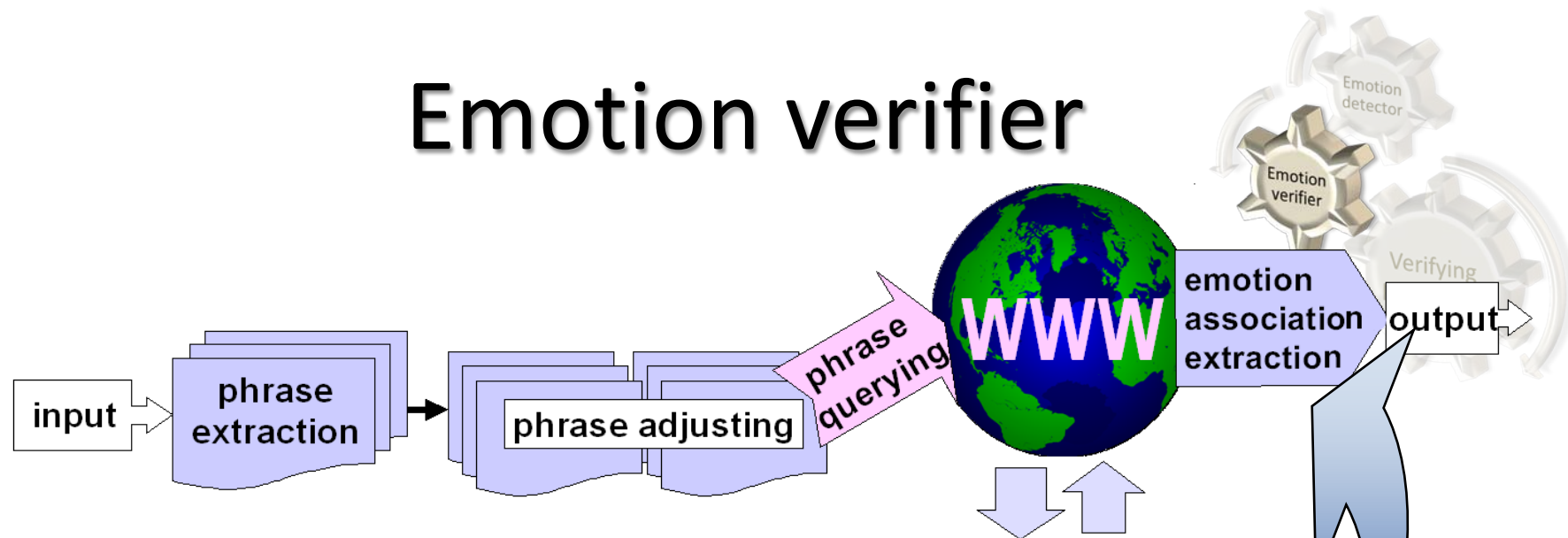
Take only 50% of results

Sentence: *Aa, pasokon ga kowarete shimatta…* (Oh no, the PC has broken…)

Extracted emotion type	Type extracted / all extracted types	Ratio
[fear]	28/133	0.210526315789474
[sorrow, sadness]	26/133	0.195488721804511
[dislike, detestation]	16/133	0.120300751879699
[liking, fondness]	14/133	0.105263157894737
[relief]	12/133	0.090225563909
[excitement]	11/133	0.0827067669
[joy, delight]	10/133	0.075187969924812
[surprise, amazement]	9/133	0.067669172932330
[anger]	5/133	0.037593984962406
[shame, shyness, bashfulness]	2/133	0.015037593984962