Humor, Emotions and Communication: Human-like Issues of Human-Computer Interactions

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Introduction

The research described below is unique within both cognitive science and computer science (especially in AI and HCI-related variants) as, to the best of our knowledge, it is the first to combine the issues of humor generation and emotion recognition in an interaction between humans and computers. We present the first conversational system which recognizes user emotions and on this basis decides whether or not to use humor in response.

Humor and Emotions

This research is based on an assumption that what can work well in interactions between humans can also be beneficial for HCI. It was demonstrated that humor can induce positive moods and reduce negative moods in humans; see Dybala (2011); Dybala et al. (2010c) for a summary. This leads to the conclusion that it should perform the same role in HCI. This was shown in existing research, however, only to some extent. While non-computer-science related research usually considers the humor-emotion relationship in what we defined as three-stage chains, i.e. emotive state I → humorous stimulus→emotive state II, in HCI, all research so far focuses only on doublets, i.e. humorous stimulus→ emotive reaction (for more details regarding this approach see Dybala et al., 2010a). Our research bridges this gap and is the first in HCI in which not only emotions following but also those preceding humorous acts were taken into consideration (Dybala, 2011).

Components

The system developed in our research is named MAS-Punda. Punda is the name of our pun generator (Dybala et al., 2008), and MAS stands for "multiagent system", as it is composed of multiple intelligent agents: 1) a conversational agent, 2) an emotion recognition agent and 3) a humor generator.

Conversational Agent

The first agent in our research is Maru-chan, a conversational agent for Japanese (Takahashi, 2009). The agent uses the Internet to extract word associations for users' utterances, and then uses them to generate a relevant response (Dybala et al., 2010d). For more details, see Dybala, Ptaszynski & Sayama (2012a), Dybala (2011).

Emotion Recognition Agent

The second agent used in our research is Ptaszynski's et al. Emotion Recognition Agent (2010). Besides performing the decisive role in the multi-humoroid, it is also used in automatic evaluation of the system. The agent uses databases with emotive expressions and emotive elements for Japanese. It performs two types of text analysis: 1) it detects if a sentence is emotive, and 2) it determines the type and valence of the conveyed emotion(s). For more details, see Dybala (2011) and Dybala et al. (2010c).

Humor Generation Agent

The second agent used in this research is Pundalin, a pun generator for Japanese (Dybala et al., 2008), which also uses the Internet. This agent represents the class of "humoroids", defined by Dybala et al. (2009d). Against a user utterance, the agent generates phonetic candidates for puns, selects the most appropriate, and then integrates it into an adequate humorous response. In the generation step, the agent uses phonetic patterns based on an innovative classification of Japanese puns, proposed by Dybala (2011). For more details about this agent, see (Dybala, 2011; Dybala et al., 2010c).

Multiagent Emotion Aware Joking System

The agents described above were merged to create a multiagent humor-equipped joking conversational system. It represents a high level class of humoroids, defined and named by Dybala et al. (2010d) as "multi-humoroids". Basing on existing literature (see above), we assumed that in HCI, the computer agent can use humor to make the interlocutor feel better. In order to do that, first the system detects human emotions (performed by ML-Ask), and on this basis makes a decision whether a joke should be told.

To summarize the decision rules used in this experiment, the assumptions were that: 1) if a human's emotive state is negative or neutral, the agent can use humor in order to make him / her feel better, and 2) otherwise, the response is generated by the non-humorous agent. If ML-Ask decides that a joke should be told, the response is generated by the joke generator. If ML-Ask decides otherwise, the response is generated by the Maru-chan (Dybala et al., 2010c).

Evaluation Experiments

The multiagent system was evaluated using a novel chatterbot evaluation methodology proposed by Dybala et al.

(2010b). In this particular case we conducted two experiments: user-oriented and automatic.

User-oriented evaluation

In the first experiment we asked 13 users to perform conversations with Maru-chan and MAS-Punda in order to compare their performance in a questionnaire completed afterwards. Some results are summarized in Table 1.

Table 1. User-oriented evaluation experiment results
A) Did the agent try to make the conversation more interesting?, B) Did you find the conversation interesting?, C) Did the agent try to make you feel better?, D) Did the agent use humor in appropriate moments?, E) Describe your feelings towards the agent after the interaction (sum), F) Which agent was better?, cont? – do you want to continue the dialogue? (option to choose)

Question	A	B	C	D	E	F	cont?
Maru	1.69	2.08	1.69	1.00	-9	38%	2
MAS	2.85	2.69	2.69	2.45	+8	62%	5

Automatic evaluation

In the second experiment, the chat logs acquired in the first experiment were analyzed by the ML-Ask agent to investigate user emotions and their changes during the conversations. Some results are summarized in Table 2.

Table 2.Automatic evaluation experiment results

	Maru-chan			MAS-Punda		
Emotiveness	91 (average: 7.0 per utt.)			125 (average 9.6 per utt.)		
Valence	to positive	to negative		to positive	to negative	
	68%	32%		94%	6%	
Final emotion	pos.	neg.	neutr.	pos.	neg.	neutr.
	69%	31%	0%	85%	0%	15%

Summary and Future Directions

The experiments showed that the humor- and emotion-equipped multiagent system was evaluated as better, more interesting and, perhaps most importantly, making users feel better than the baseline agent. This leads to the conclusion that our goal to construct a conversational system able to properly react with humor to users' emotions was achieved.

That said, there is still much to be done in this area. Currently we are working on a user-adaptive humor sense model, which should lead to personalization of the system (Dybala et al., 2009b). We also plan to construct a metaphor processing agent and implementing it into our system.

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