JAGIELLONIAN UNIVERSITY
IN KRAKOW

4th International Conference
on Affective and Pleasurable Design

Towards Joking, Humor Sense Equipped and Emotion Aware Conversational Systems

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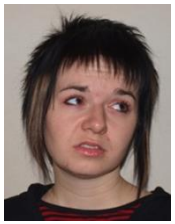
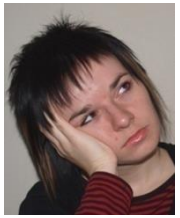
Humor

STRESS [1]



ANXIETY [2]

BOREDOM [3]



1. Martin, R. A. and Lefcourt, H. M.: “Humor and life stress. Antidote to adversity”. New York, Springer Verlag, 1996
2. N.A. Yovetich, J.A. Dale, M.A. Hudak. Benefits of humor in reduction of threat-induced anxiety. *Psychological Reports, 66*(1), 51-58 (1990)
3. Richard A. Dienstbier, "The impact of humor on energy, tension, task choices, and attributions: Exploring

Humor

- We tend to use humor when discussing difficult subjects - **makes our conversation easier** [4]

4. Michael Mulkay, *On humor: Its nature and its place in modern society*. UK: Cambridge: Polity Press, 1988.

Humor

- If it is so good in human-human interaction…

- …should also work well in human-computer interaction

Humor

- If we are going to construct naturally talking machines, we need to include humor in our research

- Important challenge for AI, NLP and HCI:

to create

a humor-equipped talking machine

Computational Humor

A humor-equipped system should be able to:

- detect user's humorous behaviors
- react to them adequately
- recognize users' emotions
- on this basis - decide whether or not use humor
- generate humorous contents
- recognize users' reactions to humorous contents
- construct users' humor sense models to individualize its performance.

State of the art

- See paper for the summary
- Much has been done
- Still to be done:
  - system able to react to users' particular emotional states with humor
  - humor-equipped chatterbot with individualization module (able to adapt to users' humor sense)
  - system able to both recognize and generate humor

Our project

A humor-equipped system should be able to:

- detect user's humorous behaviors
- react to them adequately
- recognize users' emotions
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Our project

GOAL: construct a system able to:

- detect user's humorous behaviors
- react to them adequately
- recognize users' emotions
- on this basis - decide whether or not use humor
- generate humorous contents
- recognize users' reactions to humorous contents
- construct users' humor sense models to individualize its performance.

Our project

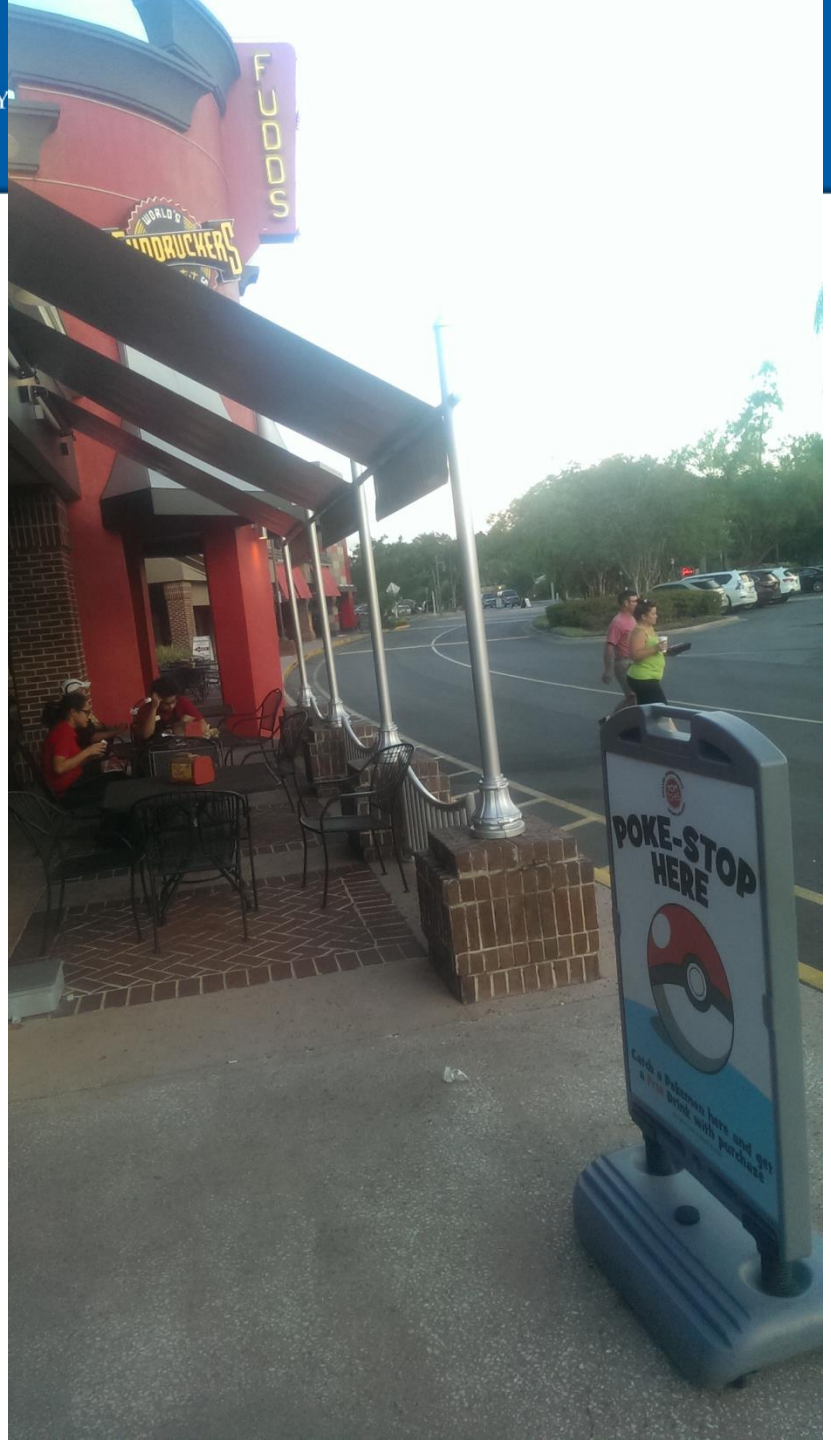
Restrictions:

- Japanese
- Chatterbot, text based
- Humor generation: Japanese puns (*dajare*)
- Humor detection: Japanese puns (*dajare*)
- Emotions: affect-from-text recognition
- Individualisation: emotion-based

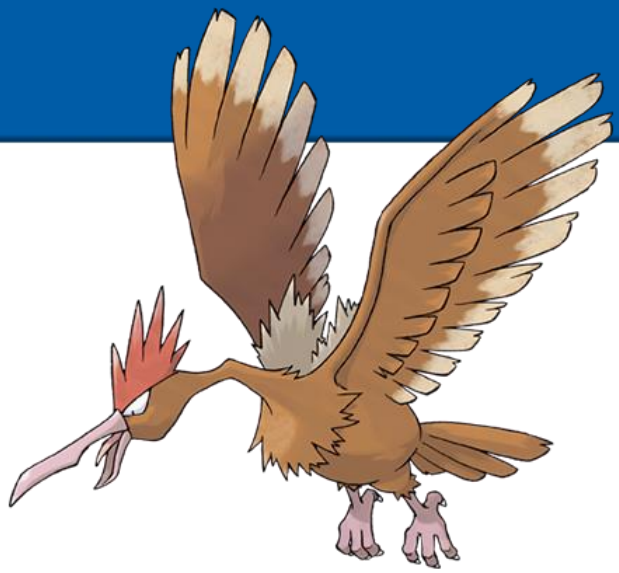
Humorous response generator

Puns.

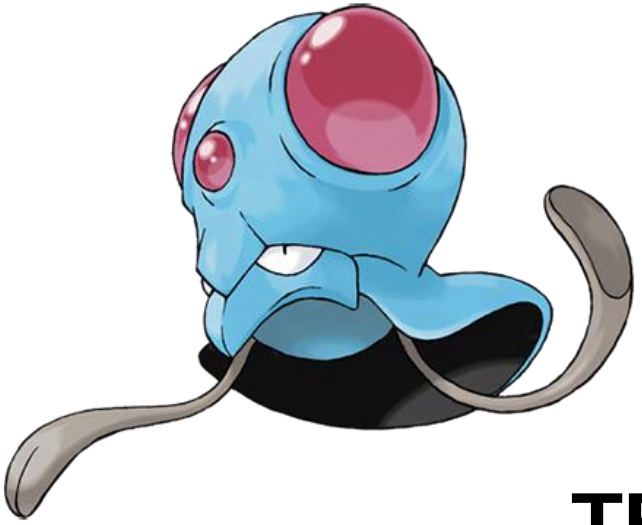

GILDAN
DARTH
GATOR
GATORLAND
ORLANDO


FUDDS
POKE-STOP
HERE

SPEAROW



FEAROW

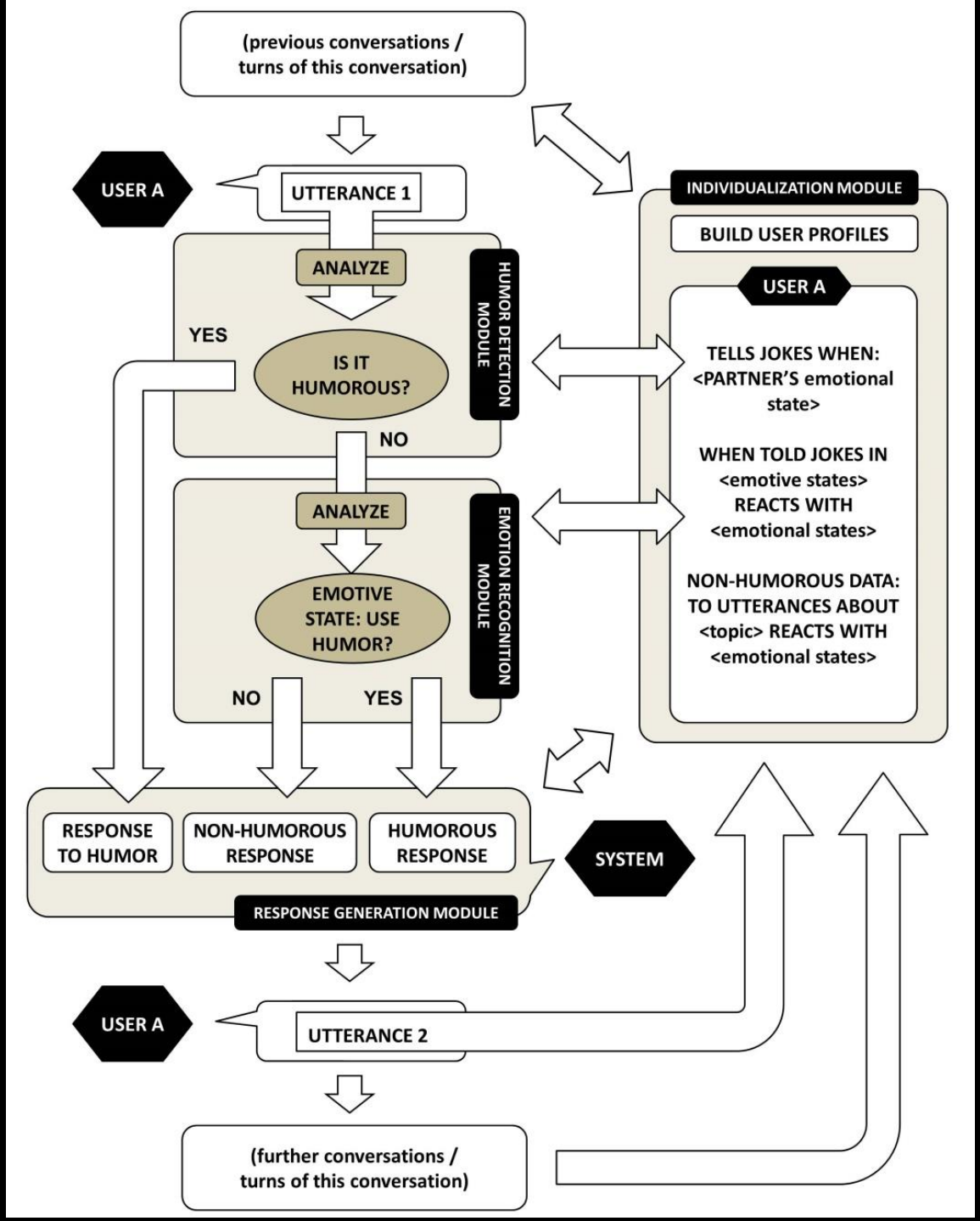


TENTACOOL

Our system

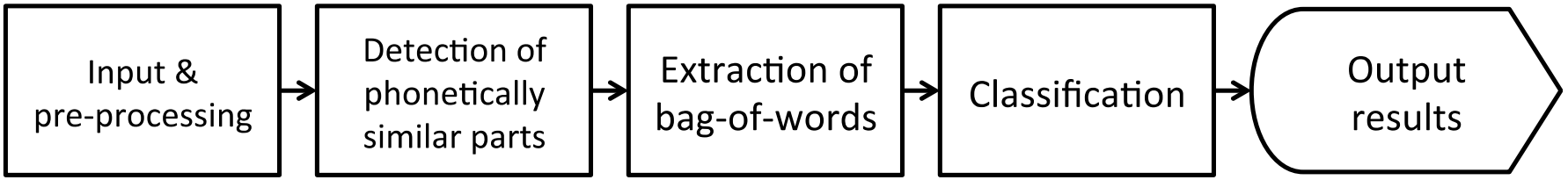
Modules:

- Humor detection module
- Emotion recognition module
- Response generation module
  - Humorous response generator
  - Non-humorous response generator
  - Reaction to humor generator
- Individualization module


(previous conversations / turns of this conversation)
USER A
UTTERANCE 1
ANALYZE
YES
IS IT HUMOROUS?
HUMOR DETECTION MODULE
NO
ANALYZE
EMOTIVE STATE: USE HUMOR?
EMOTION RECOGNITION MODULE
NO
YES
INDIVIDUALIZATION MODULE
BUILD USER PROFILES
USER A
TELLS JOKES WHEN: <PARTNER'S emotional state>
WHEN TOLD JOKES IN <emotive states> REACTS WITH <emotional states>
NON-HUMOROUS DATA: TO UTTERANCES ABOUT <topic> REACTS WITH <emotional states>
RESPONSE TO HUMOR
NON-HUMOROUS RESPONSE
HUMOROUS RESPONSE
SYSTEM
RESPONSE GENERATION MODULE
USER A
UTTERANCE 2
(further conversations / turns of this conversation)

Humor recognition module

- Pun/Non-pun classifier using SVM
- Positive examples were obtained from websites collecting Japanese puns
- Negative examples were sentences with limitation of sentence length
- SVM features
  - Bag of words
  - Exact-match and similarity



Humor recognition module

20-fold cross validation of the classifier
Size of both the examples: 23,984 sentences, divided into 22,784 versus 1,200 sentences for training and tested data with the same numbers of positive and negative examples

Set	BOW features	Exact-match	Similarity	Euphonic sounds	Precision	Recall	F-measure
F_1	-	O	O	O	0.908	0.861	0.884
F_2	O	-	-	-	0.873	0.824	0.848
F_3	O	O	O	O	0.915	0.633	0.749

Humor recognition module

Summary:

- This pun detection algorithm can be used in our system
- Still much to be done
- Currently we are working on its full implementation, which will be evaluated experimentally in the nearest future
- Also: funniness assession

Emotion recognition module

ML-Ask system - a text-based affect analyzer for Japanese [5, 6]

- Keyword-based
- Uses a lexicon of emotive elements and emotive expressions [5]
- Uses a web mining technique to extract emotive associations from the Internet
- Detects specified emotions from emoticons [7]

5. Ptaszynski, M., Masui, F., Dybala, P., Rzepka, R., Araki, K.: Open Source Affect Analysis System with Extensions. In: Proceedings of iHAI 2013, Sapporo, Japan (2013).

6. Ptaszynski, M., Dybala, P., Rzepka, R., Araki, K.: Affecting Corpora: Experiments with Automatic Affect Annotation System - A Case Study of the 2channel Forum. In Proceedings of PACLING-09, pp. 223--228. Hokkaido University, Sapporo, Japan (2009).

7. Ptaszynski, M., Maciejewski, J., Dybala, P., Rzepka, R., Araki, K.: CAO: A Fully Automatic Emoticon Analysis System Based on Theory of Kinesics. In: IEEE Transactions on Affective Computing, vol. 1, no. 1, 46--59 (2010).

Emotion recognition module

Steps of analysis:

1. **Specify whether an utterance is emotive** - i.e. if it contains emotive elements (like “whoa!” or “Oh!”)
2. **Recognize the particular emotion types in utterances described as emotive** – by detecting if it contains emotive expressions, i.e. words or phrases that define specific emotional states (like “happy” or “sad”).
3. **Use a web mining technique to extract emotion associations** from the Internet (emotive expressions that co-occur most frequently with the input). “I lost my job” -> “sad”, “angry”

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Emotion recognition module

Sentence: ***Kono hon saa, sugee kowakatta yo. Maji kowasugi!***

(That book, ya know, 'twas a total killer. It was just too scary.)

Emotive elements: *saa* (emphasis), *sugee* (totally), *yo* (emphasis), *maji* (really), -*sugi* (too much), exclamation mark

Emotive value: 6 (above zero -> specify types of emotions)

Emotive expressions: *kowai* (frightening)

Emotions found: **fear**

Valence: **negative**

Emotion recognition module

Sentence: ***Kyou wa atatakai desu ne.***
(It's warm today, isn't it?)

Emotive elements: -*ne* (-isn't it)

Emotive value: 1
(above zero -> specify types of emotions)

Emotive expressions: none
(-> use web mining procedure)

Emotions found on the Web: **joy**

Valence: **positive**

Emotion recognition module

Tested experimentally

	emotive/ non-emotive	emotion classes
ML-Ask	98.8%	73.4%
CAO	97.6%	80.2%
ML-Ask+CAO	100.0%	89.9%

CAO – emoticon recogition module

Response generation module

3 submodules:

- **Non-humorous response generator** (chatterbot) for Japanese (currently: 2 Web-based systems) [8, 9]
- **Response to user's humor generator** – currently 5 different phrases that can be used in reaction to users' humorous utterances
- **Humorous response generator** – generates Japanese puns towards inputted sentence

8. Higuchi, Shinsuke, Rafal Rzepka, and Kenji Araki. "A casual conversation system using modality and word associations retrieved from the web." Proceedings of the Conference on Empirical Methods in Natural Language Processing. Association for Computational Linguistics, 2008.

9. Dybala, P.: Humor to Facilitate HCI. Germany: Lambert Academic Publishing (2011).

Humorous response generator

PUNDA Japanese pun (*dajare*) generator [9, 10]

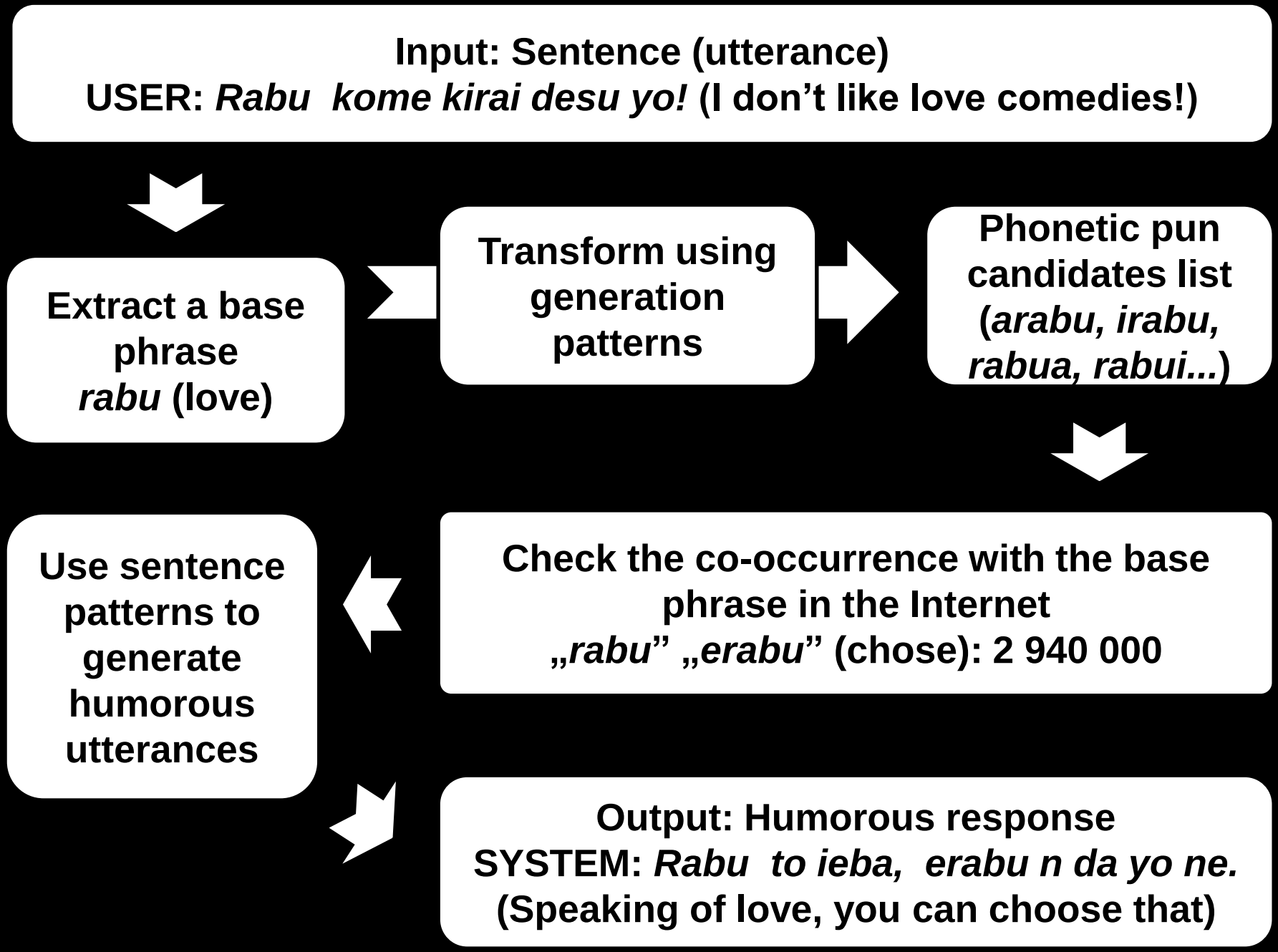
Futon ga futtonda

Futon flew away

- Internet-based
- Uses templates to generate humorous responses towards users utterances

9. Dybala, P.: Humor to Facilitate HCI. Germany: Lambert Academic Publishing (2011).

10. Dybala, P., Ptaszynski, M., Maciejewski, J., Takahashi, M., Rzepka, R., Araki, K.: Multiagent system for joke generation: Humor and emotions combined in human-agent conversation. Journal of Ambient Intelligence and Smart Environments (Thematic Issue on Computational Modeling of Human-Oriented Knowledge within Ambient Intelligence) 2 (2010), 31--48 (2010).


Input: Sentence (utterance)
USER: *Rabu kome kirai desu yo!* (I don't like love comedies!)
Extract a base phrase *rabu* (love)
Transform using generation patterns
Phonetic pun candidates list (*arabu, irabu, rabua, rabui...*)
Check the co-occurrence with the base phrase in the Internet „*rabu*" „*erabu*" (chose): 2 940 000
Use sentence patterns to generate humorous utterances
Output: Humorous response
SYSTEM: *Rabu to ieba, erabu n da yo ne.*
(Speaking of love, you can choose that)

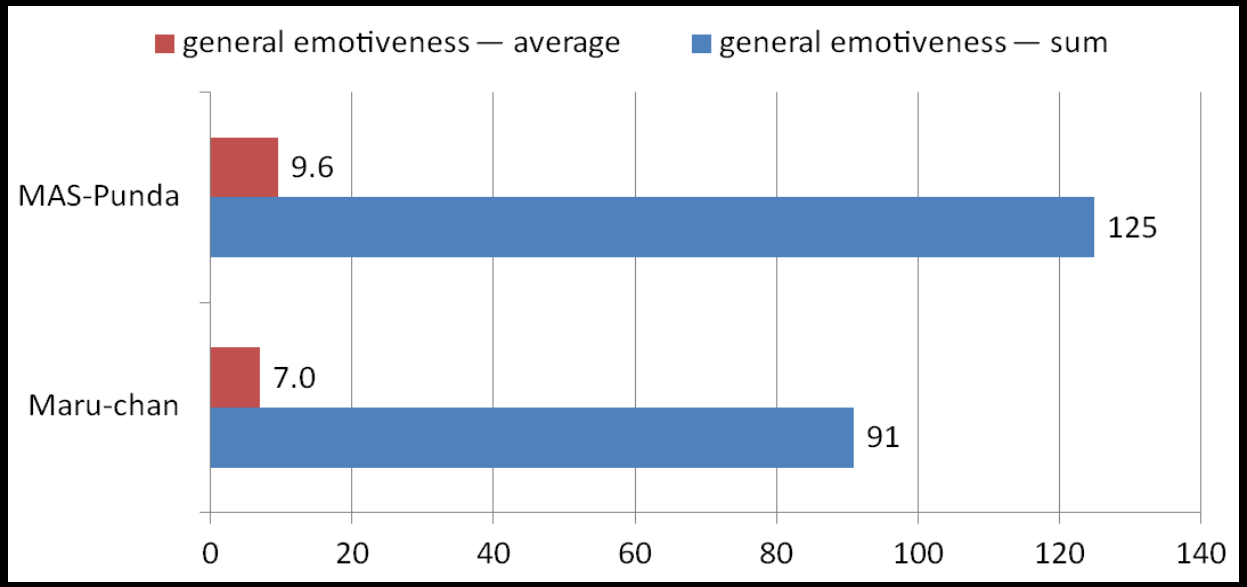
Humorous response generator

- The system generates pun candidates with 75% accuracy (compared to human level)
- In our previous research implemented into a conversational system.
- Evaluation experiments showed that it was evaluated as better, more human-like and triggering more positive emotions than a similar system without humor.[9, 10, 11]
- Still not human level – working on improvements

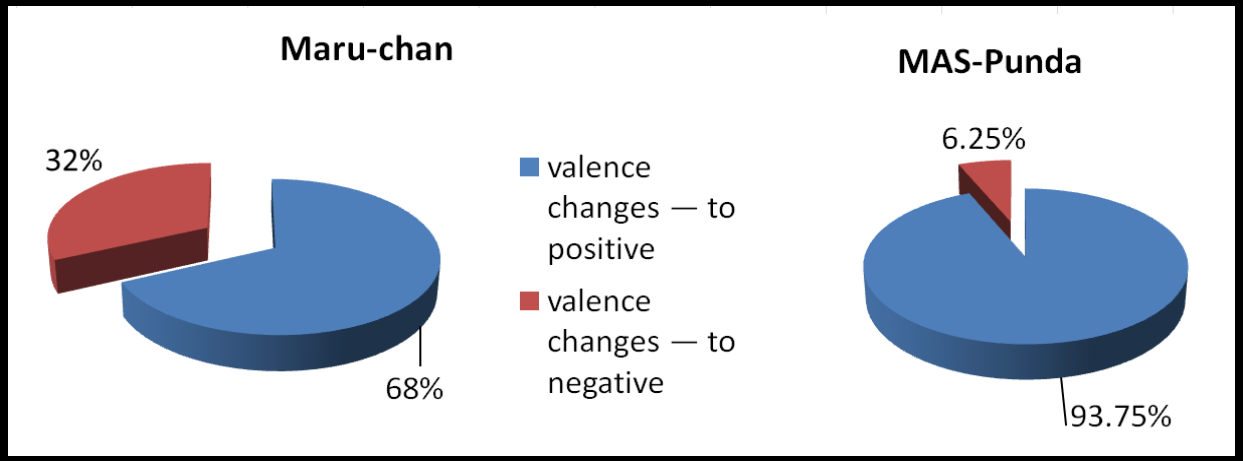
9. Dybala, P.: Humor to Facilitate HCI. Germany: Lambert Academic Publishing (2011).

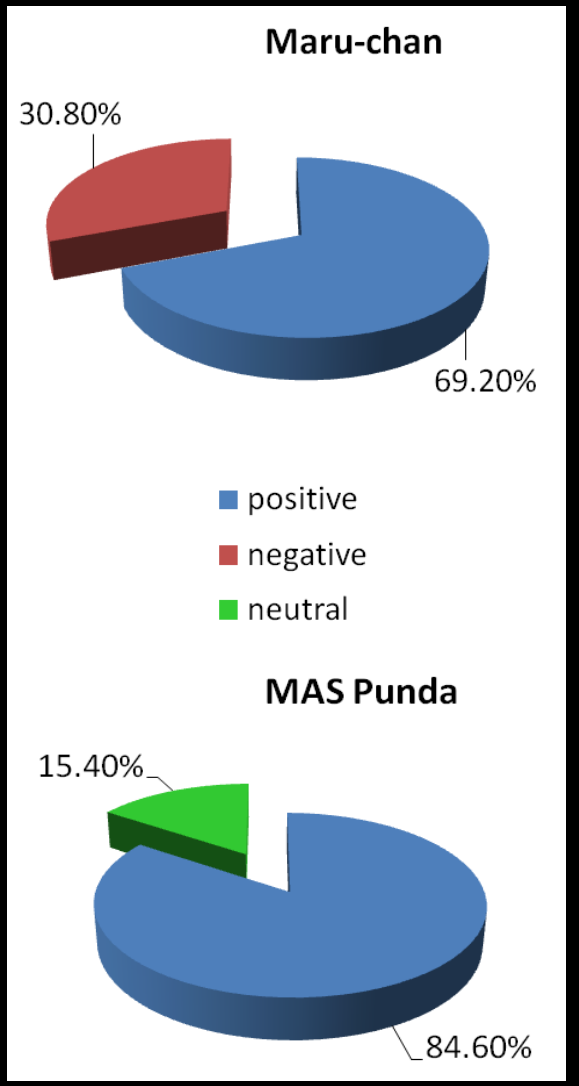
10. Dybala, P., Ptaszynski, M., Maciejewski, J., Takahashi, M., Rzepka, R., Araki, K.: Multiagent system for joke generation: Humor and emotions combined in human-agent conversation. Journal of Ambient Intelligence and Smart Environments (Thematic Issue on Computational Modeling of Human-Oriented Knowledge within Ambient Intelligence) 2 (2010), 31--48 (2010).

11. Dybala, P., Ptaszynski, M., Rzepka, R., Araki, K.: Extending the Chain: Humor and Emotions in Human Computer Interaction. International Journal of Computational Linguistics Research, Vol. 1, Issue 3, 116--125 (2010).



Maru-chan – chatterbot without humor
MAS-Punda – chatterbot with humor





Individualization module

- Uses the ML-Ask affect analyzer to gather data about users' emotive states during conversations.
- On this basis the module builds each user's individual model of sense of humor.

Individualized interaction

USER: Something

analyze

Emotiveness Analysis System:

Checking user's emotional states

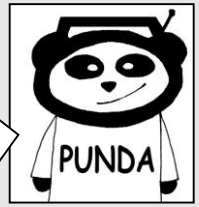
Evolving user-adjusted humor sense model

USER A:

-types of jokes:
<red-haired>: reacts with:
<anger>
<disgust>

SYSTEM: Joke about red-haired girls

OK to joke



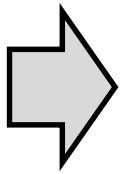
USER: Angry, Disgusted

analyze

Individualization module

User A

- emotion changes when told jokes in emotive state <sadness>:
  - to positive: 7/10
  - to neutral: 2/10
  - to negative: 1/10



OK to tell jokes when <sad>

Individualization module

Emotiveness analysis based decission taking method tested experimentally:

- Implemented into a joking chatterbot
- if user's emotive state negative or neutral - use humor to make him/her feel better.
- Results: enhanced user's moods, evaluated as friendly, human-like and using humor in appropriate moments

Individualization module

- Summary: uses emotiveness analysis based data to individualize system's performance
- More interactions = more complex models
- Problem: at initial stage performance will not be individualized – may be discouraging
- Proposed solution: initial settings based on statistical data (e.g. which age/social groups preffer which types of jokes) – currently gathering
- Individualization module can be used also for features other than humor

Conclusion & Future Work

- Goal: Construction of a joking, humor sense equipped and emotion aware conversational system
- Currently: Under development, working on modules separately
- In the nearest future: join them into one system, perform evaluation experiments

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Thank you for your attention