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Shifting Valence Helps Verify Contextual Appropriateness of Emotions

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Presentation Outline

1. Introduction
2. Specificities of the Japanese language
3. ML-Ask – Automatic affect annotation tool
4. Contextual Valence Shifters
5. Contextual Appropriateness of Emotions
6. Verifying procedure
7. Evaluation Experiment
8. Results
9. Conclusions & Future Work

INTRODUCTION

- Ontology - a formal representation of a group of concepts within a domain including relationships between those concepts.
- Applications (thousands!):
  - Industry [1]
  - Business [2]
  - Biology and biomedical informatics [3]
  - Information science:
    - Information retrieval, document classification
    - **affect analysis** [4]

1) Diez-Orzas, Pedro, Antonietta Alonge ``Exploiting data from the EuroWordNet database for industrial applications'' In: Proceedings of the 1st International Conference on Language Resources and Evaluation , pp. 857-64, Granada, Spain, 1998.
2) N. Izumi and T. Yamaguchi: Supporting Development of Business Applications Based on Ontologies, International Conference on Electronic Commerce, pp.893-897 (2001)
3) Bodenreider, O. and A. Burgun and J.A. Mitchell ``Evaluation of WordNet as a source of lay knowledge for molecular biology and genetic diseases: A feasibility study'' In: Studies in Health Technology and Informatics , pp. 379-384, vol.95, 2003
4) A Neviarouskaya, H Prendinger, M Ishizuka, *Recognition of Affect Conveyed by Text Messaging in Online Communication,* Lecture Notes in Computer Science, 2007, Springer

INTRODUCTION

- Ontology - Examples:
  - WordNet [1] (Development began in 1985)
  - OpenCyc [2]

1) http://wordnet.princeton.edu/
Miller, George A. ``WordNet: a dictionary browser.'' In: Proceedings of the First International Conference on Information in Data, University of Waterloo, Waterloo, 1985.
2) http://www.opencyc.org/

INTRODUCTION

- Ontology - Examples:
  - WordNet [1] (Development began in 1985)
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- For Japanese (our processing language):
  - YATO: Yet Another Top-level Ontology [3]
  - Japanese WordNet [4] NEW (released in February 2009, 24 years after English version)

1) http://wordnet.princeton.edu/
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2) http://www.opencyc.org/
3) http://133.1.32.226/OntologyViewer/view.jsp?id=onto4
4) http://nlpwww.nict.go.jp/wn-ja/index.en.html

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    …
- For Affect analysis (in English):
  - WordNet Affect [5]

1) http://wordnet.princeton.edu/
   Miller, George A. ``WordNet: a dictionary browser.'' In: Proceedings of the First International Conference on Information in Data, University of Waterloo, Waterloo, 1985.
2) http://www.opencyc.org/
3) http://133.1.32.226/OntologyViewer/view.jsp?id=onto4
4) http://nlpwww.nict.go.jp/wn-ja/index.en.html
5) http://wndomains.itc.it/download.html
   C Strapparava, A Valitutti , *WordNet-Affect: an affective extension of WordNet*, Proceedings of LREC, 2004

INTRODUCTION

- Ontology development:
  - Time (Japanese WordNet – 24 years after English WordNet [still in development])
  - Effort (many things tagged and evaluated manually)
  - Still lacking of many ontologies!
    (No WordNet Affect for Japanese)
- Ontology evolution (one of the meanings):
  - Limitations! -> Need higher level information about context

INTRODUCTION

- Ontology development:
  - Need to do things faster
  - **Automatize tagging, annotation**
  - Automatize evaluation

- Ontology evolution (one of the meanings):
  - Limitations! -> Need higher level information about context

    Pragmatics (contextual use of language):
    - Evaluative information (good vs. bad)
    - Super-evaluative information (e.g. **what is appropriate for which context?**)*

*) In this research, by “context” we mean a context induced by one sentence.

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

ML-ASK – AUTOMATIC AFFECT ANNOTATION TOOL

- Usual approach to affect analysis:
  - A 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

ML-ASK – AUTOMATIC AFFECT ANNOTATION TOOL

- 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)

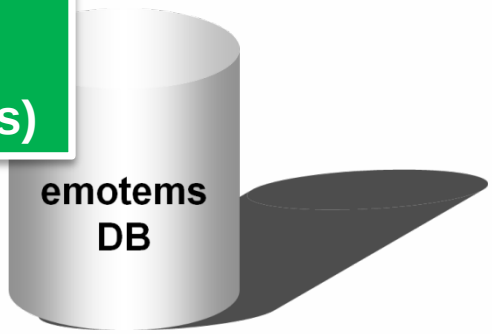
**) M. Ptaszyński, *Moeru gengo - Intānetto kei-jiban no ue no nihongo kaiwa ni okeru kanjōhyōgen no kōzō to kigōrontekikinō no bunseki – "2channeru„ denshikeijiban o rei toshite* –(Boisterous language. Analysis of structures and semiotic functions of emotive expressions in conversation on Japanese Internet 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

ML-ASK – AUTOMATIC AFFECT ANNOTATION TOOL

Gathered manually (907 items)



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)

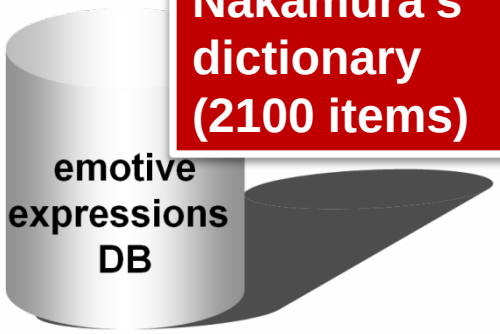
hypocorystics

–ちゃん *–chan* (name suffix)

textual representations of voice modulation and body language (emoticons)

"!", "??", "…", (T_T), (-д-;), __|￣|○

Nakamura's dictionary (2100 items)



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

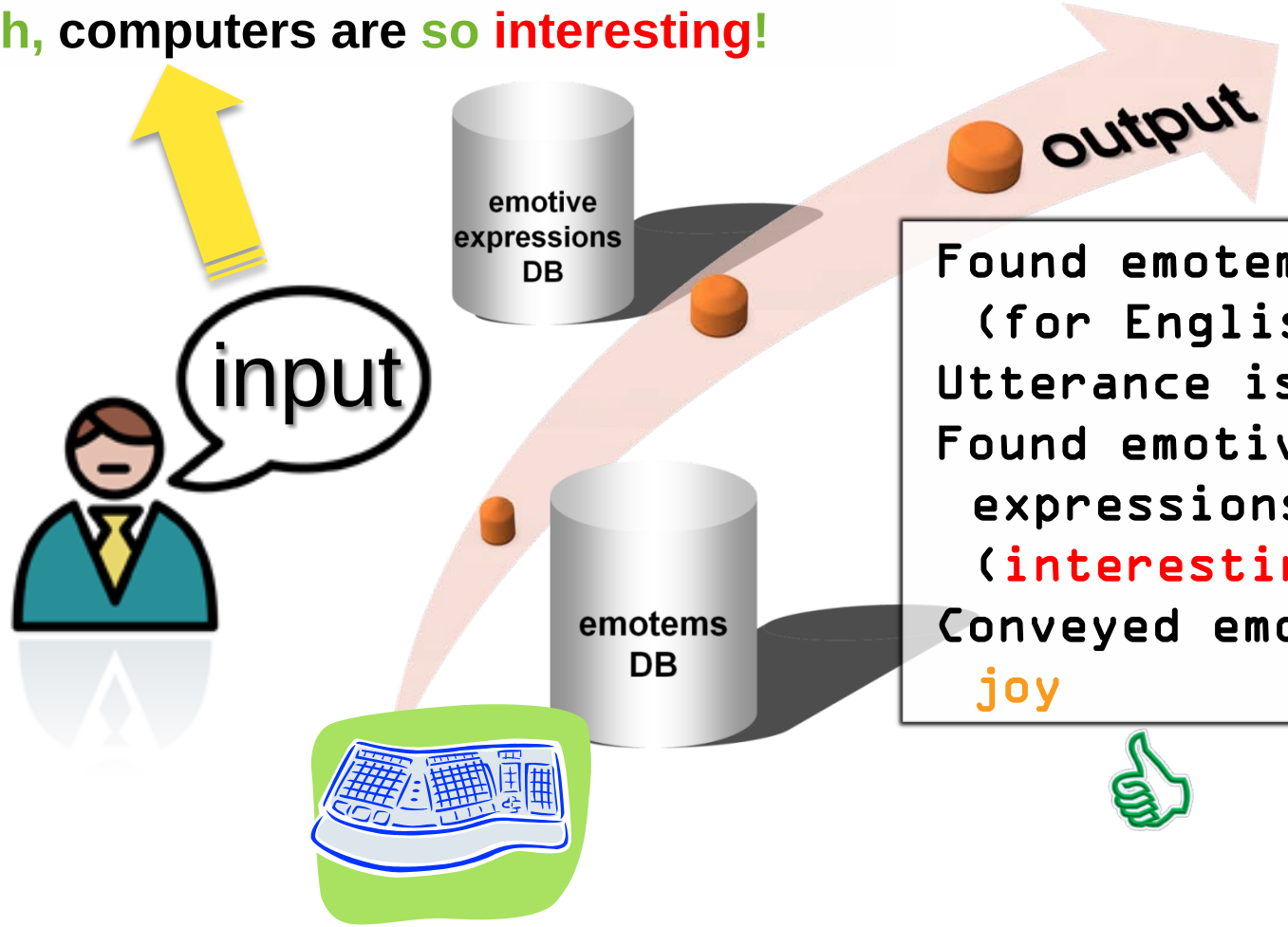
嬉しい *ureshii* (happy)
悔しい *kuyashii* (mortifying)
怖い *kowai* (scary)

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

ML-ASK – AUTOMATIC AFFECT ANNOTATION TOOL

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 – AUTOMATIC AFFECT ANNOTATION TOOL

Problematic inputs:

あんまり面白くなかったな…
Anmari omoshiroku nakatta na…
Oh, it wasn't that interesting...

```
Found emotems: na, ...
 (for English: oh, ...)
Utterance is: emotive
Found emotive
 expressions: omoshiroi
 (interesting)
Conveyed emotion types:
 joy
```

ML-ASK – AUTOMATIC AFFECT ANNOTATION TOOL

Problematic inputs:

あんまり面白くなかったな…
Anmari omoshiroku nakatta na…
Oh, it wasn't that interesting...

"not that-" changes the valence

```
Found emotems: na, ...
 (for English: oh, ...)
Utterance is: emotive
Found emotive
 expressions: omoshiroi
 (interesting)
Conveyed emotion types:
 joy
```

Contextual Valence Shifters

- Polanyi, L. and Zaenen, A. (2004) 'Contextual Valence Shifters', *AAAI Spring Symposium on Exploring Attitude and Affect in Text: Theories and Applications.*

  (Published later by Springer : *Computing Attitude and Affect in Text: Theory and Applications)*

Contextual Valence Shifters

- Definition:

  The group of words and phrases, which change the semantic orientation (valence polarity) of an evaluative word.

  negations: not- , never-, etc., in Japanese: *amari -nai* (not quite-)*, mattaku -nai* (not at all-)*, or sukoshi mo -nai* (not even a bit-)*.*

  intensifiers: very- , deeply- , etc., in Japanese: *totemo-* (very much-), *sugoku-* (-a lot)*, or kiwamete-* (extremely)*.*

Contextual Valence Shifters

Examples:

John **is** clever vs. John **is not** clever.

clever +1 combined with *not* ->*not clever* -1

John **is** successful at tennis vs. John **is never** successful at tennis.

successful +1 combined with *not* -> *not successful* -1

Each of them is successful vs. **None** of them is successful.

Polanyi, L. and Zaenen, A. (2004)

Contextual Valence Shifters

*) Emotive expressions – red
Emotemes – green

11/8/2009

1. 諦めちゃいけないよ！

Akirame cha ikenai yo!

Don't cha give up!

CVS constructions:
-cha ikenai / -tewa ikenai (don't you, you cannot)

2. それほど面白くもなかったよ。

Sore hodo omoshiroku mo nakatta yo.

Oh, come on, it wasn't that interesting.

CVS constructions:
-mo nakatta / -mo nai (it is/was not that)

Contextual Valence Shifters

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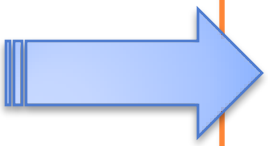


"Give up" in Nakamura's dictionary = "dislike" which emotion type is "not-dislike" ??

2. それほど面白くもなかったよ。

Sore hodo omoshiroku mo nakatta yo.

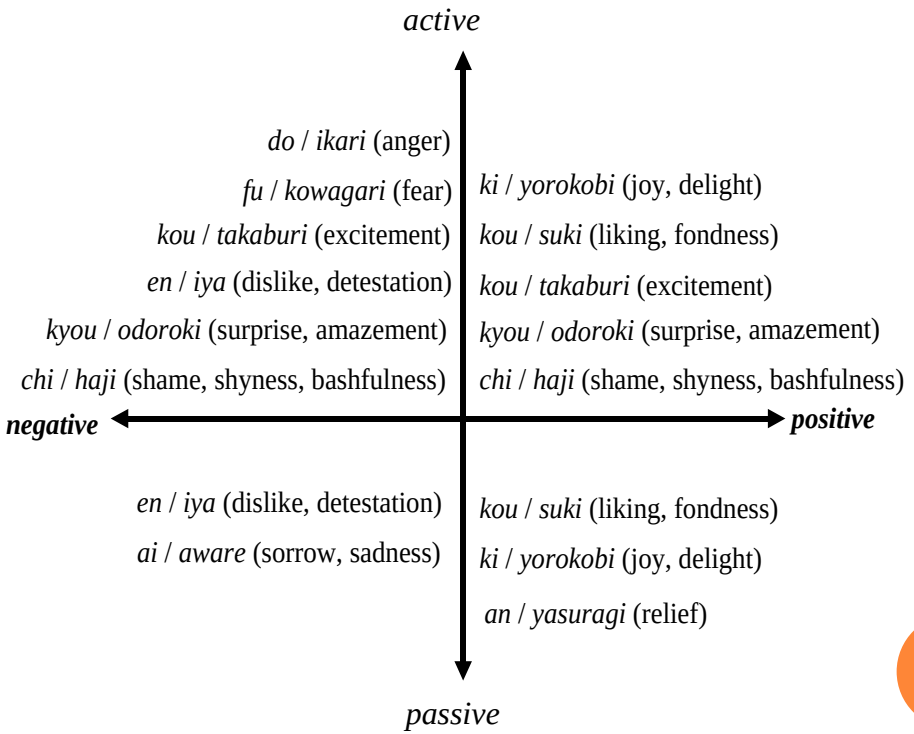
Oh, come on, it wasn't that ineteresting.

"interesting" in Nakamura's dictionary = "joy" which emotion type is "not-joy" ??

Contextual Valence Shifters

- 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)

H. Schlosberg. "The description of facial expressions in terms of two dimensions." Journal of Experimental Psychology, 44:229-237. 1952.
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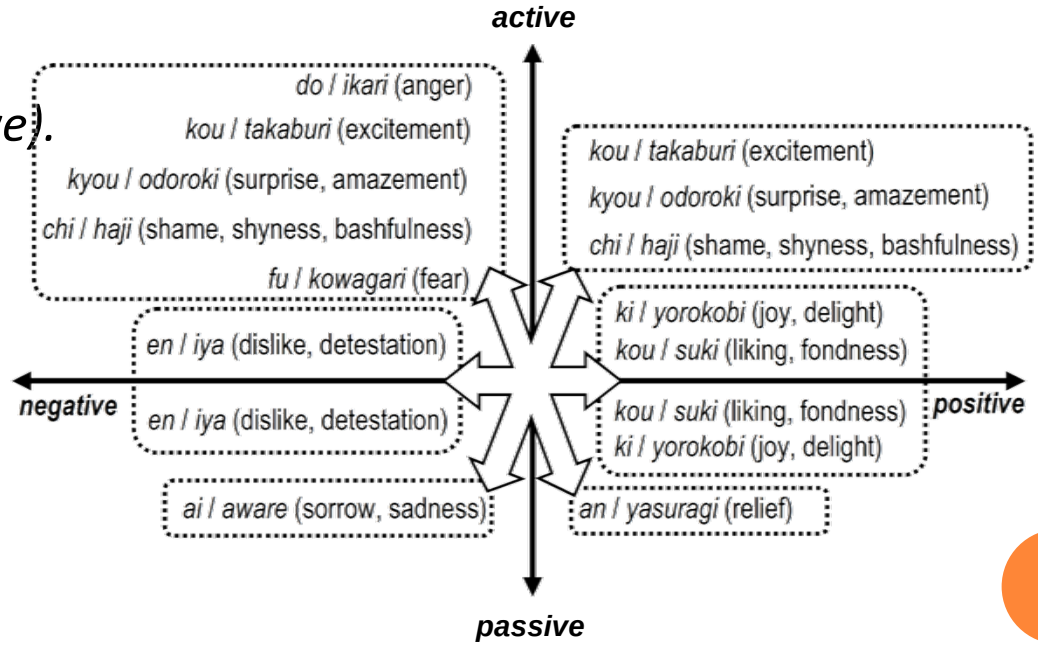

Assumption:
CVS negation changes both valence and activation parameters

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Contextual Valence Shifters

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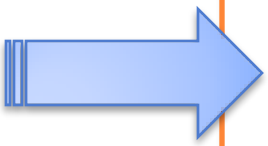

"give up" = "dislike"
"not-dislike" = "joy, fondness"
(includes "encouragement")

2. それほど面白くもなかったよ。

Sore hodo omoshiroku mo nakatta yo.

Oh, come on, it wasn't that ineteresting.

"interesting" = "joy"
"not-joy" = "dislike"
(includes "boredom")

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  - Need to do things faster
  - ☑ **Automatize tagging, annotation**
  - Automatize evaluation

- Ontology evolution (one of the meanings):
  - Limitations! -> Need higher level information about context

    Pragmatics (contextual use of language):
    - Evaluative information (good vs. bad)
    - Super-evaluative information (e.g. **what is appropriate for which context?**)*

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - Good vs. bad is not enough
  - Is this particular “good”/“bad” appropriate for this context?
    - John was in a bad mood during the party last night…

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    - John was in a bad mood during the party last night because he was given the sack and his girlfriend left. (Negative, but appropriate)

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    - Mary looks happy…

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

CONTEXTUAL APPROPRIATENESS OF EMOTIONS

Japanese tend to express emotions after expressing their cause. (in English – both, before or after)

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*

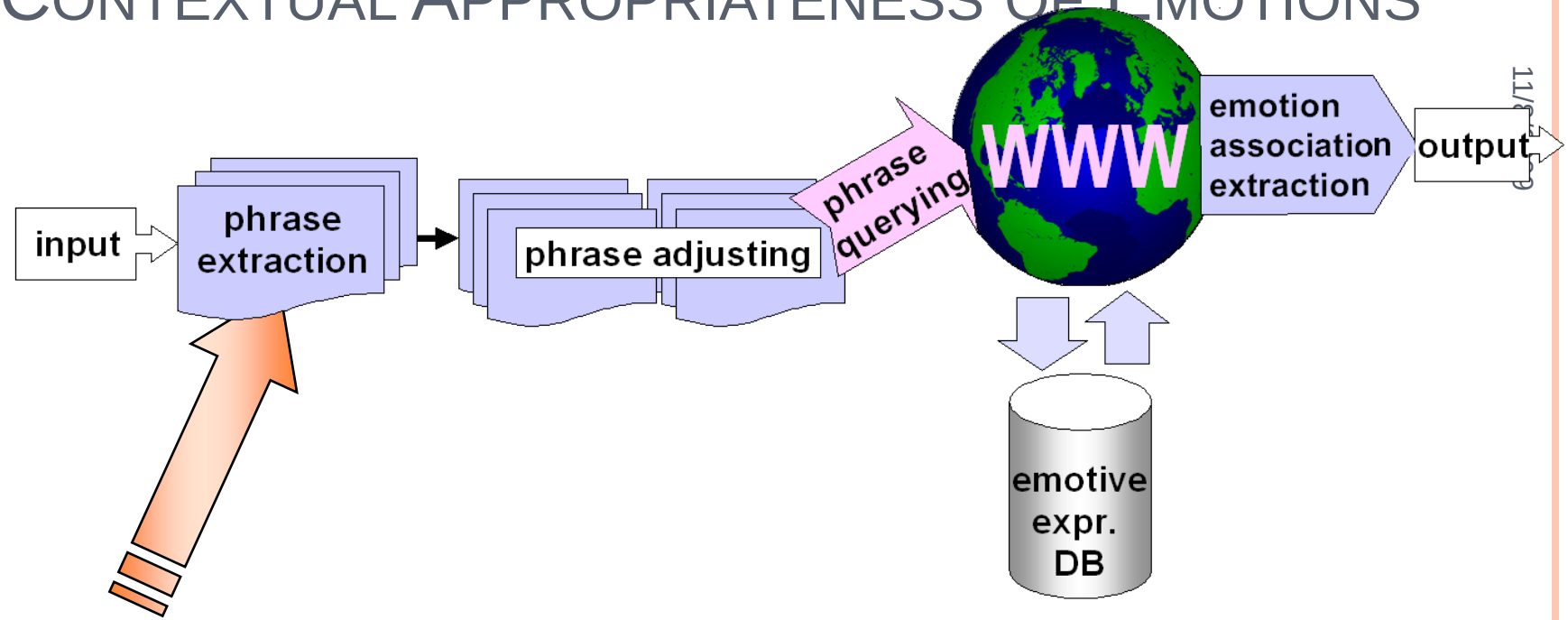
1) Yoshitaka Yamashita. *Kara, Node, Te-Conjunctions which express cause or reason in Japanese* (in Japanese). Journal of the International Student Center, 3, Hokkiado University, 1999.
2) Wenhan Shi, Rafal Rzepka and Kenji Araki. *Emotive Information Discovery from User Textual Input Using Causal Associations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

Contextual Appropriateness of Emotions

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.**

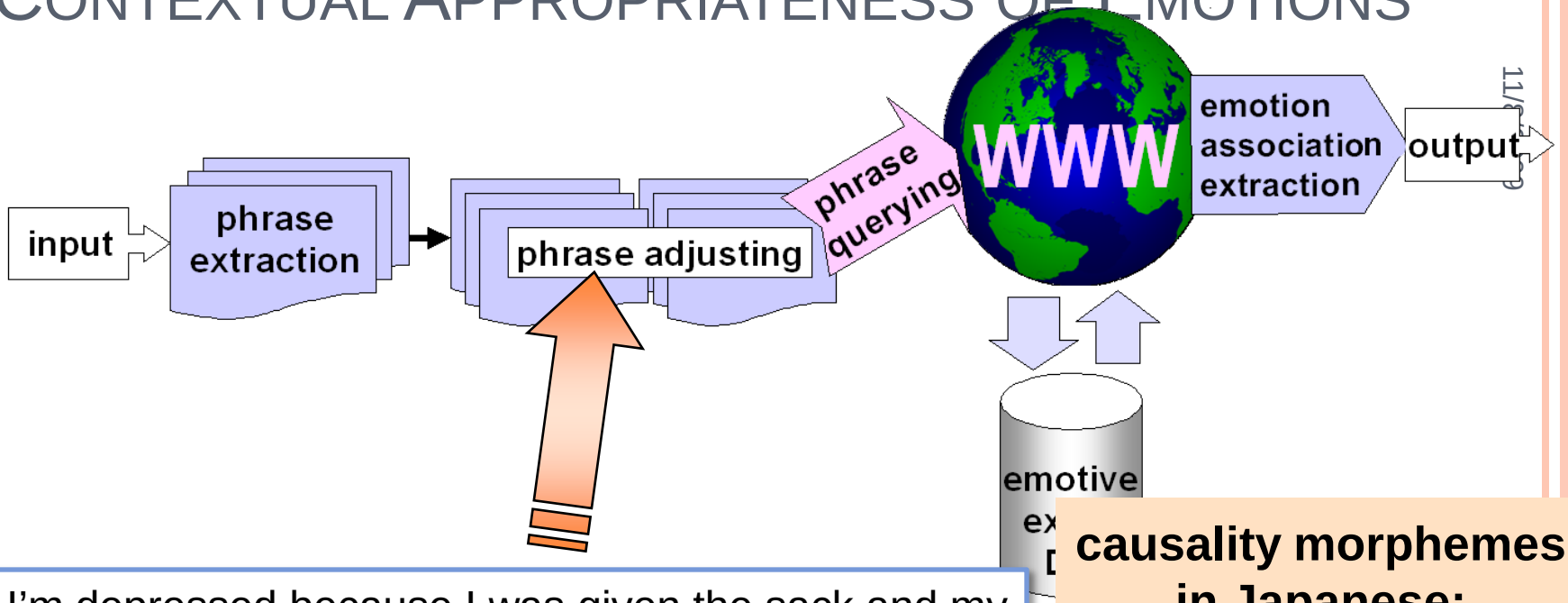
Contextual Appropriateness of Emotions



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"
"to be left by a girlfriend"

CONTEXTUAL APPROPRIATENESS OF EMOTIONS



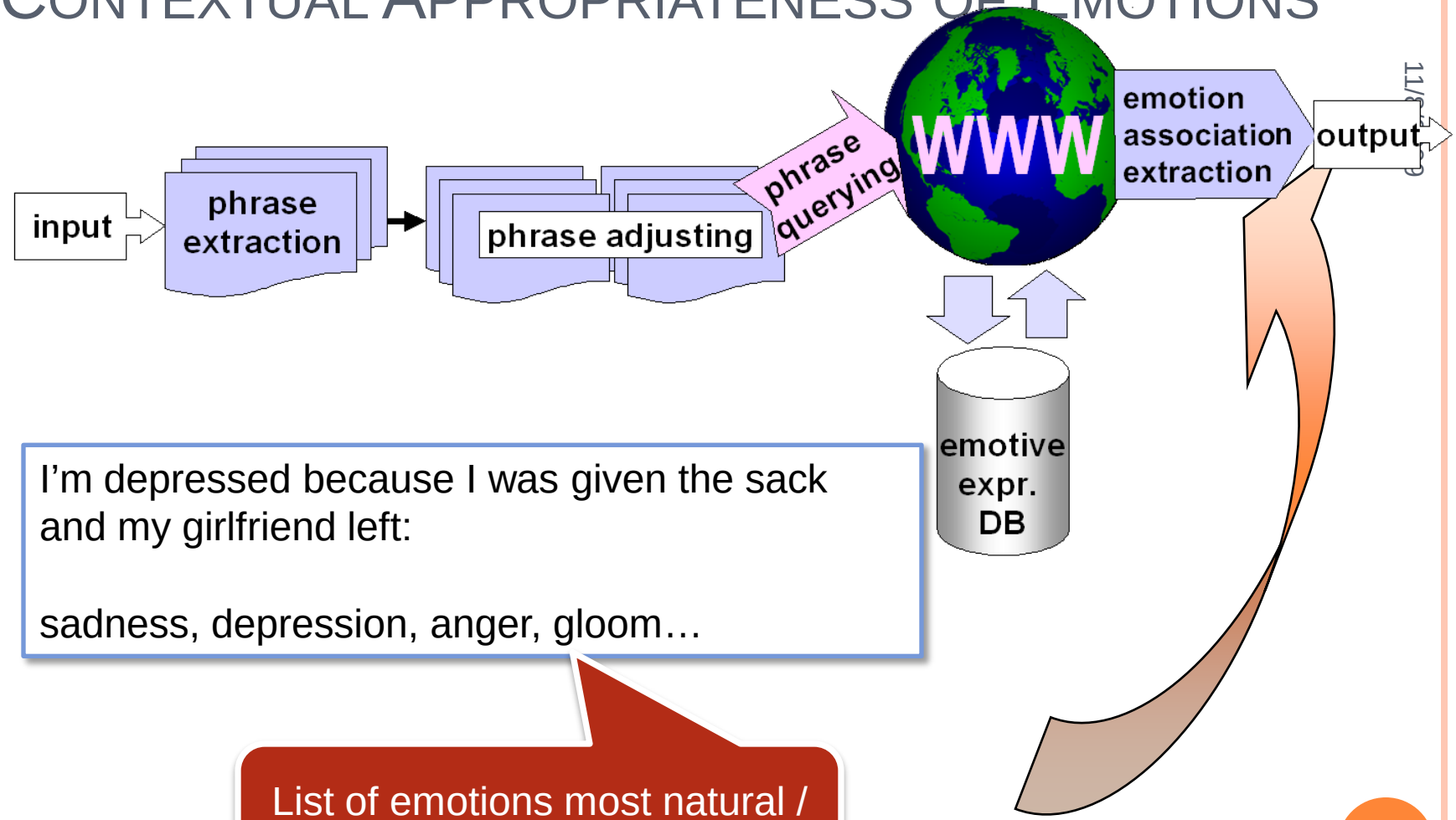
I'm depressed because I was given the sack and my girlfriend left:

"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…"

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

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

Contextual Appropriateness of Emotions



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

sadness, depression, anger, gloom…

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):

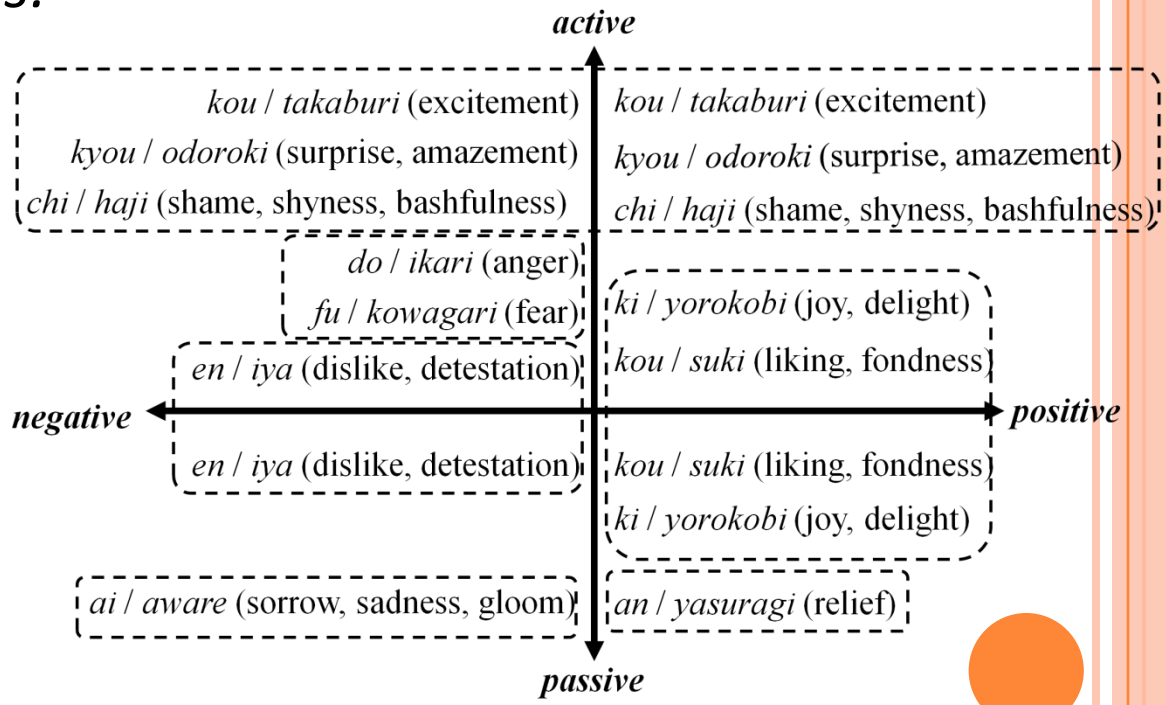
- Joy
- Surprise
- …

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)."



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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
- …

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: *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 feel so bored for winning the Loebner prize.* **ML-Ask:dislike, depression;** **Web mining:excitement, joy** Agent: *You should be happy!* **[consolation]**

VERIFYING PROCEDURE

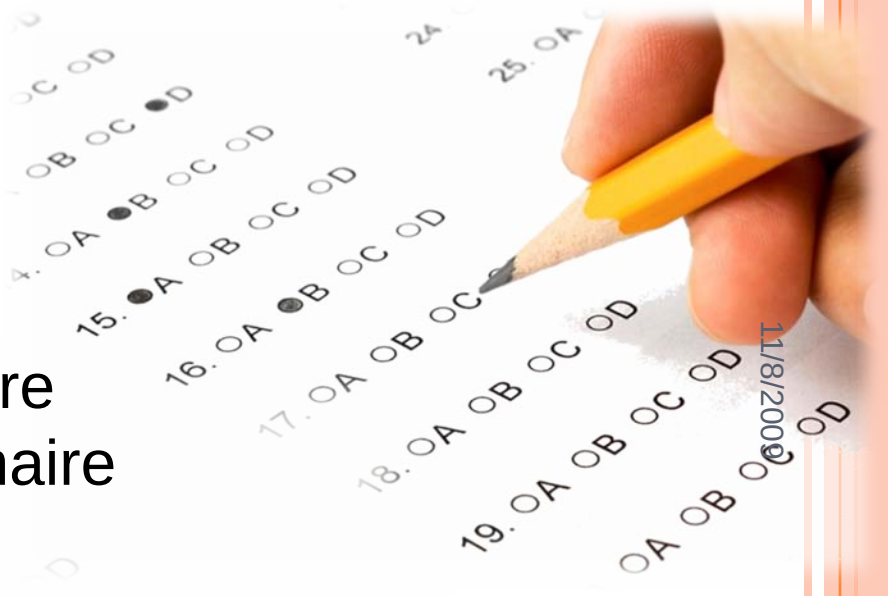
	Appropriate **hate**	Appropriate **joy**
Appropriate	User: *I hate him for making a fool of me in front of* everyone. **`ML-Ask:dislike;`** **`Web mining:anger, dislike`** Agent: *You have a reason to be angry.* **`[empathy]`**	User: *I'm so happy I passed the exam!* **`ML-Ask:joy;`** **`Web mining:joy,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

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
  2 versions of the system: with / without CVS

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 were evaluated by a questionnaire
- Questions:
  - 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.
- 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
- Two summarization of results:
  (1) If 4 people out of 10 agree it's enough for a common-sense
  (2) For 10 people = 10 points, 0 people = 0 points
- Did CVS implementation help?

RESULTS

- Improvement with CVS:

(1)

A) 75% -> 85%

B) 75% -> 90%

C) 45% -> 50%

D) 50% -> 55%

(2)

A) 63% -> 70%

B) 55% -> 63%

C) 36% -> 41%

D) 45% -> 50%

Conclusions & Future Work

- Agent equipped with our system can determine what communication strategy is the most desirable
  - Personal conversational agent
  - Stress management counselor
  - Companion for kids
- Application to ontology development
  - Creating WordNet Affect for Japanese
  - Enriching an affective ontology with rules of appropriateness (e.g., expressing happiness is good, but `if` on a funeral `then` inappropriate)

Conclusions & Future Work

- Improve ML-Ask
  - Disambiguate emotion type affiliations of emotemes
  - Enlarge databases
- Improve Web-mining
  - Mining certain areas (blogs, forums)

Thank you for listening!

Contextual Appropriateness of Emotions

- Contextual Appropriateness :
  - John is sad because his close friend died. (Negative, but appropriate)

    Vs.
  - John is happy because his close friend died. (Positive, but inappropriate)

    Google:

    "sad"*"close friend died“ vs. “happy"*"close friend died“

    "close friend died“*"sad“ vs. "close friend died“*“happy“

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    1,060 vs. 9

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    "close friend died“*"cheerful“ : 9

    "cheerful“ *"close friend died“: 9

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    "depressed“*"close friend died“: 415

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Causal information

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