Humour Research: State of the Art

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Humour Research: State of the Art

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Abstract

Humour is a multi-disciplinary field of research. People have been working on humour in many fields of research like psychology, philosophy and linguistics, sociology and literature. Especially in the context of computer science (or Artificial Intelligence) humour research aims at modeling humour in a computationally tractable way. Having computational models of humour allows interface designers to have the computer generate and interpret humour when interacting with users. There are many situations in human-human interaction where humour plays an important role in keeping the conversation going. Making use of the so-called CASA paradigm (Computers Are Social Actors) we may expect that a similar role can be played in human-computer interaction. In this report we survey current humour research with the aim to identify useful theories that can be applied in the human-computer interaction context. We focus on the following subjects: humour theories, related humour research, linguistic aspects of humour, computational aspects of humour, applications and resources.

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1 Introduction

Humour is a multi-disciplinary field of research. People have been working on humour in many fields of research like psychology, philosophy and linguistics, sociology and literature. Especially in the context of computer science (or Artificial Intelligence) humour research aims at modeling humour in a computationally tractable way. Having computational models of humour allows interface designers to have the computer generate and interpret humour when interacting with users. There are many situations in human-human interaction where humour plays an important role in keeping the conversation going. Making use of the so-called CASA paradigm (Computers Are Social Actors) we may expect that a similar role can be played in human-computer interaction. In this report we survey current humour research with the aim to identify useful theories that can be applied in the human-computer interaction context. We focus on the following subjects: humour theories, related humour research, linguistic aspects of humour, computational aspects of humour, applications and resources.

1.1 Conventional Humour Theories

In the conventional literature on theories on humour there is a division in three basic theories:

- Superiority Theory
- Relief Theory
- Incongruity Theory

This chapter will briefly discuss these three theories, together with additional theories from the fields of psychology and sociology. A theory proposed by Veatch attempts to explain humour and laughter in a broader sense and will be discussed in section 1.6.

1.2 Superiority Theory

The assumption of the superiority theory is that we laugh about the misfortunes of others; it reflects our own superiority. This theory can be found in the work of Plato, Aristotle, and Hobbes [BAR92]. Plato suggests that humour is some kind of malice towards people that are being considered relatively powerless. Hobbes further explains that humans are in a constant competition with each other, looking for the shortcomings of other persons. He considers laughter as an expression of a sudden realisation that we are better than others, an expression of 'sudden glory'.

Although this theory seems old-fashioned in the 21st century, Charles Gruner reformulated this theory as the Superiority Theory of Humour [GRU97]. His theory contains a thee-part thesis:

- Every humorous situation has a winner and a loser.
- Incongruity is always present in a humorous situation.
- Humour requires an element of surprise.

The first part of this thesis contains the idea of Superiority. The assumption that all humour has a winner and a loser is based on human nature. Through history humans have used humour to "compete" with other persons, making them the target of their humorous comment. The "winner" is the one that successfully makes fun of the "loser".

This theory can explain the fun of some humorous television programs, like sitcoms and talk shows, and successful Hollywood movies like *'There's Something About Mary'*. Nathaniel Grow [GRO00] uses the Superiority Theory of Humour in his analysis of the success of MTV's show *"The Tom Green Show"*.

1.3 Relief Theory

The Relief Theory has a clear physiological or psycho-physiological nature [RUT97]. The theory reached its zenith when Freud proposed his theory how laughter can release tension and "psychic energy". This energy continuously builds up within the human body, has no further use and therefore has to be released. This release is spontaneous and expresses itself in laughter. This theory is popular among those who believe that laughter is beneficial for one's health.

Freud explains that this "psychic energy" in our body is built as an aid for suppressing feelings in taboo areas, like sex or death. When this energy is released we experience laughter, not only because of the release of this energy, but also because these taboo thoughts are being entertained.

A more conventional version of the Relief Theory is that we experience a pleasant sensation when humour replaces negative feelings like pain or sadness.

The theory does not really give an explanation as to why we find humour funny and can in fact be seen a theory of laughter.

1.4 Incongruity Theory

The incongruity theory is the most influential approach to the study of humour and laughter. Kant, in the eighteenth century, is credited to have made the first full conceptualisation of incongruity. A good description of the incongruity theory is found in the following words uttered by Schopenhauer [SCH83]:

> "The cause of laughter in every case is simply the sudden perception of the incongruity between a concept and the real objects which have been thought through it in some relation, and the laugh itself is just an expression of this incongruity."

When jokes are examined in the light of the incongruity theory, two objects in the joke are presented through a single concept, or 'frame'. The concept becomes applied to both objects and the objects become similar. As the joke progresses, it becomes apparent that this concept only applies to one of the two objects and thus the difference between the objects or their concepts becomes apparent. This is what is called incongruity [RUT97].

Many agree on the point that it is not the incongruity but the congruous resolution of the apparent incongruity that makes a certain situation funny. That is why we speak of the incongruity-resolution theory.

The incongruity-resolution theory is more or less a linguistic theory, because it explains how jokes are structured and does not pay attention to the influence of the surrounding factors. Moreover, it cannot explain why we can hear a joke more than one time and still find it funny and why not all incongruities are funny.

1.5 Minsky's Theory on Humour

Minsky bases his Theory on Humour on Freud's notion of humour [MIN81]. Freud claims that our brain creates so-called "censors" in order to create barriers that prevent us from thinking "naughty" or "forbidden" thoughts. When we are able to elude these barriers by means of a joke, we experience a sudden release of "psychic energy" and this energy is discharged in the form of laughter. This theory could explain why we laugh about childish jokes with double meanings and why we laugh about sexual and aggressive jokes in general.

However, this theory doesn't explain why we experience other types of jokes as funny, for example why we laugh about humorous nonsense. Freud wrote that this maybe had to do with our perception of what humour exactly is. Minsky assumes, however, that the fun of humorous nonsense can also be explained with the "censor" theory.

One of Freud's examples of a nonsense joke where logic fails is the following:

> A gentleman entered a pastry-cook's shop and ordered a cake; but he soon brought it back and asked for a glass of liqueur instead. He drank it and began to leave without having paid. The proprietor detained him. "You've not paid for the liqueur." "But I gave you the cake in exchange for it." "You didn't pay for that either." "But I hadn't eaten it".

The result of such a joke is that we find ourselves puzzled, next troubled; after that we experience laughter and find the logical absurdity humorous. Minsky suggests that our subconscious builds a collection of "cognitive censors" in order to suppress this kind of faulty logic with which we can do ourselves some kind of cognitive harm. When we are therefore able to elude these censors, or where no specific censors exist, we experience laughter. These censors are able to "learn" and "improve" and that explains why we experience a joke we already heard several times less funny.

Minsky further proposes that we are thinking in what he calls "frames". A frame is a way to define a certain stereotyped situation. We are able to make shifts between these frames, from the very simple to very powerful once-in-a-lifetime insights we obtain by finding less obvious connections between two situations. A lot of jokes, especially 'puns', make use of words that have more than one meaning. In order to make the good assumption, we have to make a sense-shift of the word, causing a frame-replacement in our way of reasoning (the less obvious frame for the 'default' frame). We can experience this as humorous, although it can also be dangerous for, for example, schizophrenic persons. One example is the schizophrenic patient who sees a penny in the street, says "copper, that's a conductor," and then runs to a streetcar to speak to the conductor.

1.6 Violation Theory

The violation theory, as proposed by Thomas Veatch [VEA98] can be seen as an attempt to create one global theory of all different sorts of humour. It suggests comprising all existing humour theories like the incongruity-resolution and superiority theory.

The theory describes three necessary and (jointly) sufficient conditions for humour perception. When one of these conditions is lacking, there is no humour perception and if all three are present, humour perception is also there. The three conditions are being described as:

- V - The violation of a certain commitment of the perceiver about how things ought to be.

- N - The perceiver has the dominating feeling that the certain situation is normal.

- Simultaneity - These two understandings V and N have to be present in the mind of the perceiver at the same time.

In other words, a certain situation is humorous when it seems that the situation is normal, but at the same time it seems like something is wrong. To cite Veach:

"Humor is (emotional) pain (V) that doesn't hurt (N)."

Veatch describes condition V as a "subjective moral violation", the violation of that what the perceiver cares about. It can be described best this way, because it depends on the perceiver what it is he experiences as a violation. It depends on one's commitment or attachment to a certain situation.

Veatch goes on to explain that the grade of attachment of the perceiver is important as to if he will experience a situation as humour, offensive or unremarkable. He describes this phenomenon with a three-level scale of commitment and its consequences. The relation of commitment and humour perception becomes clear in Table 1.

			Perceiver		
level	logic	commitment	gets it	is offended	sees humour
level 1	not-V	none	no	no	no
level 2	V and N	weak	yes	no	yes
level 3	V and not-N	strong	yes	yes	no

Table 1 – The three-level scale

The normality factor (= the amount of 'normal' information in a joke) is, besides the level of attachment, of importance and can have a strong and profound influence on how the perceiver will experience the violation.

In his paper Veatch describes how this theory can put other theories in their proper place and that they are more or less derivable from the violation theory. This theory can also explain why babies experience 'peekaboo' as humorous and what makes a joke a 'sick joke'.

1.7 Sociology Theories

The difference between humour research in the sociology field and other fields is that the research of sociologists is not centred round the question why we laugh. Their research is focusing on the social and cultural context of a joke or any other humorous event. They do not try to understand why a joke causes laughter or why we find a certain situation humorous, they focus on the way a joke is contextually interpreted. This means: to understand the real meaning of a joke in its cultural and social context, the consequences of a joke and the influence of and in interpersonal relationships.

The social environment of humour is vast and humour can be seen as a part of many different social actions. According to sociologists, the social impact of joking and humour is very important in our everyday life and there are many different theories on the social impact of humour. Jason Rutter discerns in [RUT97] a division of sociologies of humour in three groups he calls *Maintenance Theories, Negotiation Theories* and *Frame Theories*.

Maintenance Theories suggest that jokes maintain the established social roles and divisions within a society. They can strengthen roles within the family, within a working environment and everywhere there exists an in-group and out-group. When ethnical jokes are concerned, jokers choose groups very similar to theirs as the target of the joke only to focus on the mutual differences and in that way strengthen the established divisions between the two groups.

Negotiation Theories look at humour and laughter from a specifically sociological perspective. They focus on the role of humour as a means of interaction, pastime and an event where more than one person is involved. The hearer defines if a joke is funny or not, depending on the social and cultural context of the joke and its environment. A study of humour and jokes can offer insight in a culture and reveal aspects of this culture that would otherwise not be observed.

Frame Theories tend to see joking as a break from the everyday serious life. The joker makes a shift from the serious frame to the humorous frame and is allowed to present criticism without fear for retribution. The jokes are founded on the society and culture, but are standing outside the normal discourse. From the humorous frame people can give comments and breach taboos without causing offence. Of course, a joke is only accepted as humorous when all involved parties agree that it is a joke. By switching to the humorous frame when introducing a potentially volatile subject, one can always make the "only joking" excuse.

2 Humour and Related Research

2.1 Introduction

Because of the broad scope of humour research, it is impossible to highlight all current research. Some of the research that is closely related to the theories of humour and of interest within the scope of the project is highlighted in this chapter. The chapter will discuss: laughter research, contextualisation of humour, humour and health and 'sense of humour'.

2.2 Laughter Research

Many researchers connect laughter to humour and use these two terms in the same context. However, humour and laughter are closely related but certainly not the same. Laughter can be the result of humour, but not every humorous situation will invoke laughter, as well as humans laugh without the perception of humour.

There is little research going on in the field of laughter. The curious 1962 outbreak of contagious laughter in Tanganyika that lasted for six months and affected thousands of people led to research about the nature of laughter. A point to start is the article written by Robert Provine that appeared in the January/February 1996 issue of the American Scientific [PRO96]. He has done research about the structure of laughter and about the chimpanzee laughter. More interesting in the context of this deliverable is his research about the social and linguistic context of laughter. Laughter is contagious and can be used to evoke laughter or a positive mood, as being done on television, where laugh tracks are being used to accompany sitcoms to make the experience of a sitcom more pleasant.

Elizabeth Muehlchen [MUE00] refers to [PRO96] and adds that laughter brings people together as a group, it signals "bonding, affirmation, belonging, listening", it can be disarming and by means of laughter people can show more about themselves than that they are aware of.

In [DAV96] Jessica Davis digs deeper in the social, physiological and psychological effects of laughter in specific.

2.3 Contextualisation of Humour

In [ZAJ91] Anat Zajdman discusses how a canned joke can be implemented into a discourse. He presents a 'four-stage model', indicating a gradual increase of semantic relevance of the joke to the discourse.

These four types of joke incorporation are represented in the four-stage model:

- Type A – "Supplier"

  This speech-event consists of a question and an answer that contains the required information, followed by a joke.

- Type B – "Sub-contractor"

  This speech-event consists of a question and an answer that contains the required information, followed by an announcement that a joke is to come, the joke and an explanation of the relevance of the joke to the situation.

- Type C – "Joint venture"

  This is an abbreviated form of Type B. The joke is introduced without fully telling it, assuming that the text is known to the hearer and will be evoked by him through an allusion.

- Type D – "Merger"

  This type takes place when the required information is perfectly compounded with the joke.

The model shows four types of joke incorporation with an increase in connections with the context. The canned jokes in the "Supplier" incorporation have very loose connections with the context and the jokes in the "Merger" incorporation are merged in the context, resulting is an overlap between the joke scripts and the context. In this way information can be conveyed using jokes.

2.4 Humour and Health

The Association for Applied and Therapeutic Humor that was founded in 1988 [AATH] was created to be active in the field of education, research, application and clearinghouse on information related to therapeutic humour. On their website information about the association can be found, as well as articles and links to other related websites.

Steven Sultanoff, the former president of the AATH, has written some articles about therapeutic humour [SUL95]. He points out that although humour is one of the most powerful methods to help one to overcome periods of crisis, individuals immersed in the crisis often experience crisis humour as hurtful. The factor that determines if a joke is appreciated or not is the butt of the joke.

Others generally appreciate self-deprecating humour or humour aimed at situations, but humour is aimed at a group or at individuals used to degrade or insult is generally not appreciated. When a person is involved in a crisis situation, it is likely that such a person will integrate the crisis into their internal emotional being. These persons will experience humour aimed at the crisis situation as aimed at them and therefore experience the humour as hurtful or insensitive. In order for crisis humour to be beneficial an individual has to take distance from the crisis. This distance may be proximal, emotional or temporal; when the distance is large enough, crisis humour may be healthful.

Ellie Marek and Judith Tingley discuss in [MAR00] the appreciation of gender jokes by men and women. Their conclusions were than men find this type of humour funny much more often than women do and that women were more frequently offended and saw more hostility in this type of jokes than men do.

2.5 Sense of Humour

A complete issue of the HUMOR Journals was dedicated to *measurement approaches to the sense of humour* [RAS96]. Willibald Ruch states in the introduction that humour is an important trait of our personality. The agenda of 'sense of humour' research is "to describe the entirety of observable habitual differences in humor, investigate their interrelations in a systematic way, and eventually define a smaller set of traits that account for the differences observed, that is, to make up a person's "sense of humor"."

In order to create a theoretical model of 'sense of humour' three different aspects have to be studied: the causes of *individual* differences in humour, the *group* differences (gender, racial, etc.) and *intraindividual* differences. A potential description of a humorous personality consists of a multi-dimensional structure of the all the different components of humour.

One important aspect is to determine how broad the scope of the expression *humour* is. Is humour distinguishable from *satire*, *irony*, *wit*, etc. and do there exist besides *sense of humour* also concepts like *sense of satire* and *sense of wit*? Or is humour an umbrella-term for our humorous personality trait?

The HUMOUR journal shows that there are good scales to measure the different aspects of the sense of humour. However, more theoretical and empirical work has to be done on the definition or foundation of the concepts of sense of humour.

The application Jester 2.0 is an on-line joke recommending system using collaborative filtering in order to recommend jokes adapted to the user's 'sense of humour' [GOL00]. A user has to rate jokes and according to these ratings he will become associated with a 'nearest neighbour', another user with a similar 'sense of humour'. New jokes will be recommended according to the ratings this 'nearest neighbour' gave to other jokes.

Giselinde Kuipers [KUI01] is looking how a social background is of any influence on the 'sense of humour' within the Dutch society. She is especially interested in the vast amount of ethnical jokes that exist in The Netherlands.

3 Humour Research in the Linguistic Field

3.1 Introduction

Within the linguistic field humour can be treated from syntactic, pragmatic and semantic points of view.

Attardo and Raskin have done a lot of work on semantic aspects of verbal humour. Their work, based on the incongruity-resolution theory has resulted in the General Theory of Verbal Humour and this theory will be discussed in section 3.6.

3.2 Humour and syntax

Oaks [OAK94] offers a catalogue of syntactic and lexical devices for the creation of ambiguity within jokes. Robert Hetzron [HET91] gives an extended account on the structure of jokes and punchlines. He assumes that a joke consists of 'pulses'. These pulses are successive episodes in a text or parts of an enumeration. These pulses can be humorous, amusing or informative; the main condition is that the last pulse contains the punchline. Hetzron also subjects the punchlines to a feature analysis and describes the logical devices that are used to make punchlines sound funny.

Neal Norrick looks at the intertextuality of jokes [NOR89]. He assumes that intertextual jokes are based on an original text or joke that the perceiver has to know in order to appreciate the joke. In another paper Norrick [NOR93] examines the presence and importance of repetition in canned jokes and spontaneous conversational joking.

3.3 Humour and pragmatics

Rachel Giora [GIO01] states that pleasure and liking are induced by stimuli that involve both innovativeness and familiarity. This has resulted in the *optimal innovation hypothesis*:

> "If a stimulus is optimally innovative it would be rated as
> more pleasurable than either a familiar stimulus or a purely
> innovative stimulus."

A stimulus would be optimally innovative if it involves a novel response to a familiar stimulus, but "would also allow for the automatic recoverability of a salient response related to that stimulus so that the similarity and difference between the novel and the salient would be assessable." [GIORA]

Marlene Dolitsky focuses on the aspects of the unsaid in humour [DOL92]. She assumes that the place where the unsaid communication takes place is the point of the joke where its 'funniness' resides. The three aspects where the unsaid in humour must be studied are:

1. *The speech act that is humour.*

2. *The participants in the humorous event.*

   A speech act consists of explicit and implicit information. The implicit information is conveyed through the utterances and the speaking situation taken together as a whole. This implicit information is based on the shared knowledge and assumptions concerning the world the speaker and listener live in. When telling a joke the speaker leads the listener on to apply rules of pertinence knowing that they do not apply to the story being

told. The humorous effect is held the listeners' realisation that he or she has been led down the garden path. Another way to use the unsaid in the speech act is to mix standard scripts or 'frames' in a way that they result in a humorous situation.

3. *The rule breaking character of humour.*

   Every society has its rules that are governing the behaviour of its members. These rules are part of the common knowledge of the community and they regulate the things a member can and cannot do. Humour can bee seen as a carnival of language. During carnival all rules are abolished; likewise humour is based on the bending and breaking of rules. These rules are always unsaid and are therefore a third aspect one has to study in order to understand the funniness of the unsaid in humour.

Ephratt [EPH96] is relying on the notion of speech acts in his pragmatic account of humour.

3.4 Semantic Script Theory of Humor

The Semantic Script Theory of Humor (SSTH) is a theory developed by Victor Raskin and is summarised in [ATT91] where different existing theories are being combined in the General Theory of Verbal Humor (GTVH). The theory assumes that a joke is always related with two different scripts that are opposed to each other in a special way. The theory explains that the text of a joke is unambiguous up to the point of the punchline. The punchline triggers a switch from one script to another and makes the hearer realise that more interpretations of the text are possible from the beginning.

The theory postulates three levels of abstraction of script opposition with at the highest level of abstraction the opposition between *real* and *unreal*. At a lower level of abstraction these oppositions can take three forms, namely *actual vs. non-actual*, *normal vs. abnormal*, *possible vs. impossible*. At the lowest level these oppositions can be manifested as oppositions like *good vs. bad*, *live vs. death*, *sex vs. non-sex*, etc.

The theory ignores other parameters that have an influence in the funniness of a joke, assuming that script opposition is the most important factor. Only two types of triggers, or logical mechanisms that trigger the script-switch in the punchline are distinguished: ambiguous and contradictory triggers. These logical mechanisms of script-switch are seen as an implementation of the script opposition and are not given special attention.

3.5 The Five-Level Model of Joke representation

This model developed by Attardo in 1987 models five levels of joke representation. The different levels are:

1. Surface
2. Language
3. Target + Situation
4. Template
5. Basic (script opposition and logical mechanism)

The ordering of the different levels is based on the linguistic meaning-to-sound theories of how sentences are being formed. This model yields a number of theoretical problems that are being

discussed in [ATT91]. A revision of this model in combination with the SSTH led to the formulation of the General Theory of Verbal Humor.

3.6 The General Theory of Verbal Humor

The derivation of the GTVH from the SSTH can be found in [ATT91]. In [RUC93] a description of the GTVH can be found. Besides script opposition the scope of the GTVH consists of five other parameters, called Knowlegde Resources (KR).

The six Knowledge Resources of this theory are:

- Language (LA)

   The LA KR is the set linguistic components chosen to form the actual text of the joke.

- Narrative strategy (NS)

   The joke has to be cast in some form of narrative organisation. This has been called the NS KR.

- Target (TA)

   The TA KR is the butt of a joke. Non-aggressive jokes do not have a target.

- Situation (SI)

   The SI KR is the situation of the joke. One can think of the object, participants, surroundings, activities, etc.

- Logical mechanism (LM)

   The LM KR represents the mechanism used to bring two different scripts together in one joke.

- Script opposition (SO)

   The SO KR is the most abstract of all resources. It deals with the script opposition/overlapping requirement as has been described by the SSTH.

An important aspect of the GTVH is the hierarchal organisation of the KRs. The basic principle is that a certain KR probably will determine or will be determined by another KR. The hierarchical organisation of KRs is: SO, (LM), SI, TA, LA, NS, LA, organised from less similar and less determined to more similar and more determined.

In [ATT91] a study of the relation between differences in KRs between two jokes and their similarity is outlined. The assumption is that that if the GTVH is correct, a linear increase of similarity between pairs of jokes selected along the KR hierarchy will be perceived. This theory proves true for all KRs except LM. The question therefore was raised if LM is a KR of not.

In [ATT97] Attardo compares the GTVH with the incongruity-resolution theories and is pointing that LM is in fact the resolution of the incongruity, or script opposition (SO). This means that LM can be seen as an optional KR, because so-called nonsense jokes, jokes without resolution can also be experienced as funny. It is also possible that LM is only the resolution and no KR at all.

Graeme Ritchie states in [RIT01] that the GTVH is more developed than any other theory, but from the computational point of view it is nothing more than a very early draft of a model.

4 Humour Research in the Computational Field

4.1 International Workshop on Computational Humor

The state of the art in computational humour is not very developed. The IWCH proceedings [HUL96] give a good overview of the state of the art in 1996. Ritchie summarises these proceedings in [RIT01], where he discusses the following research done in the field of computational humour.

- The logical analysis of irony by Utsumi;

- The research on syntactic ambiguity in jokes by Ephratt;

- The pun detecting program for Japanese by Takizawa et al.;

- The JAPE riddle-generator created by Binsted and Ritchie;

- The neural account of what happens when a humorous stimulus is processed by a hearer or reader proposed by Katz.

4.2 Building on the Surprise Disambiguation and Two-Stage Model

Ritchie has done some interesting research as well. In [RIT99] he takes the incongruity-resolution (IR) theory as the basis in order to propose some processing steps that might be necessary in order to interpret a joke. He analyses two variations on the IR model: the Surprise Disambiguation (SD) model and the two-stage model of Suls [SUL72].

The SD model assumes that there are two different interpretations for the set-up of a joke, one more obvious to the audience than the other. The audience will not become aware of the less obvious interpretation until the punchline conflicts with the obvious interpretation and evokes the other meaning. The two-stage model assumes that the punchline creates incongruity and that a cognitive rule has to be found that enables the content of the punchline to follow naturally on the contents of the set-up.

Building on the SD model he sets out that there are several relations or properties proposed as the essential ingredients in incongruity-resolution humour, but that not all of these relations or properties are necessary to create humour. These relations or properties are:

- *Obviousness*. The obvious interpretation of the set-up is more likely to be noticed than the less obvious or 'hidden' interpretation.

- *Conflict*. The meaning of the punchline does not make sense with the more obvious interpretation of the set-up.

- *Compatibility*. The meaning of the punchline does make sense with the 'hidden' interpretation of the set-up.

- *Comparison*. There is a contrasting relationship, or even a clash between the two interpretations op the set-up.

- *Inappropriateness*. The 'hidden' interpretation of the set-up is inappropriate. It can lead to on of the following effects: *Absurdity* (the flouting of everyday logic) or *Taboo* (the flouting of socially acceptable matters).

Another factor that is discussed in the context of SD jokes is the *violation* of expectations. Instead of a conflict between the interpretation of the obvious set-up and the punchline, a punchline can be in conflict with some prediction. Therefore it may be necessary to consider two possible subtypes of the 'conflict' relation: one that sets the punchline against the more obvious interpretation of the set-up and one that sets the punchline against a predicted interpretation.

Ritchie gives a sketch of a processing model for the interpretation of jokes in the manner of the SD model and draws the conclusion that the SD account relates to the delivery of humorous content. It reduces the existing problems of the understanding of humour to a set of sub-problems. The model does not explain what makes certain incongruity funny and other just a misunderstanding. It offers a solution to how incongruity can be brought to the audience's attention.

Suls' two-stage model could be summarised as follows [RIT99]:

- a text is read, make predictions

- while no conflict with predictions, keep going

- if input conflicts with predictions:

    - if not ending – PUZZLEMENT

    - if it is the ending, try to resolve:

        - no rule found – PUZZLEMENT

        - cognitive rule found – HUMOUR

The difference between this model and the SD model is that the two-stage model does not need any ambiguity to be present in the set-up. The model does not say how surprising a part of a text must be in order to count as a punchline. It is also not clear what a 'cognitive rule' is and why there exist different 'cognitive rules'.

The following differences between the two models are mentioned:
"

(a) The two models cover, or attempt to cover, different subclasses of joke. The SD model requires an ambiguous setup, whereas the two-stage model makes no mention of ambiguity.

(b) The SD model decomposes the humorous effect into slightly simpler concepts (particularly COMPARISON, ABSURDITY, and TABOO), and so at least starts to address the issue of "incongruity".

(c) The two-stage model relies on some (undefined) form of "humorous logic", and so leaves the difficult problem of 'incongruity' relatively untouched."

Building on these two models in [RIT00] Ritchie describes jokes using objects, properties and relations in a sorted version of first order predicate logic, in this way describing descriptive and narrative jokes. It is suggested that developing detailed descriptions of subclasses of jokes in this way will give more insight in the concept of incongruity and can lead to a broader theory of humour.

4.3 A Formal Model for Punning Riddles

Kim Binsted and Graeme Ritchie have devised a formal model of the semantic and syntactic regularities underlying some of the simpler types of punning riddles [BIN97]. 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.

Syllable substitution is the strategy to confuse a syllable (or syllables) in a word with a similar- or identical-sounding word. The following joke is an example of syllable substitution.

> What do shortsighted ghosts wear? Spooktacles. [WEB78]

Word substitution is the strategy to confuse an entire word with another similar- or identical-sounding word. An example of a joke with word substitution is:

> How do you make gold soup? Put fourteen carrots in it. [WEB78]

Metathesis is a strategy very different to syllable or word substitution. It uses reversal of sounds and words to suggest a similarity in meaning between two semantically distinct phrases.

> What is the difference between a torn flag and a postage stamp? One's a tattered banner and the other's a battered tanner. [BIN97]

Punning riddles based on these three strategies are all suitable for computer generation. Ritchie and Binsted chose to focus on the word substitution based punning riddles, because lists of homophones (= phonetically identical words) are already available.

The assumptions about the contents and the structure of the lexicon are as follows. The lexicon consists of a finite set of *lexemes* and of *lexical relations*. A *lexeme* is an abstract entity corresponding to the meaning of a word. If a word has two meanings, it has two corresponding lexemes. Every lexeme has a set of properties about the representation and the type of word. A *lexical relation* can be an explicit relation between two lexemes, like synonym or homophone, or a general inter-lexeme relation, applicable to more than one pair of lexemes.

In order to describe a punning riddle, two sorts of symbolic description have to be used: *schema* and *template*. A schema stipulates a set of relations witch must be hold between the lexemes used to build a joke. A template indicates the information necessary to turn a schema and lexemes into a piece of text. It contains fixed segments of text that are to be used and syntactic details of how lexemes have to be expressed.

This model is implemented as a computer program named JAPE-1. This program will be further discussed in chapter six.

4.4 Using Humour in User Interfaces

Reeves and Nass have shown in their studies [REE96] that humans respond in the same way to computers as they do to persons with respect to psychosocial phenomena such as personality, politeness, flattery, and in-group favouritism. Because humour is an essential part of human communication, humour should be integrated into user interfaces if we want to make human-computer interaction more natural and flexible.

Two conducted experiments that examined the effects of humour in task-oriented computer-mediated communication (CMC) and human-computer interaction (HCI) show that humour can have many positive effects [MOR98]. Participants who had received jokes during the interaction

rated the system as more likable and competent, smiled and laughed more, responded in a more sociable manner and reported greater cooperation. The study provides strong evidence that humour should be incorporated in CMC and HCI systems.

In [BIN95] Kim Binsted discusses how humour can make user interfaces friendlier. Humans use humour to ease communication problems. In a same way humour can be used to solve communication problems that arise with human-computer interaction using Natural Language (NL) interfaces.

Binsted explains that the kinds of humour to be used do not have to be very sophisticated. Suitable humour that can be used is self-deprecating humour. In some cases deprecating the user of a third party can be appropriate, but this type of humour is very risky.

Humour can make a computer more human when it fails and can ease the interaction. Inappropriate humour, however, is irritating and humour should be tailored to the user. When a certain user regularly works with a system, the system can adapt the types of jokes to the user's taste. The user should always have the option to turn the humorous input off.

Therefore she concludes that humour that is sparingly and carefully used can make NL interfaces much friendlier.

Oliviero Stock claims in [STO96] that, as far as the natural language understanding area is concerned, we have to address two main objectives in order to process humour: being capable of producing efficiently all different interpretations of linguistic expressions, and being capable of choosing efficiently the appropriate one in the given context. There do exist systems for yielding all possible interpretations of a joke at various levels of analysis (morphological, lexical, syntactic, semantic, pragmatic, discourse, intentional).

Stock claims that techniques as speech recognition can open the way to greater possibilities for the interface, it can for example analyse an expression at a phonetic level. At the semantic and pragmatic level a system should have some knowledge about world, stereotypes and user.

Maes [MAE95] claims that the interface should be separated from the underlying system in order that the user will not perceive the interface as responsible for the functioning of the whole system. Stock believes that the future prospect is that a user will interact with more agents, each with its social role. The user can decide whether to pay attention to what each one of them has to say and can enjoy the interaction.

Recently, embodied conversational agents (ECA's) have become a well-established research area. Embodied agents are agents that are visible in the interface as animated cartoon characters or resembling human beings. Sometimes they just consist of an animated talking face, displaying facial expressions and, when using speech synthesis, having lip synchronization. These agents are used to inform and explain or even to demonstrate products or sequences of activities in educational, e-commerce or recreational settings. Experiments have shown that ECA's can increase the motivation of a student or a user interacting with the system. Current research deals with improving intelligent behaviour of these ECA's, but also with adding emotional behaviour and personality in order to make them more believable [Nij01] to the user and to induce trust. It seems to be quite natural to make a step from event appraisal theories for emotion to appraisal theories for humourous events, in order to try to realize that ECA's smile or even laugh at the right moment, making them even more believable.

5 Applications

5.1 Introduction

This chapter is not meant to give a survey of possible applications of humour research. Rather we illustrate some of the results of humour research with some implemented software systems or algorithms. Nevertheless, we should mention here that humans use humour in speech, texts and dialogue. This means that any algorithm, tool or system that is meant to manipulate speech, language, dialogue or text in such a way that knowledge of contents plays somekind of role can profit from achievements of humour research. Again, we confine ourselves to showing some existing systems.

5.2 Joke Analysis and Production Engine

The JAPE-1 program is based on the model of generating punning riddles as described in section 4.3. The architecture of JAPE-1 is described in [BIN97]. The riddles that JAPE-1 can generate are a subgroup of all punning riddles. These riddles all:

- Use word substitution as main mechanism;

- Substitute phonologically identical words;

- Substitute into a noun phrase;

- Use the constructed phrase in the punchline.

The knowledge bases used are a set of schemata (see section 4.3), a set of templates, a lexicon containing humour-independent semantic and syntactic information, a homophone base, containing pairs of phonologically identical lexemes and a post-production checker, to sift out more of the more obvious non-jokes.

The lexicon was especially constructed for JAPE-1, but the information it contains is general and neutral. The power to generate jokes lies not in the lexicon. The basic algorithm for automatic joke generation used by JAPE-1 is the following:
"

1. Choose a common noun phrase from the lexicon.

2. Choose an appropriate schema, into which the phrase can fit.

3. Fit the phrase's constituent lexemes into the schema.

4. Instantiate the key lexemes into the schema.

5. Choose an appropriate template, thus instantiating the characteristic links.

6. Generate the near-surface form of the riddle, instantiating characteristic lexemes in the process.

7. Check that the generated joke is neither repetitive, nor a sensible question-answer pair."

Tests performed with human judges pointed out that JAPE-1 does not generate very good jokes. There is room for improvement, adjusting the lexicon, the templates and the schemas and adding some filtering heuristics. JAPE-2 is an improved version of JAPE-1 that has an interface with WordNet. Using WordNet as a lexical source produces too many entries of which many are too

'obscure' to make meaningful puns. Therefore additional filtering has to be done and all this makes JAPE-2 much slower than JAPE-1.

5.3 Elmo, the Natural Language Robot

Dan Loehr has integrated the humour system JAPE and his natural language robot Elmo [LOE96]. JAPE and Elmo are integrated at four different levels:

1. Elmo can issue a query for a pun from JAPE when he receives a request like: "tell me a riddle".

2. An attempt to make Elmo produce humour relevant to the user input.

3. Make Elmo produce humour relevant to the user input, using a pre-chosen pun.

4. Make Elmo return a carefully scripted reply, to achieve a 'smoother' response.

The conclusion was that there are many difficulties producing relevant, fluid humour on arbitrary input. Improving relevance by casting a broader net around the words of the discourse and the words available to the generator failed. The net proved to be too large and too slow and even produced less relevant responses than before.

5.4 The Light Bulb Joke Generator

Attardo and Raskin [ATT94] have created a simple joke-generating program called LIBJOG (Light Bulb Joke Generator). The program shows how simple methods can be used to create jokes. The first version uses an entry for a commonly stereotyped group and combines this entry with a template for a light bulb joke. For example:

entry: (Poles ((activity1 hold the light bulb)

(numberX 1)

(acrivity2 turn the table he is standing on)

(numberY 4)))

template: How many (group name) does it take to screw in a light bulb?

(NumberX). One to (activity1) and (numberY) to (activity2).

[Condition: X = Y + 1.]

The joke-generating mechanism is very limited and only consists of substituting the stereotyped entity in the template. The LIBJOG does not make use of a humour-independent lexicon. The only 'lexicon' it uses is the set of stereotyped entries.

5.5 The Mnemonic Sentence Generator

Craigh McDonough [DON01] has built a software application called Mnemonic Sentence Generator that converts any alphanumeric password into a humorous sentence. The techniques used from the field of computational humour are based on the incongruity theory. One of the requirements of the system is that it generates a sentence that is easier to remember than the password itself. If the sentence is funny, it will be even less difficult to remember a sentence.

The sentence template consists of two clauses of each four words. The template, taken from [DON01] is as follows:

Sentence template

(W_1 = Person Name) + (W_2 = Positive-Verb) + (W_3 = Person Name + "'s") + (W_4 = Common Noun) + ", while" + (W_5 = Person Name) + (W_6 = Negative-Verb) + (W_7 = Person Name + "'s") + (W_8 = Common Noun)

The goal is to combine two opposite scripts in one sentence, using a 'positive' verb in the first clause and a 'negative' verb in the second clause. Furthermore they choose from their lexicon personal names from one particular topic domain (in their first implementation politics), because this will make the sentence more cohesive, more meaningful and memorable.

One example of an MSG generated sentence is:

"Arafat joined Quayle's Ant, while TARAR Jeopardized thurmond's vase." [DON01]

(password: AjQA3Jtv)

In his conclusion McDonough suggests as an improvement to create new sentence templates, to make a wider use of natural language processing techniques in order to choose more suitable words in a sentence and to set the mnemonic sentence to music, like a nursery rhyme.

5.6 Acronym Applications

There is a World Wide Web searchable database containing more than 200,000 abbreviations and acronyms. The address of site is http://www.acronymfinder.com/.

AnvilLogic has developed a commercial version an electronic acronym dictionary and information about this application can be found at the website of AnvilLogic (http://www.anvillogic.com/products/).

In 1963 there appeared in Newsweek an article written by Philip Broughton [BRO68]. He developed a method to create phrases that appear intelligent or important. He called it the Systematic Buzz Phrase Projector that is based on the technique of combining three words from a lexicon containing thirty words. Although the generated phrases do not make sense, the audience is likely not to admit that they do not understand the generated phrase (or acronym). Although the method is not really scientific, the idea of creating acronyms by using humorous non-sense is implemented in this model.

6 Resources

6.1 Introduction

Algorithms and tools to analyse or generate verbal humour as part of a text or of a dialogue require the results of humour research to be built in. It means that traditional part-of-speech taggers, parsers, annotation tools, knowledge representation formalisms, languages and systems are among the resources for humour research. Corpora, as being made available by, for example, the Linguistic Data Consortium (http://www.ldc.upenn.edu/) are of course important as well. In such collections we can find speech and text databases and lexicons that can be used for research

and development purposes. In the context of such initiatives we also find the development of tools and standards that can be used by verbal humour research. Well known is also Douglas B. Lenat's CYC system and in particular its open source version (OpenCyc), a large general knowledge database and associated reasoning engines.

6.2 Princeton WordNet

WordNet is an online lexical reference system. Its design is based on psycholinguistic theories of how the human lexical memory works [MIL93]. The words are organised into synonym sets, or *synsets*, representing an underlying lexical concept. Different relations intertwine the synsets. WordNet has proved to be the inspiration for many different wordnets in many different languages, all based on the same structure.

6.3 Global WordNet Association

The Global WordNet Association (GWA) is established with the goal to maintain, standardise and interlink wordnets for all languages in the world. They build on the success of Princeton WordNet and EuroWordNet. On their website one can find more specific information about who they are and what their goals are (http://www.hum.uva.nl/~ewn/gwa.htm).

6.4 EuroWordNet

EuroWordNet is a multilingual database with wordnets for several European languages. The wordnets have the same structure with synsets and basic semantic relations between them as the Princeton WordNet. The wordnet are linked to an Inter-Lingual-Index and via this index it is possible to go from a word in one language to similar words in other languages. The index also gives access to a shared top-ontology that provides a common semantic framework for all languages. If a wordnet is compatible it can be added to the EuroWordNet database and be connected to any other wordnet.

The EuroWordNet website gives more information about the background and research (http://www.hum.uva.nl/~ewn/). In [FAR98] there is a description of the methodology for converting the Princeton WordNet to a Spanish WordNet.

6.5 MultiWordNet

"MultiWordNet is a project currently under development at ITC/IRST aiming at the realisation of a large scale generic lexicon for Italian based on the English version of WORDNET. The project implements a multilingual lexical hierarchy, which is able to deal with a number of lexical idiosyncrasies, including lexical gaps between the two languages. The acquisition methodology includes two steps. Using a bilingual on line dictionary, first the system automatically builds a set of candidate mappings from an Italian lemma to English synsets. In the second step a lexicographer either confirms or discards the proposed synsets. A graphical interface has been implemented which combines the access to the bilingual dictionary with the English WordNet and allows the user to insert language specific synsets."

– taken from the MultiWordNet website (http://ecate.itc.it:1024/projects/wordnet/).

6.6 WordNet++

Steuten et al. [STE00] have developed WordNet++ at the University of Amsterdam. WordNet++ is an extension to WordNet that makes the lexical database suitable for the support of the Color-X (Conceptual Linguistically based Object-oriented Representation Language for Information and Communication Systems) method. This is a method based on object-oriented and linguistic modelling concepts. The wordnet uses a static object model and an event model. WordNet++ contains special relationships of *domain-specific* knowledge that do not exist in WordNet.

6.7 Lexical FreeNet

Doug Beeferman describes in [BEE98] the design and implementation of Lexical FreeNet, a semantic network that combines WordNet-derived semantic relations with data-derived and phonetically derived relations. It is based on FreeNet, a system for describing and exploring finite binary relations between tokens or strings of characters.

Lexical FreeNet contains in total almost 200.000 tokens, including phrases. These words are taken from the CMU Pronouncing Dictionary, WordNet and broadcast news transcripts. There are seven semantic relations, two phonetic relations and one orthographic relation. A description of these relations can be found in [BEE98].

There exists a World Wide Web interface (http://lefn.com) that gives human users the possibility to explore the lexical database. Beeferman is speculating that Lexical FreeNet can be used in automatic text processing, like text segmentation and text summarization, but no applications have been developed so far.

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