Laughing with HAHAcronym, a Computational Humor System

Oliviero Stock and **Carlo Strapparava**
ITC-irst, Povo, I-38050, Trento, Italy
{stock, strappa}@itc.it

Abstract

Computational humor is a challenge with implications for many classical fields in AI such as, for example, natural language processing, intelligent human-computer interaction, reasoning, not to mention cognitive science, linguistics and psychology. In this paper we summarize our experience in developing HAHAcronym, a system devoted to produce humorous acronyms, and we discuss some concrete prospects for this field.

Introduction

The interaction between humans and computers needs to evolve beyond usability and productivity. There is a wide perception in the field that the future is in themes such as entertainment, fun, emotions, aesthetic pleasure, motivation, attention, engagement and so on. Humor is an essential element in communication: it is strictly related to the themes mentioned above, and probably humans cannot survive without it. While it is generally considered merely a way to induce amusement, humor provides an important way to influence the mental state of people to improve their activity. Even though humor is a very complex capability to reproduce, it is realistic to model some types of humor production and to aim at implementing this capability in computational systems. Let us now review a few elements that make humor so important from a cognitive point of view.

Humor is a powerful generator of emotions. As such, it has an impact on people's psychological state, directs their attention, influences the processes of memorization and of decision-making, and creates desires and emotions. Actually, emotions are an extraordinary instrument for motivation and persuasion because those who are capable of transmitting and evoking them have the power to influence other people's opinions and behaviour. Humor, therefore, allows for conscious and constructive use of the affective states generated by it. Affective induction through verbal language is particularly interesting; and humor is one of the most effective ways of achieving it. Purposeful use of humorous techniques enables us to induce positive emotions and mood and to exploit their cognitive and behavioural effects. For example, the persuasive effect of humor and emotions is well known and widely employed in advertising. Advertisements have to be both short and meaningful, to be able to convey information and emotions at the same time.

Humor acts not only upon emotions, but also on human beliefs. A joke plays on the beliefs and expectations of the hearer. By infringing on them, it causes surprise and then hilarity. Jesting with beliefs and opinions, humor induces irony and accustoms people not to take themselves too seriously. Sometimes simple wit can sweep away a negative outlook that places limits on people's desires and abilities. Wit can help people overcome self-concern and pessimism that often prevents them from pursuing more ambitious goals and objectives.

Humor encourages creativity as well. The change of perspective caused by humorous situations induces new ways of interpreting the same event. By stripping away clichés and commonplaces, and stressing their inconsistency, people become more open to new ideas and points of view. Creativity redraws the space of possibilities and delivers unexpected solutions to problems. Actually, creative stimuli constitute one of the most effective impulses for human activity. Machines equipped with humorous capabilities will be able to play an active role in inducing users' emotions and beliefs, and in providing motivational support.

There are many practical settings where computational humor will add value. Among them there are: business world applications (such as advertisement, e-commerce, etc.), general computer-mediated communication and human-computer interaction, increase in the friendliness of natural language interfaces, educational and edutainment systems.

Not necessarily applications need to emphasize interactivity. For instance there are important prospects for humor in automatic information presentation. In the Web age presentations will become more and more flexible and personalized and will require humor contributions for electronic commerce developments (e.g. product promotion, getting selective attention, help in memorizing names etc) more or less as it happened in the world of advertisement within the old broadcast communication.

Little published research exists on whether humor is valuable in task-oriented human-computer interaction (HCI). However (Morkes, Kernal, & Nass 1999) did some experiments concerning the effects of humor in HCI and

computer-mediated communication situations. Especially in computer-mediated communication tasks, participants who received jokes rated the "person" or computer they worked with as more likable and competent, reported greater cooperation, joked back more often etc. The experiments show that humor enhances the likeability of an interface "without distracting users".

There has been a considerable amount of research on linguistics of humor and on theories of semantics or pragmatics of humor (Attardo 1994). Within the artificial intelligence community, most writing on humor has been speculative. Minsky (Minsky 1980) made some preliminary remarks about formalizing some kind of humor within an artificial intelligence/cognitive science perspective. He refined Freud's notion that humor is a way of bypassing our mental "censors" which control inappropriate thoughts and feelings (Freud 1905). So far, very limited effort has been put on building computational humor prototypes. The few existing ones are concerned with rather simple tasks, normally in limited domains. Probably the most important attempt to create a computational humor prototype is the work of Binsted and Ritchie (Binsted & Ritchie 1994). They have devised a model of the semantic and syntactic regularities underlying some of the simplest types of punning riddles. A punning riddle is a question-answer riddle that uses phonological ambiguity. The three main strategies used to create phonological ambiguity are syllable substitution, word substitution and metathesis. Humor recognition has received even less attention. It is worth mentioning the work of (Mihalcea & Strapparava 2005) that investigated the application of text categorization techniques to humor recognition. In particular they showed that classification techniques are a viable approach for distinguishing between humorous and non-humorous text, through experiments performed on very large data sets. Finally, (Nijholt 2003) investigates how computational humor research can add value to the communication with machines (e.g. intelligent interfaces, personal robots).

In general, the constructive approaches are mostly inspired by the incongruity theory (Raskin 1985), interpreted at various levels of refinement. The incongruity theory focuses on the element of surprise. It states that humor is created out of a conflict between what is expected and what actually occurs when the humorous utterance or story is completed. In verbal humor this means that at some level, different interpretations of material must be possible (and some not detected before the culmination of the humorous process) or various pieces of material must cause perception of specific forms of opposition. Natural language processing research has often dealt with ambiguity in language. A common view is that ambiguity is an obstacle for deep comprehension. Exactly the opposite is true here.

The work presented here refers to HAHAcronym, the first European project devoted to computational humor, part of the Future Emerging Technologies section of the Fifth European Framework Program. The main goal of HAHAcronym was the realization of an acronym ironic re-analyzer and generator as a proof of concept in a focused but non restricted context. In the first case the system makes fun of existing acronyms, in the second case, starting from concepts provided by the user, it produces new acronyms, constrained to be words of the given language. And, of course, they have to be funny.

HAHAcronym, fully described in (Stock & Strapparava 2003; 2005a; 2005b), is based on various resources for natural language processing, adapted for humor. Many components are present but simplified with respect to more complex scenarios and some general tools have been developed for the humorous context. A fundamental tool is an incongruity detector/generator: in practice there is a need to detect semantic mismatches between expected sentence meaning and other readings, along some specific dimension (i.e. in our case the acronym and its context).

HAHAcronym

The realization of an acronym re-analyzer and generator was proposed to the European Commission as a project that we would be able to develop in a short period of time (less than a year), that would be meaningful, well demonstrable, that could be evaluated along some pre-decided criteria, and that was conducive to a subsequent development in a direction of potential applicative interest. So for us it was essential that:

1. the work could have many components of a larger system, simplified for the current setting;
2. we could reuse and adapt existing relevant linguistic resources;
3. some simple strategies for humor effects could be investigated.

One of the purposes of the project was to show that using "standard" resources (with some extensions and modifications) and suitable linguistic theories of humor (i.e. developing specific algorithms that implement or elaborate theories), it is possible to implement a working prototype. For that, we have taken advantage of specialized thesauri and repositories and in particular of WORDNET DOMAINS, an extension developed at ITC-irst of the well-known English WORDNET. In WORDNET DOMAINS, synsets are annotated with subject field codes (or domain labels), e.g. MEDICINE, ARCHITECTURE, LITERATURE,... In particular for HAHAcronym, we have modelled an independent structure of domain opposition, such as RELIGION vs. TECHNOLOGY, SEX vs. RELIGION, etc..., as a basic resource for the incongruity generator.
Other important computational tools we have used are: a parser for analyzing input syntactically and a syntactic generator of acronyms; general lexical resources, e.g. acronym grammars, morphological analyzers, rhyming dictionaries, proper nouns databases, a dictionary of hyperbolic adjectives/adverbs.

Implementation

To get an ironic or "profaning" re-analysis of a given acronym, the system follows various steps and relies on a number of strategies. The main elements of the algorithm can be schematized as follows:

- acronym parsing and construction of a logical form

- choice of what to keep unchanged (for example the head of the highest ranking NP) and what to modify (for example the adjectives)
- look for possible, initial letter preserving, substitutions
  - using semantic field oppositions;
  - reproducing rhyme and rhythm (the modified acronym should sound as similar as possible to the original one);
  - for adjectives, reasoning based mainly on antonym clustering and other semantic relations in WORDNET.

Making fun of existing acronyms amounts to basically using irony on them, desecrating them with some unexpectedly contrasting but otherwise consistently sounding expansion.

As far as acronym generation is concerned, the problem is more complex. We constrain resulting acronyms to be words of the dictionary. The system takes in input some concepts (actually synsets, so that input to this system can result from some other processing, for instance sentence interpretation) and some minimal structural indication, such as the semantic head. The primary strategy of the system is to consider as potential acronyms words that are in ironic relation with input concepts. Structures for the acronym expansion result from the specified head indication and the grammar. Semantic reasoning and navigation over WORDNET, choice of specific word realizations, including morphosyntactic variations, constrain the result. In this specific strategy, ironic reasoning is developed mainly at the level of acronym choice and in the incongruity resulting in relation to the coherently combined words of the acronym expansion.

Examples and Evaluation

Here below some examples of acronym re-analysis are reported. As far as semantic field opposition is concerned, we have slightly biased the system towards the domains FOOD, RELIGION, and SEX. For each example we report the original acronym and the re-analysis.

ACM - Association for Computing Machinery
→ Association for Confusing Machinery
FBI - Federal Bureau of Investigation
→ Fantastic Bureau of Intimidation
PDA - Personal Digital Assistant
→ Penitential Demoniacal Assistant
IJCAI - International Joint Conference on Artificial Intelligence
→ Irrational Joint Conference on Antenuptial Intemperance
→ Irrational Judgment Conference on Artificial Indolence
ITS - Intelligent Tutoring Systems
→ Impertinent Tutoring Systems
→ Indecent Toying Systems

As far as generation from scratch is concerned, a main concept and some attributes (in terms of synsets) are given as input to the system. Here below we report some examples of acronym generation.

Main concept: *tutoring*; Attribute: *intelligent*
FAINT - Folksy Acritical Instruction for Nescience Teaching
NAIVE - Negligent At-large Instruction for Vulnerable Extracurricular-activity

Main concept: *writing*; Attribute: *creative*
CAUSTIC - Creative Activity for Unconvincingly Sporadically Talkative Individualistic Commercials

We note that the system tries to keep all the expansions of the acronym coherent in the same semantic field of the main concepts. At the same time, whenever possible, it exploits some incongruity in the lexical choices.

Testing the humorous quality of texts or other verbal expressions is not an easy task. There are some relevant studies though, such as (Ruch 1996). For HAHAcronym an evaluation was set with a group of 30 American university students. They had to evaluate the system production (80 reanalyzed and 80 generated acronyms), along a scale of five levels of amusement (from *very-funny* to *not-funny*). The results were very encouraging. The system performance with humorous strategies and the one without such strategies (i.e. random lexical choices, maintaining only syntactic correctness) were totally different. None of the humorous re-analyses proposed to the students were rejected as completely non-humorous. Almost 70% were rated funny enough (without humorous strategies the figure was less than 8%). In the case of generation of new acronyms results were positive in 53% of the cases.

A curiosity that may be worth mentioning: HAHAcronym participated in a contest about (human) production of best acronyms, organized by RAI, the Italian National Broadcasting Service. The system won a jury's special prize.

Prospects for Computational Humor

As we said in the introduction, humor is an important mechanism for communicating new ideas and change perspectives. On the cognitive side humor has two very important properties: it helps getting and keeping people's attention and it helps remembering.

Type and rhythm of humor may vary and the time involved in building the humorous effect may be different in different cases: some times there is a context - like in joke telling - that from the beginning let you expect for the humorous climax, which may occur after a long while; other times the effect is obtained in almost no time, with one perceptive act. This is the case of static visual humor, of funny posters or of when some well established convention is reversed with an utterance. Many advertisement-oriented expressions have this property. The role of variation of a known expression seem to be of high importance and studies have also shown the positive impact on the audience of forms of incongruity in the resulting expressions.

As for memorization it is a common experience to connect in our memory some knowledge to a humorous remark or event. In a foreign language acquisition context it may happen that an involuntary funny situation was created because of so called "false friends" words that sound similar in two languages and may have the same origin but a very different meaning. The "false friends" acknowledgment is

conducive to remembering the correct use of the word. Similarly, as shown experimentally (see the introduction), a good humorous expression has exceptionally good recall quality not only *per se* but also for product type and brand, especially if it somehow pertinent. For a large number of verbal expressions what it takes is the ability to perform *optimal innovation* (Giora 2002) of existing material, with a humorous connotation. We must start from well known expressions that are firm points for the audience, and are connected to the concept or element we intend to promote. We should then be able to perform variations either in the external context, in case the material is ambiguous and the audience can be lured to a different interpretation; or, more often, within the expression itself, changing some material of the expression appropriately, while still preserving full recognisability of the original expression. For instance a good advertising expression for a soft drink is *"Thirst come, thirst served"*, obvious alteration of a known expression.

As we are considering future developments, this process is for us an extension of what we have done within HAHAcronym. It takes of course more complex components, though. We are talking about natural language expressions, more difficult than acronyms for syntax, semantics, pragmatics. They involve world knowledge, common sense and so on.

In most fields of AI the difficulties of reasoning on deep world knowledge have been understood for a while. There is a clear problem in scaling up between toy experiments and meaningful large scale applications. The more so in an area such as humor, by many called "AI-complete", where good quality expressions require subtle understanding of situations and are normally the privilege of talented individuals. Our goal here is to produce general mechanisms limited to the humorous re-visitation of verbal expressions, but meant to work in unrestricted domains. Our approach is based on a number of resources with rather shallow internal representations for most of the knowledge and on the design of some specialised reasoners. We consider the use of affective terms a critical aspect in communication and in particular for humor. Valence (positive or negative polarity) of a term and its intensity (the level of arousal it provides) are fundamental factors for persuasion and also for humorous communication. Making fun of biased expression or alluding to related "colored" concepts plays an important role for humorous revisitation of existing expressions.

From an application point of view we think the world of advertisement has a great potential for the adoption of computational humor.

(Perry *et al.* 1997) have shown that perception of humor in promotional messages produce higher attention and in general a better recall than non humorous advertisement of the product category, of the specific brand and of the advertisement itself.

The future of advertisement will probably include three important themes: a) reduction in time to market and extension of possible occasions for advertisement; b) more attention to the wearing out of the message and for the need for planning variants and connected messages across time and space; c) contextual personalisation, on the basis of audience profile and perhaps information about the situation. All three cases call for a strong role for computer-based intelligent technology for producing novel appropriate advertisements. We believe that computational humor will help producing those kind of messages that have been so successful in the "slow" or non personalised situation we have lived in.

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