Observations on Humorous Act Construction

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Abstract

We discuss the generation of humorous acts by embodied agents. How can a humorous act be constructed from the discourse and when should it be displayed? Rather than introducing algorithms for humorous act production we discuss the issues that are involved. From our observations it becomes clear that current research on affective computing, research on generating and interpreting facial expressions and research on embodied (and intelligent) agents can and should be combined with humor research. Results can help to design new and interesting applications in human-computer interaction using embodied agents.

1 Introduction

Embodied conversational agents have been introduced to play, among others, the role of conversational partner for the computer user. The user may interact with embodied conversational agents to engage in an information service dialogue, a transaction dialogue, to solve a problem cooperatively, perform a task, or to engage in a virtual meeting. In this interaction with embodied agents, verbal and nonverbal communication is equally important. Multimodal emotion display and detection are among the research issues in this area of human-computer interaction.

In previous years researchers have discussed the potential role of humor in the interface. Observations about the role of humor in the interface were made in [Binsted, 1995]. Humans use humor to ease communication problems and in a similar way humor can be used to solve communication problems that arise with human-computer interaction. Binsted emphasizes the role of humor in natural language interfaces. Humor can help to make the imperfections of natural language interfaces more acceptable for the users and when humor is sparingly and carefully used it can make natural language interfaces much friendlier.

In [Nijholt, 2002] we discussed the role of humor for embodied conversational agents in the interface. It is a discussion on the possible role of humor support in the context of the design and implementation of embodied conversational agents. This role can be said to follow from the CASA ('Computers Are Social Actors') paradigm, assuming that humans contribute human-like properties to embodied agents that can help in obtaining more enjoyable interactions.

In the next section we have a short inventory of the role of humor in human-human interaction and how we expect this can be translated to a human-computer interaction context. In the next sections we have preliminary observations on the generation of humorous acts and on the appropriateness of displaying them. An example of humorous act generation is presented. Section 4 discusses tools and resources needed in future research. Section 5 contains the conclusions.

2 Humor in Interpersonal Interaction

2.1 Introduction

In interpersonal interactions humans use humor, humans smile and humans laugh. Humor can be spontaneous, but it can also serve a social role and be used deliberately. In an educational situation humor can be used by the teacher to catch students' attention but also to foster critical thinking. Humor allows criticism to be smoothed, stress can be relieved and students can become more involved in joint classroom activities by the use of humor. Humor can also help when it comes to frustration. In a commerce situation negotiators use humor to induce trust.

It is possible to look at preconceived aims of conversational partners to create humor during a conversation or discussion. Here we rather look at situations where humor is generated during an interaction for grabbing the opportunity to be funny. The aim of wanting to be funny at a particular point in a conversation may also be to hide embarrassment, to dominate the discussion or to change the topic.

In daily conversations humor very often plays a social role. Not only in conversations with friends and relatives, but also in the interaction with a real estate agent, a saleswoman, a tourist guide, a receptionist or a

bartender. In more goal-directed situations teaching is a field where the use of humor has received attention. Humor contributes to motivation, attention, promotion of comprehension and retention of information, a more pleasurable learning experience, a development of affective feelings toward content, fostering of creative thinking, reducing anxiety, etc.

2.2 Humor and Embodied Agents

Embodied conversational agents (ECAs) have become a well-established research area. Embodied agents are agents that are visible in the interface as animated cartoon characters or animated objects resembling human beings. These agents are used to inform and explain or to demonstrate products or sequences of activities in educational, e-commerce or entertainment settings. Experiments have shown that ECAs can increase the motivation of a student interacting with the system.

An embodied agent has a face. It may have a body, arms, hands and legs. We can give it rudimentary intelligence and capabilities to have verbal and nonverbal interaction. An ECA can display its affective state through facial expressions, its voice and word choice.

2.3 Embodied Agents as Social Actors

Embodied agents are, among others, meant to act as conversational partners for computer users. An obvious question is whether they, despite available verbal and nonverbal communication capabilities, will be accepted as conversational partners. Can we replace one of the humans in a human-to-human interaction by an embodied conversational agent without being able to observe important changes in the interaction behavior of the remaining human?

In the research on the CASA paradigm [Reeves & Nass 1996] it has been demonstrated that people interact with computers as if they were social actors. Due to the way we can let a computer interact, people may find the computer polite, dominant, extrovert, introvert, or whatever attitudes or personality (traits) we can display in a computer. Moreover, they react to these attitudes and traits as if a human being displayed them. The CASA paradigm should be applicable to ECAs at least as well as to computers in general. As illustrated, humor plays an important role in interpersonal interactions. From the CASA experiments we may extrapolate that humor will play an important role in human-computer interactions. This has been confirmed with some specially designed experiments [Morkes *et al*., 2000].

3 Generation and Appropriateness of Humorous Acts

3.1 Introduction

We discussed the role of humor in human-human interaction and a possible role of humor in human-ECA interaction. There are many types of humor and it is not the case that every type of humor is suited for any occasion during any type of interaction where humor

can play a useful role. Telling a joke among friends may lead to amusement, while the same joke among strangers will yield confusion. An assessment of the appropriateness of the situation for telling a joke or making a humorous remark is necessary. Appropriateness does not mean that every conversational participant has to be in a jokey mood for a humorous remark. Rather, it means that the remark or joke can play a role in the interaction process, whether it is deliberately aimed at achieving this goal, whether there is a mutually accepted moment for relaxing and playing or whether it is somewhere in between on this continuum.

It is also the 'quality' of the remark that makes it appropriate. 'Quality' does not only refer to the contents of the remark, which may be based on a clever observation or ingenious wordplay, but in particular on an assessment whether or not to produce the humorous utterance. Just to make things more complicated, the possibility and the urge to make a humorous remark may overrule social rules how to behave.

From now on we talk about Humorous Acts (HA's). In telephone conversations a HA is a speech utterance. Apart form the content of what is being said, the speaker can only use intonation and timing in order to generate or support the humorous act. Obviously, we can think of exceptions, where all kinds of non-speech sounds help to generate – on purpose or by accident – a HA. In face-to-face conversations a HA can include, be supported or even made possible, by non-verbal cues. References can be made, implicitly or explicitly, to the environment that is perceivable for the partners in the conversation. This situation also occurs when conversational partners know where each of them is looking at or when they are able to look at the same display, display contents (e.g., a web page) or a shared virtual reality environment.

We emphasize that participants in a discussion may, more or less deliberately, use humor as a tool to reach certain goals. A goal may be to smooth the interaction and improve mutual understanding. In that case a HA can generate and can be aimed at generating feelings of common attitudes and empathy. However, a HA can also be face threatening and be aimed at eliminating an opponent in a (multi-party) discussion. Whatever the aim is, conversational participants need to be able to compose elements of the context in order to generate a HA and they need to assess the current context (including their aims) to determine the appropriateness of generating a HA.

Sometimes, conversations have no particular aim, except the aim of providing enjoyment to the participants. Here, humor acts as a social facilitator. In [Tannen, 1984] an analysis is given of the humorous occurrences in the conversations held at a Thanksgiving dinner. Different styles of humor for each of the dinner guests could be distinguished. All guests had humorous contributions. For some participants more than ten percent of their turns were ironic or humorous. Humor makes one's presence felt, was one of her conclusions.

Generation (and interpretation) of HA's during a dialogue or conversation has hardly been studied. There is not really a definition, but at least the notion

of conversational humor has been introduced in the scientific literature [Attardo, 1996]. We present two observations before going into more details of generating HA's for ECAs in the next sections.

Our first observation concerns the Gricean cooperation principle. Grice's assumption was that conversational partners are cooperative. Jokes are about misleading a conversational partner. However, explicit joke telling is often preceded by some interaction that is meant to obtain agreement about the inclusion of a joke in the interaction. When the participants are in the mood for jokes, joke telling occurs naturally and there is some meta-level cooperation. In [Attardo, 1997] an enlarged version of the principle is introduced, allowing such 'non-cooperative' behavior.

Our second observation concerns the spontaneous character of conversational humor. As we mentioned, the generation of HA's during conversations is not always aimed at entertaining or showing cleverness. HA creation can be done to obtain a cooperative atmosphere. HA creation also happens when the possibility to create a HA and a humorous urge to display the result overrules (Gricean) principles concerning truth of the contribution, completeness of the contribution, or relevance of the contribution for the current conversation. The moment to introduce a canned joke during a conversation can be very much related to the situation. It can be triggered by an event (a misunderstanding, the non-availability of information, word choice of a conversational partner, etc.), including a situation where one of the conversational partners does not know what to contribute next to the conversation. In contrast, conversational HA's are improvised and much more part of the discourse through natural contextual ties. There is not necessarily a signaling of the humorous nature of the act and in the case of humor as a social facilitator this is not always desirable.

3.2   Setting the Stage for ECA Humor Generation

When looking at ECAs we need to distinguish four modes of humor interpretation and generation. The ECA should be able to generate HA's. Why should it do it, is it appropriate to do it, what is the aim of doing it? Moreover, how should it display the HA? Intonation, body posture, facial expression should be in accordance with the HA. Should the ECA understand its own HA? That is, when its conversational partner makes a reference to the HA, should it be able to interpret this reference in order to be able to generate an appropriate next utterance? With that we cross a border. The ECA can be made to understand HA's generated by its human conversational partner. Apart from understanding from a linguistic or artificial intelligence point of view, this also requires showing comprehension by generating appropriate feedback, including nonverbal behavior in face, gestures and body posture. These are the two ECA points of view. From the point of view of a human partner we should consider appreciation and understanding of what the ECA is doing and also allowing the ECA to understand what the human partner is doing, including utterance com-

prehension and multimodal input from face, body and actions. We will mainly look at the ECA's ability to generate HA's. Corresponding nonverbal behavior should be added, or should be designed in close interaction with the generation of verbal acts.

When we talk about the generation of a HA and corresponding nonverbal communication behavior of an ECA we should take into account an assessment of the appropriateness of generating this particular HA. This includes an assessment of the appreciation of the HA by the human partner and therefore it includes some modeling of the interpretation of HA's by human partners. That is, a model for generation of HA's requires a model of interpretation and appreciation of HA's. This is not really different from discourse modeling in general. An ECA needs to make predictions of what is going to happen next. Predictions help to interpret a next dialogue act or a humorous act successor.

Since our starting point here is to make ECA's more social and intelligent partners we try to confine ourselves as much as possible to the humorous act generation part of an ECA's humor intelligence without taking contextual issues (the appreciation of the HA by a conversational partner) into account.

Finally, an other issue we need to consider is whether HA generation by a computer or by an ECA either requires or gives the opportunity to introduce HA's that are acceptably different and maybe more easily generated or accepted than human-generated HA's. For example, computers or ECA's can become easily the focus of humor of a human conversational partner. The computer or ECA can anticipate this and can decide to use self-deprecating humor in order to avoid being attacked because of its weaknesses. In that case the ECA makes itself the butt of humor, for example, by making references to its poor understanding of a situation, its appearance and facial expressions and its poor quality of speech recognition and synthesis. All these issues will not be considered here.

3.3   Appropriateness of Humorous Act Generation

Humor is about breaking rules, rather than following rules, e.g. politeness conventions or, more generally, violating the Gricean rules of cooperation. In creating humorous utterances during an interaction people hint, presuppose, understate, overstate, use irony, tautology, ambiguity, etc. [Brown & Levinson, 1978], i.e., all kinds of things that do not follow Grice's Maxims. We follow [Zajdam, 1992] who speaks of a humorous communication mode. Humorous utterances can be constructive and there can be a mutual understanding and cooperation during the construction of a HA. The HA's we would like to consider in this proposal are, contrary to canned jokes that often lack contextual ties, part of the discourse. Canned jokes are not completely excluded, since some of them can be adapted to the context, for example by inserting the name of a conversational partner or by mapping words or events of the interaction that takes place on template jokes (see also [Loehr, 1996]. Nevertheless, depending on contextual clues a decision has to be made to evoke and

adapt the joke in order to integrate it in a natural way in the discourse. Such decisions have also to be made when we consider hints, understatements, ambiguities, and other communication acts and properties that aim or can be used to construct a HA. [Hay, 2001] distinguishes several types of humor support strategies. For example, contributing more humor, playing along, using echo and offering sympathy. Support can also mean the co-construction of a sequence of remarks leading to a hilarious or funny observation starting from a regular discourse situation. This requires research on (sequences of) dialogue acts, an issue that is rather far away from current dialogue act research, both from the point of view of non-regular sequences of acts and from the point of view of distinguishing sufficiently many subtleties in dialogue acts that initiate and allow these sequences.

For HA construction, we need to zoom in on two aspects of constructing humorous remarks:

- recognition of the appropriateness of generating a humorous utterance by having an appraisal of the events that took place in the context of the interaction; dialogue history, goals of the dialogue partners (including the dialogue system), the task domain and particular characteristics of the dialogue partners have to be taken into account; and

- using contextual information, in particular words, concepts and phrases from the dialogue and domain knowledge that is available in networks and databases, to generate an appropriate humorous utterance, i.e., a remark that fits in the context and that nevertheless is considered to be funny, is able to evoke a smile or a laugh, or that maybe is a starting point to construct a funny sequence of remarks in the dialogue.

It is not the case that we can look at both aspects independently. With some exceptions, we may assume that, as should be clear from human-human interaction, HA's can play a useful and entertaining role at almost every moment during a dialogue or conversation. Some common ground, some sharing of goals or experiences during the first part of the interaction is useful, but it is also the quality of the HA that determines whether the situation is appropriate to generate this act. We cannot simply assess the situation and decide that now is the time for a HA. When we talk about the possibility to generate a HA and assume a positive evaluation of the quality of the HA, then we are also talking about appropriateness.

To generate humor in conversational interaction we need to continuously integrate and evaluate the elements that make up the interaction (in its context and given the goals and knowledge of the system and the human conversational partner) in order to decide:

- the appropriateness or non-appropriateness of generating a humorous utterance, and

- the possibility that elements from the dialogue history, the predicted continuation of the dialogue and knowledge available from domain, task and goals of

the dialogue partners allow the construction and the generation of a humorous act.

3.4 Generation of Humorous Acts: An Example

We present an example of constructing a HA. It is meant to be representative for our approach. It is an example of deliberately misunderstanding, an act that can often be employed in a conversation when some ambiguity in words, phrases or events is present, in order to generate a HA. We look at deliberate erroneous anaphora resolution.

Anaphorically used words are words that are referring back to something that was earlier mentioned or that is known because of the discourse situation and/or the text as it is read or heard. The anaphorically used word is called 'the anaphor', the text to which it refers 'the antecedent'. The extra lingual entity they co-refer to is called the referent. Anaphora resolution is the process of determining the antecedent of an anaphor. The antecedent can be in the same sentence as the anaphor, or in another sentence. Incorrect resolution of anaphoric references can be used in order to create a HA in a dialogue situation. Consider for example the text used in a Dilbert cartoon where a new "Strategic Diversification Fund" is explained in a dialogue between the Adviser and Dilbert:

- Adviser: "Our lawyers put your money in little bags, then we have trained dogs bury them around town."

How to continue from here? We are dealing with a situation that is meant to create a joke, but nevertheless, all the elements of a non-constructed situation are there. What are these dogs doing? Burying lawyers or bags? So, a continuation could be:

- Dilbert: "Do they bury the bags or the lawyers?"

Surely, this Dilbert remark is funny enough, although, from a natural language processing point of view it can be considered as a clarifying question, without any attempt to be funny. There is an ambiguity, that is, the system needs to recognize that generally dogs don't bury lawyers and therefore 'them' is more likely to refer to bags than to lawyers.

We need to be able to design an algorithm that is able to generate this question at this particular moment in the dialogue. However, the system should nevertheless know that certain solutions to this question are not funny at all. It can take the most likely solution, from a common sense point of view, but certainly this is not enough for our purposes. We need to introduce algorithms for anaphora resolution that decide to take a wrong but humorous solution, rather than that they take solutions that are the most likely correct ones. Obviously, then there is the question when this incorrect solution leads to a funny remark. When looking at previous language and humor research we can start with results that tell us about word and word meaning relations. Someone uses a word. Isn't useful, from a humor point of view, to look at its non-regular meaning in this context? Moreover, isn't it possible to use

this non-context related meaning to generate a humorous conversational act? For example, in this cartoon, we would like to generate the following follow-up answer

- "We've tried it both ways."

as it appears in the cartoon.

This example is certainly not complete in illustrating the full range of research aspects we need to tackle. In the cartoon we have a linguistic ambiguity, it can be resolved using common-sense knowledge and advanced methods for reference resolution, and we choose not to resolve it that way because we recognize that a less obvious solution can be used to construct a humorous continuation of the dialogue. In order to recognize this less obvious solution we need to include it on a stack of solutions, where in general the order of elements on the stack is determined by the increasing possibility to relate it to features of the antecedent in the history of the dialogue and the real world. However, in this case, rather than following the order of the stack from the top to the bottom, we need to make a shortcut from elements, probably near the bottom of the stack, to nodes in a network containing semantic information that allows to reason about possibly humorous relationships between words and concepts.

Although we have not seen humor research devoted to erroneous anaphora resolution, the approaches in computational humor research in general are not that different from what we saw here. The approaches are part of the incongruity-resolution theory of humor. This theory assumes situations – either deliberately created or spontaneously observed – where there is a conflict between what is expected and what actually occurs. Ambiguity plays a crucial role. Phonological ambiguity, for example in certain riddles, syntactic ambiguity, semantic ambiguity of words, or events that can be given different interpretations by observers. Due to the different interpretations that are possible, resolution of the ambiguity may be unexpected, especially when one is led to assume a 'regular' context and only at the last moment it turns out that an other context allowing an other interpretation was present as well. These surprise disambiguations are not necessarily humorous. Developing criteria to generate humorous surprise disambiguations only is one of the challenges of humor theory. Attempts have been made, but they are rather primitive. Pun generation is one example [Binsted & Ritchie, 1997], acronym generation [Stock & Strapparava, 2003] an other. In both cases we have controlled circumstances. These circumstances allow the use of WordNet and WordNet extensions and reasoning over these networks, for example, to obtain a meaning that does not fit the context or is in semantic opposition of what is expected in the context. No well-developed theory is available, but we see a slow increase in the development of tools and resources that make it possible to experiment with reasoning about words and meanings in semantic networks, with syllable and word substitutions maintaining properties of sound, rhyme or rhythm and with higher-level knowledge concepts that allow higher-level ambiguities.

4 Research, Tools and Corpora

When discussing humor research and development it is useful to distinguish between methods, tools and resources for verbal HA generation and methods and tools that help to have ECA's generate and display HA's. Nowadays graphics, animation and speech synthesis technology make it possible to have embodied agents that can display smiles, laughs and other signs of appreciation of the interaction or explicitly presented or generated humor. Current ECA research, however, hardly pays attention to these issues. Facial expressions are often confined to the display of some basic emotions and subtleties of different smiles are not considered. Especially the display of laughter will meet some research challenges, both in speech synthesis and in facial animation. Current multimodal and affective markup languages need to be extended in order to include the multimodal presentation of humorous acts.

Presently, tools and resources for verbal HA generation are hardly available. We mentioned WordNet and its extensions as examples. Corpora are needed in order to be able to study the creation of HA's in dialogues and naturally occurring conversations. When and why are they constructed and which elements of the discourse were used to construct the HA? Clearly, in goal-directed dialogues we will see less HA's than in natural occurring conversations that are open-ended, contain many topic shifts and are also held to maintain a relationship. Annotations need to be defined that include different kinds of humorous acts.

In the line of research on autonomous agents we need an ECA to understand why the events that take place generate enjoyment by its partner and why it should display enjoyment because of its appreciation of a HA. That is, models are needed that allow generation, prediction, detection and interpretation of humorous events. What events do we distinguish, how do we perceive them, and how do we integrate them at a semantic and pragmatic level of understanding of what is going on? There are two approaches to this question when we look at state-of-the-art research. One down-to-earth approach deals with dialogue act prediction. What is going to happen next, given the history and the context of the dialogue? Can we predict the next dialogue act by our conversational partner or can we compute the next dialogue act that is expected by the agent's partner? Dialogue acts are events that need to be appraised. In our research we use Bayesian Networks to predict dialogue acts. While this approach is unconventional from the point of view of event appraisal, it is an accepted approach in dialogue modeling research that has been implemented in a number of dialogue systems. It seems to be useful to introduce more refined dialogue acts that take into account the willingness of a partner to construct a HA.

The second approach we want to mention has its origin in emotion research. A usual standpoint in emotion research is that of appraisal theory, the evaluation of situations followed by categorizing arising affective states. Some of these theories have been designed with

computation in mind. How can we elicit and display emotions using a computational model? A mature theory for calculating cognitive aspects of emotions is the OCC model [Ortony *et al.*, 1988], a framework of 22 distinct emotion types. Can we go from event appraisal theories for emotion to appraisal theories for deciding the appropriateness of constructing a humorous act? One event that should be taken into account is the ability to construct a HA in the given context. In human-computer interaction applications some (stripped-down) versions of the model have been used. Examples are the OZ-project [Reilly & Bates, 1992], concerned with the development of a theatre world inhabited by emotional agents, and the Carmen project [Marsella *et al.*, 2000], where event appraisal is used to recognize feelings of guilt and anger in a setting where an embodied agent talks with a mother of children with leukemia.

It seems also useful to review existing theories and observations concerning the appraisal of (humorous) situations (available as events, in conversations, in verbal descriptions or stories) in terms of possible agent models that include explicit modules for beliefs, desires, intentions and emotions. How does the agent reason when on the one hand the situation is normal, while at the same time there is a violation of a certain commitment of the agent about how things ought to be. With this view in mind it is useful to look at the violation theory discussed in [Veatch, 1998], attempts to define degrees of incongruity [Deckers, 2001], attempts to define humor in terms of violations of Grice's maxims [Attardo, 1993] and proposals to define and explain humor or laughter in terms of perceptual, affective, and response patterns [Russell, 2000].

5 CONCLUSIONS

This paper touches upon the state of the art of embodied conversational agents, humor modeling and affective computing. Using the 'computers are social actors' paradigm we made clear that it is useful for natural interaction between human and computer to introduce characteristics of human-human interaction in agent-human interaction, including the generation of humor and the display of appreciation of humor. We introduced the notion of a HA in a dialogue or in a conversation. We didn't provide general algorithms for construction HA's or for deciding when to generate a HA in a dialogue or conversation. Rather we discussed issues involved and an illustrative example.

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