

Generation of Idiom-based Witticisms to aid Second Language Learning

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## Abstract

In this thesis, we discuss a model of simple idiom-based witticisms which we have implemented on a computer. The resulting program, **WIS<sub>CR</sub>AIC** (Witty Idiomatic Sentence Creation Revealing Ambiguity In Context) generates jokes by deriving meaning partially from context and partially from humour-independent lexical entries. **WIS<sub>CR</sub>AIC** also produces explanations of the jokes it creates, with a view to helping second language learners master the idioms which form the basis of the jokes.

After reviewing the literature and previous computational efforts in the field, we examine the validity of using humour as a tool for learning language. Then we explore various types of joke, the mechanisms they employ, and identify the sub-class of jokes our model describes.

We describe the design of the system, and compare this design with another implemented model of humour, **J<sub>A</sub><sup>PE</sup>**. Finally we evaluate the output of the system. Although the system succeeds in producing texts which are recognisably jokes, the average funniness rating was not very high. We suggest improvements to the model and implementation, such as more developed constraints on the choice of a protagonist for the sentence and the extension of the model to cover other types of text-based humour.

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# Chapter 1

## Introduction

### 1.1 Motivation for project

The motivation for this project was to develop a system which could construct jokes and explanations of those jokes to aid second language learning.

This provides the basis for a suitable AI research project for a number of reasons. First, the task is computationally tractable. Formal models of humour already exist and computational models of humour have been successfully implemented. Second, the results of at least part of our research are falsifiable. Although humour is a subjective phenomenon, it is possible to judge the output objectively in terms of whether or not it is in fact jokes. People can usually identify jokes, whether or not they find them particularly funny. Funniness in this respect is a secondary concern. The other part of our motivation is harder to quantify. In our evaluation of the output of the program we hope to show that the jokes do indeed aid language learning, though because this claim is not readily falsifiable it will not be the primary focus of our research.

The area we have chosen to study therefore, while falling into the creativity

category of AI, is in fact tractable and falsifiable.

Specifically our goal is to develop a model of humour which uses idiomatic expressions as the basis of jokes, and implement this model in a joke producing program which also provides explanations of the jokes it produces. We will then evaluate the output of this program to establish whether or not our goals have been achieved.

## 1.2 Goals

The goals of this project are:

- to explore the semantic constituents of short witticisms
- to develop a model of at least one type of witticism
- to implement that model in a computer program for generating jokes and explanations of those jokes
- to test and evaluate that program's ability to produce recognisable jokes and helpful explanations
- to suggest improvements to the the methods used in developing the model and its implementation

## 1.3 Results

We succeeded in developing a model of a sub-class of puns, namely witticisms that use idioms as the basis of the joke. This model was then successfully implemented in a computer program, WIS<sub>CRAIC</sub> (Witty Idiomatic Sentence Construction Revealing Ambiguity In Context). The program produces a range of jokes,

but focuses primarily on witticisms (question-answer and one-liners) which use phonological ambiguity to create jokes based around pseudo-idioms (idioms altered during the course of joke production).

WIS<sub>CRAIC</sub> is different from previous methods of producing computational humour in that it tries to derive meaning implicitly from context, rather than using explicit syntactic and semantic categories. WIS<sub>CRAIC</sub> linguistic information is also completely general in nature. It is not tailored in any way for the purposes of joke building.

The output of the system was then tested on volunteers and found to be “mildly amusing” or slightly better. The majority of the systems output was however considered to indeed be jokes.

## 1.4 Structure of this thesis

We begin by looking at humour research that has been carried out to date in Chapter 2 and how such research pertains to or influences the current research. Then in chapter 3 we look at various theories and studies concerned with humour and learning. In chapter 4 we identify different types of joke and specify the type that our program WIS<sub>CRAIC</sub> is designed to produce. Chapter 5 explores WIS<sub>CRAIC</sub> design at both a conceptual and implementation level. Having developed the description of how WIS<sub>CRAIC</sub> works, we then compare it with the leading example of computational humour developed so far, J<sub>A</sub><sup>P</sup>E. The systems are compared and we examine how feasible it would be for either to produce the output of the other. We test the program in Chapter 7 and present the results. These results are discussed in Chapter 8, as well as issues concerning implementation and future development.

# Chapter 2

## Humour Research

### 2.1 Introduction

Humour is a fundamental aspect of human life. It may well be a faculty that is shared by other animals, but there is little evidence to suggest that humour is as developed in other species as it is in humans. Indeed humour pervades almost every arena of human life. Surveys show we are ten times more likely to be seen sharing a moment of laughter than any other form of strong emotion.(Blythe-Lord 99)

The debate over the nature of humour ranges from speculation that it is centred physically in the brain, that it is a late evolutionary addition to the brain to the more recent belief amongst some scientists that the process of finding things funny serves our need to make some sort of emotional evaluation of every passing moment of awareness.

Theories about humour are not a recent development and are not confined to any one specific area of research. Indeed, the serious study of humour is the concern to varying degrees of a wide range of academic disciplines, including at least anthropology, classics, communications, education, linguistics, literature, medicine, philosophy, psychology, religious studies, and sociology.

In this chapter we will situate the current project by looking at classic views on

the function of humour and how humour evolved. Then we will turn to the modern theories of humour and examine which aspects support, contradict or otherwise pertain to the important elements of WIScRAIC. In addition we will highlight how these theories approach certain aspects of humour in a different manner to the one undertaken in the development of WIScRAIC and which aspects seem irrelevant to the current thesis.

## 2.2 Function & Evolution of humour

Freud <sup>1</sup> introduced the idea of mental “censors” - powerful, unconscious barriers that make it difficult to think “forbidden” thoughts. He distinguishes between “innocent” and “tendentious” jokes, the latter being capable of eliciting a much stronger emotional response, and therefore, bigger laughs. Freud accounts for this by stating that sexuality and aggression are strong and fundamental human affects, hence the greater emotional charge.

Freud believed that jokes allow us to elude these “censors” and that the resulting pleasurable release of psychic energy is discharged through laughter.

Marvin Minsky <sup>2</sup> extends Freud’s ideas to suggest that humour evolved in a social context and as such one important function of humour is to instruct others about inappropriate behaviour and faulty reasoning.

It seems logical that humour evolved with society and as such, it would seem that humour is very much related to language and its evolution. This relationship may well be bi-directional, in other words, humour could have helped shape our language and its use over the years. As so much humour is language-based, so it is hard to know for certain if an animal without language has a sense of humour or not. The belief systems that define our society are inexorably linked with language. Humour can play an important role as an indicator of what is and is not

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<sup>1</sup>All References to Freud taken from (Freud 57) unless otherwise stated

<sup>2</sup>All References to Minsky taken from (Minsky 81) unless otherwise stated

acceptable within a group, or as catalyst for discussion, reflection and development. Humour can be used to broach an uncomfortable or sensitive subject and may well result in positive change indirectly. On the other hand, the wrong sort of humour could threaten the group's belief system.

An all-encompassing theory of laughter and comedy is elusive. An understanding of these phenomena must be sought cross-culturally and pan-historically.

*“To understand laughter we must put it back into its natural environment, which is society, and above all we must determine the utility of its function, which is a social one.”* (Bergson 87)

Morreall <sup>3</sup> claims that in looking at how laughter functions in any given context we can learn “...about the structures of a society and its modes of operation...”

Perhaps the most obvious function of humour is that it is liberating.

*“...enjoying humour and boisterous laughter is eminently opposed to striving to keep all of life under control, which can be observed among the Pythagoreans, the Spartans and, to a much more marked degree, the ascetic Christians... To enjoy humour and laughter freely is the mark of a relaxed, open community, not of an ascetic ideology.”* (Bremmer 97)

In (Morreall 87) it was also suggested that the traditional neglect of humour within philosophy is due in large part to the prejudice that began with Plato and Aristotle. Plato believed that humour is nothing more than a delighted feeling of superiority, that laughter displays a kind of malice toward people who are relatively powerless. Aristotle too believed that humour is essentially derisive, “*comedy...is an imitation of people who are worse than average*” (Morreall 87)

Such a view has subsequently been termed the Superiority Theory and was the prevalent theory on humour until the Eighteenth Century. Since then two other

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<sup>3</sup>All References to Morreall taken from (Morreall 87) unless otherwise stated

broad categories for explaining laughter have emerged, namely Relief Theory and Incongruity Theory.

Although there is certainly reason to believe that all three theories hold true of certain types of humour, no one of these theories provides a sufficiently general description to cover the genre of jokes addressed by WISCRAIC, and indeed, none is sufficiently detailed to do so either.

We will return to Incongruity Theory in section 2.3.2

## **2.3 Theories of Humour**

Raskin (Raskin 85) developed a linguistic-semantic theory of verbal humour. The central idea is that in verbal humour, the text must be compatible with two different semantic scripts which are opposite in one of a number of particular ways: obscenity/no obscenity, violence/no violence, money/no money, death/life, bad/good.

Raskin's theory is strictly limited to jokes, viewed as linguistic forms, or texts. It does not deal with humour that makes no use of linguistic means, such as visual slapstick for example. Nor does it deal with differences in interpretation, such as jokes that fail in some situations but not others. Differences in perceived humour due to subjective affective evaluations, or to differences in the tension in a social situation are not accounted for in Raskin's theory.

Raskin subsequently developed the General Theory of Verbal Humour (GTVH) with Attardo which is outlined in section 2.3.1

Humour is clearly not restricted to jokes and Thomas Veatch (Veatch 98) recently developed a theory which he claims accounts for non-joke humour but also generalises over the classes of oppositeness-relationships that Raskin discusses. For this reason, he sees it as a simplification of (and therefore an improvement on) Raskin's theory.

The key aspects of Veatch's theory are discussed in 2.3.2

### 2.3.1 General Theory of Verbal Humour

The General Theory of Verbal Humour is an attempt by Attardo and Raskin (Attardo & Raskin 91) to build a linguistically sound model of verbal humour.

Attardo and Raskin have identified six joke parameters, or *knowledge resources* (hereinafter referred to as KR), which between them determine the final text form of the joke.

Although these parameters were identified through analysis of set of light-bulb jokes, they offer an interesting point of comparison and analysis of the genre of jokes, namely witticisms that WIS<sub>CR</sub>AIC is designed to produce.

#### Script Opposition

The *script opposition* KR is based on Raskin's earlier script-based semantic theory of humour (SSTH), which he summarises as follows:

*“A chunk of structured semantic information, the script can be understood for the purposes of this article as an interpretation of the text of a joke. The main claim of SSTH is that the text of a joke is always fully or in part compatible with two distinct scripts and that the two scripts are opposed to each other in a special way. In other words, the text of a joke is deliberately ambiguous, at least up to the point, if not to the very end. The punch-line triggers the switch from the one script to the other by making the hearer backtrack and realize that a different interpretation was possible from the very beginning.”*

(Attardo & Raskin 91)

The ‘special ways’ in which scripts can be opposed are at various levels of abstraction, i.e, real vs unreal, good vs bad, high stature vs low stature, non-dumb vs dumb, etc.

The text of a joke is usually deliberately ambiguous - as we have seen, ambiguity of one kind or another is the basic tenet of most linguistic humour.

However, it is not necessary to have a punch-line to trigger the switch between the two interpretations. When presented in the form of a one line witticism, a joke has no punchline, and the speaker or writer relies on the listener's natural ability to spot ambiguity. When presented in spoken form the speaker can use a range of techniques (facial expression, intonation etc.) to suggest a joke, or stress ambiguity. However, this is more difficult to do in written form. We will examine how WISCRAIC endeavours to create the suggestion of a joke in section 5.7.1

As Binsted points out, the scripts need not necessarily be opposed, merely different. Puns initially suggest one interpretation of an ambiguous word, then somehow switch to another, but the two meanings are not necessarily opposite.

### **Logical Mechanism**

This parameter determines the mechanism used to oppose the scripts. Attardo and Raskin identify several such mechanisms, including simple reversal, false priming, and simple juxtaposition but the one of particular relevance to the WISCRAIC project is *“the juxtaposition of two different situations determined by the ambiguity or homonymy in a pun”* (Attardo & Raskin 91).

A final point on this is taken from Binsted (Binsted 93):

*“Note that, in the “joke telling mode of communication”, the truth of statements and their consistency become less important. The pseudo-logic of the joke, therefore, need not be valid, just vaguely persuasive — persuasive enough that the listener will go along with the joke.”*

### **Situation**

The situation of a joke is the set of details (e.g. time, place, objects, activity, etc) which specify the joke. A given script opposition and logical mechanism can be applied to a number of different situations.

For example, these two jokes differ only in their situation:

How many Poles does it take to screw in a light bulb? *Five. One to hold the bulb and four to turn the table he's standing on.* (Freedman & Hofman 80)

How many Poles does it take to wash a car? *Two. One to hold the sponge and one to move the car back and forth.* (Binsted 93)

### **Target**

This is the only optional parameter of the six. The target of a joke is the person or stereotype the joke is aimed at. In the jokes above, the target is Poles, but this can be changed to any stereotypically stupid group (Irishmen for example).

However, in the case of WISCRAIC jokes, as with many others there is not target, so this parameter does not apply.

### **Narrative Strategy**

This KR determines the form the joke will take, i.e riddle, conundrum, expository text, etc. The more standard strategies have the advantage that the punch-line pretty much automatically falls in the right place. Also, the choice of logical mechanism limits the range of narrative strategies available.

The light-bulb joke above, given as expository text, rather than conundrum, might look like this:

It takes five Poles to screw in a light bulb: one to hold the light bulb and four to turn the table he's standing on.

WISCRAIC uses both riddles and expository texts as its narrative strategy.

### **Language**

This parameter, which is constrained by all the others, specifies which paraphrasing of the joke is used (i.e what the surface form of the joke is). The language used is particularly constrained by the narrative strategy and logical mechanism adopted.

### 2.3.2 Veatch's Theory of Humour

Veatch defines humour as “...*that certain psychological state which tends to produce laughter.*” (Veatch 98)<sup>4</sup>

Veatch's theory explains a wide variety of biological, social/communicational, and other classes of humour-related phenomena which are beyond the scope of the WISCRATIC project.

Veatch claims that humour occurs when it seems that things are normal while at the same time something seems wrong. He also seems to echo Freud's view that humour is a way to ward off suffering (Freud 57) by stating that humour is emotional pain that doesn't hurt, though this aspect of the theory is not relevant to our implementation in WISCRATIC.

The theory identifies three conditions, each of which is individually necessary for humour to occur and which jointly are sufficient for humour to occur.

#### Three Necessary and Sufficient Conditions

The term “necessary and sufficient” may need clarification. “Necessary” means that if any of the conditions is absent, then humour perception will also be absent. “Jointly sufficient” means that if all of the conditions are present, then humour perception will also be present.

Veatch claims that “...*humour occurs when it seems that things are normal (N) while at the same time something seems wrong (V). Or, in an only apparent paradox, Humour is (emotional) pain (V) that doesn't hurt (N).*”

These three conditions, taken from (Veatch 98) are elucidated below:

*V The perceiver has in mind a view of the situation as constituting a violation of some affective commitment of the perceiver to the way something in the situation ought to be. That is, a “subjective moral principle” of the perceiver is violated.*

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<sup>4</sup>All References to Veatch taken from (Veatch 98) unless otherwise stated

*N The perceiver has in mind a predominating view of the situation as being normal*

*Simultaneity The N and V understandings are present in the mind of the perceiver at the same instant in time.*

WIS<sub>CR</sub>AIC has been developed in such a way as to ensure that these three conditions have been met. The design choices which create these conditions, the degree to which this has been accomplished, and the effect on the quality of WIS<sub>CR</sub>AIC's output will be examined in detail in chapters 5 and 7.

### **Absurdity and Incongruity**

Veatch stresses that absurdity and incongruity which are often made out to be essential elements of humour often do not produce humour. Most modern humour theorists seem to have settled on some version of Aristotle's belief that jokes are based on a reaction to incongruity. This incongruity is either resolved when we suddenly realise that a silly answer has a clever second meaning, or in a nonsense punchline. In Veatch's theory, which requires the simultaneous juxtaposition of normality and violation of the accepted order of things, absurdity and incongruity are certainly present but it is the juxtaposition that is the reason for the humour, not the presence of these two elements.

These terms are vague and need clarification. The juxtaposition of normal and not-normal in one situation produces an 'It's okay', 'It's not okay' feeling which is clearly incongruous and to a degree absurd, in that the situation is simultaneously being thought of as normal and as a moral violation. Veatch claims that other kinds of absurdity are not funny unless they include this kind of absurdity.

The use of the word "moral" also needs clarification. It usually has some kind of ethical connotation (principles of behaviour), so that one may think that a "moral violation" occurs when the subject matter of the joke is in some way offensive, be it sexual, or some other socially taboo topic. This is not the sense in

which the word is used. As we will see presently, “moral” is more akin to a sense of “the way things should be”.

### **Linguistic Humour**

As we saw earlier, the evolution of humour is closely linked with that of language. Veatch refutes claims by those who think of language as a purely affectless system that puns and linguistic humour are contrary to a theory that situates humour within a moral framework.

Veatch draws our attention to the fact that all people live in a strongly evaluative sociolinguistic environment. We are educated through language, communicate through language and to some degree our thoughts and opinions are shaped by the restrictions language imposes upon us.

People usually have very clear opinions on the natural and proper order of language: they think it ought to be a certain way, and they care about it. Value judgements are very often attached to language.

According to Veatch, “...*innumerable sociolinguistic studies have certainly shown that pronunciation differences can evoke strong evaluative responses in speakers (in the “matched-guise” experiments of Labov, 1966, and his many students), to such an extent that speakers are quite willing to judge a speaker’s intelligence, prospects for employment and friendship, etc., on the basis of their pronunciation.*”

Based on this information it would appear that humour based on linguistic malformation is indeed consistent with Veatch’s theory.

Linguistic humour can take many forms. As in the case of J<sub>A</sub><sup>P</sup>E and WIS<sub>CRAIC</sub> it may exploit ambiguity (as in puns), but can also call upon other phenomena such as dialect features.

WIS<sub>CRAIC</sub> makes use of what Veatch terms “*linguistic arguments*” whereby a logically fallacious line of reasoning is followed whose apparent sense is derived from two linguistic factors: ambiguity and idioms.

## **Puns**

Puns are a form of humour which involves linguistic ambiguity. A violation in one interpretation is disguised by a “straight” interpretation in the other.

It is not immediately obvious that punning and linguistic ambiguity involve any type of moral violation but Veatch claims otherwise.

Veatch’s first observation is that puns are not very funny and he provides the following common example:

Q: “When is a door not a door?”

A: “When it’s ajar.”

Second, he claims that this kind of pun provides listeners with a certain ambiguous sense of failed and seemingly obnoxious humour. Listeners recognise that what they are hearing is a “joke” in terms of its structure and purpose, but such puns so often fail to pack much of a humorous punch. However, the failure of a “joke” to be funny does not necessarily indicate a failed joke. The lack of funniness in the punch-line can itself constitute a social violation which can be interpreted as humorous. “Groaner” is a term often used to describe such a joke, though some of these failures may elicit a much greater laughter response. The third point that Veatch raises is that the inventor of a pun generally feels a certain glow of creative accomplishment.

Veatch explains how these three observations may be derived from a moral theory of humour by examining the above example of a pun.

1. *X is a door (Given by Q)*
2. *a) X is ajar, AND b) X is a jar (the ambiguity given in A)*
3. *If X is a jar, X is not a door. (By definition of “door” and “jar”)*
4. *Therefore, X is not a door. (by 3 and 2b) 1 and 4 are logically inconsistent.*

(Veatch 98)

He states that the logical inconsistency of the pun is in itself a moral violation to most people, on account of it being contrary to the listeners perception of proper conduct of discourse, as outlined above. This pun contains another type of violation which Veatch calls “normal” as opposed to “moral”. This refers to step 2 above where two contrasting claims are made at once. Therefore a (mild) moral violation and an (only apparently) normal interpretation coincide in this text.

Remember that there are three necessary and sufficient conditions for humour. The violation is present as we have seen. The second element is that the perceiver must have in mind a predominating view that the situation is normal. Finally, these two conditions must exist in the mind of the perceiver at the same time. That is the third condition. However, if the listener rapidly recognises the two meanings of the ambiguous form, then the legitimacy of the N interpretation is lost, and the text is seen as simply wrong. In this case, the possibility of humour is lost and all that remains is the possibility that the listener will recognise the text as an attempt at a joke.

This is an interesting point, the implications of which are worth considering in the implementation of WIScRAIC. In the evaluation of WIScRAIC’s output, we hope to see if the jokes suffer from this problem - that they are recognisably an attempt at a joke but do not work as a joke for some reason. We will look at this further in the chapter 7 on evaluation.

Veatch explains that this is the reason that set joke-style puns so often fail: under one (clearly stupid) interpretation the text is mildly funny, while under another (more clearheaded) view, it is simply wrong.

Veatch also observes that in creating a pun, the speaker makes an implicit request (though he uses the word “claim”) to the listener to be cooperative and see it as funny. In doing this he is actually asking the listener not to see the obvious, and by definition the listener often has to play dumb even though he/she has already spotted and resolved the “ambiguity”. Hence the groans of “ok, go

on tell me” that often accompany poor punning attempts, or puns in general as Veatch seems to believe.

Veatch also explains why the creator of a pun often gets a certain “kick” from his/her cleverness.

*“In creating a pun, the speaker discovers a linguistic ambiguity and a way of exploiting it in constructing a described situation that contains a moral violation of some kind but that appears normal because of the ambiguity. This intellectual feat, like that of creating any joke, is grounds for a creative glow of accomplishment.”*

Veatch’s observations on puns are summarised below. Puns:

- are partly funny
- are partly failed
- are self-consciously humorous performances based on linguistic ambiguity
- result in a mixed unhappy response in listeners due to the implicit request to go along with stupid and faulty reasoning
- result in a glow of accomplishment in the creator/speaker

## **2.4 Ambiguity and wit**

Pepicello and Green (Pepicello & Green 84) hold the common view that humour is closely related to ambiguity. Linguistic ambiguity, the type that we are concerned with in WISCRATIC, can take place at a number of different levels:

Phonological - ambiguity concerning the sounds of words

e.g What bird is lowest in spirits? *A bluebird* (Pepicello & Green 84)

This is phonologically ambiguous because “blue” is a colour, but it also means down or depressed.

Morphological - ambiguity concerning word formation (as inflection, derivation, and compounding)

e.g The book thief was caught read handed

This is morphologically ambiguous because “red” and “read” are morphologically identical because “read” is only phonetically identical with “red” in its past participle form.

Syntactic - ambiguity relating to the rules of syntax or syntactics

e.g Would you rather have an elephant kill you or a gorilla? *I'd rather have the elephant kill the gorilla* (Pepicello & Green 84)

The ambiguity here arises because the sentence can be “parsed” in two distinctly different ways. Under one interpretation, the choice of death is by gorilla or by elephant, whilst under a second, the reader or listener is asked if they would prefer that the elephant kill them, or the gorilla.

The important element which these three jokes share, and which is of particular importance in WIScRAIC is that the ambiguity, be it phonological, morphological or syntactic creates a point of *semantic* comparison.

Pepicello and Green claim that this ambiguity must be unsolvable by the listener until the punchline resolves it in some unexpected way.

Although this is true of the question-answer format produced by WIScRAIC, there is no such resolution in the one line witticisms. It is probably sufficient therefore, that to the listener of a WIScRAIC witticism, the sentence make sense to a first approximation, and upon further examination, the ambiguity is revealed and a second interpretation is made possible.

Minsky (Minsky 81) reinforces the notion that jokes with any degree of sophistication have two or more meanings “condensed” into one expression or situation. An interesting question raised by Minsky is how the mind decides which

thought is intended : a partial mental state is a precursor to many others.

The way WISCRATIC deals with this notion of intended meaning is discussed in section 5.7.1

## 2.5 Humour Computation

### 2.5.1 The Light Bulb Joke Generator

Binsted provides a good summary of this attempt at humour computation:

*Attardo and Raskin have put together a simple joke generating system, LIBJOG (Light Bulb JOke Generator) (Attardo & Raskin 93), mainly to show how poorly simple cut-and-paste methods work. The first version combines an entry for an commonly-stereotyped group, for example:*

```
(i)(Poles ((activity1 hold the light bulb)
           (numberX 1)
           (activity2 turn the table he is standing on)
           (numberY 4)))
```

*with a template for a light bulb joke:*

*How many (group name) does it take to screw in a light bulb? (NumberX). One to (activity1) and (numberY) to (activity2). [Condition:  $X = 1 + Y$ .]*

*to make, not surprisingly:*

*How many Poles does it take to screw in a light bulb? Five. One to hold the light bulb and four to turn the table he's standing on.*

*Clearly, this is cut-and-paste generation of the very simplest kind.*

*Although Attardo and Raskin claim that later versions of LIBJOG “introduced more templates, more fields, and looser (and richer) relations among them,” they give no evidence of a significantly improved method. The joke-generating mechanism seems to remain the same: substitute the (humour-related) values in an entry for a stereotyped group, directly into a light-bulb joke template like the one above. (Binsted 93)*

WISCRAIC differs from LIBJOG in several significant ways:

- WISCRAIC’s lexicon is humour-independent; that is, entries are defined similarly to entries in a regular dictionary. The information is not tailored in such a way as to make it more amenable to joke production.
- WISCRAIC jokes do not have a “target” (see section 2.3.1). They do not make fun of anyone.
- WISCRAIC creates a point of semantic comparison through phonological ambiguity (section 2.4). LIBJOG does not do this.
- WISCRAIC is an implementation of a model of humour, albeit a very simple one, rather than a program that can produce jokes in an uninteresting way.
- WISCRAIC does not use templates into which values are slotted. It extracts parameters from its Knowledge Bases which meet a set of semantic constraints. The Surface-form Generator then orders these parameters into sentence and question-answer format using a grammar to ensure grammatical and syntactic correctness.

## 2.5.2 J<sub>A</sub><sup>PE</sup>

Ritchie (Ritchie 99) has highlighted the importance of devising detailed descriptions of small classes of humorous texts, and testing the validity of these descriptions through implementation on computer systems. Binsted (Binsted 93) examined the based the linguistic structure of a class of jokes, namely punning riddles, and devised a set of rules which allow for the production of question-answer riddles. These rules were implemented in a system called J<sub>A</sub><sup>PE</sup>.

Binsted identified systematic and clearly specifiable linguistic relationships between the parts of a simple punning riddle and devised abstract rules which would define such relationships. The rules are of four different types :

schemata - these define valid configurations of lexemes underlying riddles

“Lexeme” is defined as “*a meaningful linguistic unit that is an item in the vocabulary of a language*”<sup>5</sup>

sentence forms - patterns of “canned” or fixed texts with slots for words particular to a given joke which will appear in the surface form

templates - describe a set of conditions for particular items to be inserted into sentence forms

SAD rules - Short Adequate Descriptions which create linguistic structures from lexemes

Some of J<sub>A</sub><sup>PE</sup>'s jokes are reproduced below:

What kind of contest can you drive on? *A duel carriageway.*

---

<sup>5</sup>All definitions of terms taken from Merriam-Webster Online Collegiate Dictionary unless otherwise stated

What do you get when you cross a passenger ship with dishwashing detergent?  
*Ferry liquid.*

What do you call a coniferous mink? *A fir coat.*

What do you get when you cross breakfast food with a murderer? *A cereal killer.*

All the riddles produced by  $J_A^{PE}$  :

- use the definitions of lexemes in the surface form of the joke.
- exploit phonological ambiguity rather than syntactic or morphological.
- substitute into a noun phrase.
- use the phrase thus constructed in the punchline (as opposed to the question) part of the riddle.

(Binsted 93)

$WIS_{CRAIC}$  differs from  $J_A^{PE}$  in a number of ways :

- $WIS_{CRAIC}$  uses the definitions of words to look for semantic links with potential protagonists - words from the definitions do not appear in the joke.
- $WIS_{CRAIC}$  substitute phonologically identical words as its main mechanism, but a subset of  $WIS_{CRAIC}$  jokes substitute phonologically similar syllables into words.
- $WIS_{CRAIC}$  substitutes into an idiom - noun or verb may be selected.
- $WIS_{CRAIC}$  use the pseudo-idiom thus constructed in the question (as opposed to the answer) part of the joke if presented in riddle form.

- **WIS<sub>CRAIC</sub>** creates witticisms - short clever sentences with veiled meaning - as well as riddle forms.

A more detailed comparison of the two systems, including fuller explanation of **J<sub>A</sub><sup>PE</sup>**'s mechanisms is provided in Chapter 6

## 2.6 Summary

In this chapter we have explored the traditional and recent theories of humour in order to situate the current thesis.

We have seen that:

- much linguistic humour relies on ambiguity - **WIS<sub>CRAIC</sub>** is no exception
- the three necessary and sufficient conditions of humour (V,N and S) highlighted by Veatch are particularly relevant to **WIS<sub>CRAIC</sub>**
- **WIS<sub>CRAIC</sub>** differs from two previous attempts at humour computation in a number of ways

# Chapter 3

## Humour, Learning and Cognition

### 3.1 Introduction

For many students, the use of humour in the classroom makes the difference between an interesting subject and a dull subject. We all remember teachers who were able to bring a subject to life, often resulting in a heightened desire amongst the students to become actively involved in classroom activities. Contrast this with the lessons taught by teachers who approach the subject matter in a dull, dry fashion - we all remember them too, but the sense of boredom and dullness is often projected onto the subject as well.

Many teachers endeavour to use humour as part of their teaching technique - probably equally many see humour as having no place in the classroom. They believe that humour trivialises the subject and hinders learning.

In this chapter we will explore the relationship between humour and learning to see whether there are grounds for suggesting that humour improves learning and aids retention, or if the dull teachers are just as effective as the fun ones.

This evaluation will of course be done in relation to WIScRAIC to see if

such a system could have positive effects on the learning experience.

## 3.2 Humour and Relevance

One interesting question which arises when discussing humour and learning is whether or not the humour needs to be related to the subject matter.

Research has indicated that relevant humour actually aided retention:

*“...it was found that although total test scores were not significantly different, groups viewing lectures with concept related humour did significantly better on items testing recall of the humorous examples than did the serious lecture group.”* (Kaplan & Pascoe 77)

Research has also shown that humour which is irrelevant to the subject matter can improve the performance of some students.

Townsend, Mahoney and Allen (A.R. Townsend & Allen 83) found that the inclusion of well-known cartoons (with no relation to the subject matter) in multiple choice tests helped relieve student’s stress and that the achievement amongst highly anxious students was improved.

They also carried out similar tests using written humour and found that if used solely as a stress reliever, content-relevant humour is unnecessary. However, as can be expected, they found that relevance to one’s social environment is necessary for the readers to understand the context and nuances employed. This need is especially marked for satire because it depends upon an informed audience.

The WISCRAIC system is designed to be more than a stress reliever. As such, the jokes it produces are highly content-relevant. The basis of the jokes is idioms, and it is these idioms that are the subject matter. By using the target material as the source of jokes, WISCRAIC aims to provoke

thought and aid learning by encouraging students to resolve the ambiguity for themselves.

### **3.3 Humour and Creativity**

There has been research carried out to see if the use of humour stimulates creativity. One researcher found that *“Among the many practical uses of humour...is its value as a tool for encouraging the expression of creative ideas.”* (Ziv 83) Ziv also states:

*“There is a general consensus among educators that formal schooling stimulates almost exclusively convergent thinking. The same consensus exists concerning the importance of divergent thinking- which is certainly an essential element of creativity, although not to be confused with it as some over enthusiastic psychologists have done. Numerous programs aimed at training for creative thinking have been published and tried out...No mention, however, has been made of the use of humour in encouraging creative thinking.”*

Language is constantly evolving. From an academic viewpoint, language can be very dry, with its complex grammatical structures, irregular spelling and conjugation patterns, and vast vocabulary.

However, viewed as a communication tool, language is exciting. It allows us to express ourselves in endless ways, to explore the worlds and minds of others. Language is the door to a great range of examined pleasures, of which humour is certainly one. In this respect language is not restrictive, but liberating.

In my opinion, using humour directly in language learning emphasises the positive aspects of language - the reasons language exists. This is not to denigrate the need for a structured formal approach to teaching, or the need for the student to learn the rules of language. Rather it is hoped that using a system like WIScRAIC in conjunction with more traditional methods will improve motivation and hopefully accelerate the learning process.

### **3.4 Humour and teacher effectiveness**

A group of American researchers carried out a study on teacher effectiveness. (M Javidi & Nussbaum 88) The award winning subjects of the study were acknowledged as being outstanding in terms of the unusual effort they invested in ensuring the quality of the learning experience, high scholarly standards for both rigour and currency of course content and the level of students' performance.

The researchers were looking for evidence of dramatic style behaviours. They found that these teachers consistently used humour, narrative and self disclosure compared to a group of non award winning teachers.

This research is encouraging as it suggests that the educational motivations behind WIScRAIC do indeed have some validity.

### **3.5 Pros and Cons of using humour**

In his research into the applications of humour in educational interactive multimedia materials for 18-22yr olds, Blythe-Lord (Blythe-Lord 99) found that there is a difference in attitude between students and tutors towards the use of humour in educational materials.

Students are positive towards its use and the benefits that lie therein. There tutors however tend to feel unsure about its role and usefulness.

There is some evidence to support the view that when humour is used it is not the most effective for the purpose of directly helping learning or understanding.

On the positive side, as we have seen, humour has been shown to relieve stress and emotional embarrassment by preparing for the introduction of distressing and embarrassing topics.

Used in this capacity, humour does not need to be content specific.

If however humour is used to support divergent thinking and encourage creativity, then the nature of the content is important.

It would appear then that there is no one answer to the question “Is humour useful in education?”. We can only say that the character and application of the humour needs to be well considered so that it positively enables the learning outcome. For this reason, it is important to reiterate that **WISCRAIC** is designed to be used in conjunction with other methods and that it forms only part of an approach to teaching. The system is certainly not designed to be a replacement for a teacher. Rather, **WISCRAIC** is to be used to stimulate thought and questioning, and teachers should be available to answer those questions. For some students however, **WISCRAIC** could probably be used as a study aid without the need for input from a teacher.

### **3.6 Frame Theory**

Minsky suggests the notion of “frames” to explain how the mind represents any stereotyped situation, event or thing. This idea was introduced to explain the speed and apparent absence of phenomenology in perceiving and thinking.

In a sense, the lexical data capture methods employed in developing WISCRAIC were driven by a need to “capture” or “define” the frame to which certain words point.

Each frame has several kinds of information attached; some about how to use the frame, some about what one might expect to happen next, and some about what to do if those expectations are not confirmed amongst others.

The notion of “terminals” is an important one in understanding frames. Terminals link different frames together so that for example, a chair frame which specifies that a chair has a seat, a back, and four legs can have these details described by accessing another frame. Each frame also include a set of features which when present in sufficient number activate the frame itself.

When you see enough parts of a chair, the chair frame will become active, and will fill in “blanks” by default, if for example, you can only see 3 legs of the chair, or the back is obscured by view. Minsky claims that this notion of default is even stronger, so that if you observe someone in a sitting position, the chair frame will be activated, even though no chair is visible. Minsky accounts for this by saying that the “sitting” frame has as part of its description a “must be supported by” sub-frame terminal which links to a chair frame.

The chair-frame that is selected can depend, however, on the context. for default assignments are weak and easy to ”displace”. If there are other chairs around, the invisible chair will be assumed to be like one of them. If the scene is set in a park, then a park-bench frame might be activated to serve as default. If one then noticed an arm-chair arm, the system would replace the weakly-attached bench-frame by one that better suits what was seen - and one now ”sees” an armchair. (Minsky 81)

Minsky explains that certain concepts such as “game” point to a web of frames, among which certain frame-shifts are easy to make, and others are more difficult, involving a type of emotional strain. Shifting from one familiar kind of kitchen-chair to another is imperceptible, but changing a park-bench to an arm-chair would be strain enough to “surprise”.

In jokes therefore, there is some kind of improper assignment-change, where the transition between frames is not an easy or expected one. Each listener must make his own theory of what is wrong, and devise his own way to avoid this confusion in the future.

As Minsky points out, some people will do better at this than others. Each individual must have his own ways to build new connections amongst his frames.

One of the educational aims behind **WIScRAIC** can be explained in terms of frames. As we have seen above, Minsky states the need for individuals to build connections between frames. **WIScRAIC** jokes provide the catalyst for building such links between frames. We shall explore this further in later chapters.

### **3.6.1 Puns**

Puns work by changing the meaning-sense of a word.

Minsky acknowledges that such verbal sense-shifting can be funny, and even useful.

However, he states that if such sense-shifts are performed fortuitously with meaningless substitution based on superficial word-sound similarities alone, such humour can be dangerous. He does not qualify exactly what he means by “dangerous” but we presume in the context that such substitutions could lead possibly to erroneous linking between frames which would hinder learn-

ing and lead to someone choosing an incorrect frame given some “Precursor” state.

Minsky explains how frames can be applied to puns, and humour in general:

*“ The element that seems to me most common to all the different kinds of humour is that of unexpected frame-substitution, in which a scene is first described from one viewpoint and then suddenly – typically by a single word – one is made to view all the scene-elements in another, quite different way. Some such shifts are insightful, of course, while others are mere meaningless accidents.”*

I think that Minsky’s concerns about the dangers of substitution are quite valid. This problem was considered at length in the early stages of development of WIScRAIC. The design of WIScRAIC is such that the substitutions and consequent sense-shifts are far from meaningless. Also the substitutions are not done at a superficial level (substitution purely based on phonetic equivalence), but at a semantic level which reflects other choices in the joke creation. There is a logic behind these choices that is there for the reader to uncover.

### **3.7 Laughter & Learning**

As Minsky points out, to search for a “...single underlying structure from which all funny things spring...” is unrealistic. He believes that a study of the underlying constituents of humour will yield a lack of unity.

Minsky believes that this lack of unity is a consequence of the way things evolve in biology. He says that humour does not serve a single purpose but that rather, it “...serves and exploits many different needs and mechanisms”.

As the human intellect developed, so came complicated chains of reasoning which became vulnerable to bugs which people had not had to deal with before. These included “...*faulty variable bindings, subtle changes of sense, and more obscurely circular logic.*”

As society became more complex, laughter served as a signal to people who were pursuing a dangerous, objectionable or otherwise forbidden path to stop, or change direction.

With time, according to Minsky, the function of laughter became internalised, so that if a person sensed such physical symptoms as laughter, shaking etc. he or she could stop themselves doing something prohibited.

*“Perhaps, literally, men first learned to laugh at their own mistakes, and later learned to censure themselves in silence.”*

Minsky states that the concept of humour does not have a sharp definition. Rather, it points to a complex web of relations between laughter, faulty reasoning and the suppressor mechanisms discussed earlier, among others. Minsky believes that the clarity of words is itself a related illusion - language only works because oversimplification is more useful than realistic confusion. We all mean something slightly different when we use the word “humour”. In each person’s mind, the word itself points to a slightly different web-model, which is why we all laugh at slightly different things.

Minsky identifies two explicit functions of laughter which pertain to learning. First, laughter disrupts reasoning: the laughter reaction is so distracting it prevents the mind from continuing on a “forbidden” line of thought. Because of the laughter produced, the mind abandons following a particular line of reasoning or logic.

Secondly, laughter focuses attention: as reasoning is disrupted, the net effect is to hold up the absurdity which has broken the chain in sharp focus. The

incongruity receives full attention, which Minsky believes is a technique used so that “censor-learning” can take place.

This second function of laughter is of particular interest to our work on **WISCRAIC**. It is precisely this effect of focusing attention that we hope to achieve by using **WISCRAIC** to aid learning. The intention is that the joke will focus the reader’s attention on the incongruity : although the sentence produced is almost right, there is something not quite right - discovering what this is requires a more active analysis than is usually required in learning vocabulary and idioms.

### **3.8 Summary**

In this chapter we have looked at research which has been carried out into the use of humour in teaching, and have a number of theories about humour and its function in learning.

We have seen that:

- Humour has benefits in teaching whether it is related to the subject matter or not.
- Research is not conclusive as to whether or not the use of humour aids the learning process.
- Minsky’s Frame Theory can be applied to linguistic humour using puns.

# Chapter 4

## What makes a Joke?

### 4.1 Types of Joke

In this chapter we will briefly look at some of the techniques that are used to produce jokes, and how such jokes may be classified. Then we will look in a little more detail at the jokes which WIScRAIC is designed to produce.

#### 4.1.1 Question-Answer Riddles

A riddle may be defined as “*a mystifying, misleading, or puzzling question posed as a problem to be solved or guessed.*”

There are many types of riddle. Some are designed to be quite complicated tests of reasoning, logic or knowledge:

*Q. I am periodically the number 79. They once tried to make me from 29. If you add to me 80, I will appear to be 47 temporarily. What am I?*

*A. Gold.*

*On the periodic table of elements, gold is represented by the number 79. Long ago, alchemists tried to make it from copper (no.29). If mercury (no.80) comes into contact with gold, it will appear to be silver (no.47) for a while. (NIEHS ).*

whilst others are merely an exercise in alertness, or tangential thinking:

*Q. The more you have of it, the less you see. What is it?*

*A. Darkness (NIEHS ).*

*Q. What runs around a house but doesn't move?*

*A. A fence (NIEHS ).*

A sub-genre of riddles, which was addressed by (Binsted 93) in the development of JAPE is punning riddles.

A pun is defined as “*the usually humorous use of a word in such a way as to suggest two or more of its meanings or the meaning of another word similar in sound*”

Punning riddles therefore exploit ambiguity in either the question or answer part of a riddle.

An example of the question-answer riddles produced by WISCRAIC is shown below:

*Q. Who showed the woman his mussels ?*

*A. The vain fisherman*

#### **4.1.2 Witticisms**

A witticism is defined as “*a cleverly witty and often biting or ironic remark.*”

A one-liner can be a very succinct joke or witticism.

Some amusing witticisms (and the people they are attributed to) are given below:

*“If other people are going to talk, conversation becomes impossible.”* - James McNeill Whistler (Legend 00)

*“I have had a perfectly wonderful evening. But this wasn’t it.”* - Groucho Marx (Legend 00)

*“Avoid all needle drugs. The only dope worth shooting is Richard Nixon.”* - Abbie Hoffman (Legend 00)

We can see that this last witticism uses ambiguity of the word “dope” to humorous effect.

An example of a WISCRAIC witticism is :

*The obliging dairy farmer met the woman half whey !*

WISCRAIC also produces character based witticisms. If the user enters, a name, occupation and adjective describing the character, WISCRAIC will return a witticism about the named person.

For instance, if we enter “Johnny, deer-keeper, poor”, WISCRAIC will return the following witticism:

*Your mate Johnny is a hard up deer-keeper. He really needs doe !*

Now we shall examine the types of ambiguity that may be exploited in producing humorous text.

## 4.2 Mechanisms

Different types of ambiguity were explored in 2.4 and of these, WISCRAIC is designed to exploit phonological ambiguity. The different ways in which this can be done are now explored.

### 4.2.1 Syllable substitution

Using this strategy, a syllable in a word is replaced by a similar or identical sounding syllable - often rendering a word which sounds similar to a common word, but has no meaning taken in isolation. For example, WISCRAIC produces the following joke,

*What do ghosts celebrate ? Ghoultide*

by replacing the syllable “yule” from “yuletide”, with the similar sounding “ghoul”.

As Binsted (Binsted 93) points out:

The word containing the ambiguous syllable usually appears in the punchline of the riddle, while the question of the riddle refers to some constructed ‘meaning’ (i.e. not the real meaning) of the word (see chapter ?? for a discussion of this mechanism). However, the reverse can also occur:

*What is an octopus? An eight-sided cat. (Webb 78)*

Sometimes, several word-syllable confusions are made:

*Where are whales weighed? In a whaleweigh station. (Webb 78)*

Note that sometimes the confused syllable is actually *replaced* with a similar-sounding word (e.g. in “spooktacles” and “whaleweigh”),

whereas other times the possible substitution is just referred to (e.g. “octopus” was not changed to “octopuss”), probably because the appearance of the changed word in the question would give the joke away.

The subclass of jokes produced by WISCRAIC which use syllable substitution will be examined in more detail in Chapter 5

### 4.2.2 Word substitution

Again, this is clearly explained in (Binsted 93)

*Word substitution is very similar to syllable substitution. In this strategy, an entire word is confused with another similar- or identical-sounding word. For example:*

*How do you make gold soup? Put fourteen carrots in it.  
(Webb 78)*

*Again, the confused word can appear in the question instead of the punchline:*

*What do you do if you find a blue banana? Try to cheer it up. (Webb 78)*

*Note that in the above joke, “blue” has two meanings, but only one surface form. This demonstrates that a word can be confused with: an alternate meaning (e.g. “blue”, the colour, with “blue”, the mood); a word spelled differently but sounding the same (e.g. “carats” with “carrots”); or a word that sounds slightly different, as in:*

*Where do elves go to get fit? Elf farms. (Webb 78)*

*The confused word is often part of a common phrase. For example, in:*

*What sits in a fruit bowl and shouts for help? A damson in distress. (Webb 78)*

*the joke relies on the riddlee recognising the punchline as a warped version of the phrase “damsel in distress.”*

Word substitution is the principle method used in WISCRATIC jokes. All witticisms, in either one-line or question-answer format use this strategy.

### **4.2.3 Spoonerisms**

A spoonerism is defined as “*a transposition of usually initial sounds of two or more words (as in tons of soil for sons of toil)* (Merriam Webster’s Collegiate Dictionary)

(Pepicello & Green 84) provides a nice example of a spoonerism:

*What is the difference between a donkey and a postage stamp? One you lick with a stick, the other you stick with a lick. (Pepicello & Green 84)*

The effect of a spoonerism is quite distinct from that of word and syllable substitution. There actually is no point of semantic comparison in a spoonerism, but the joke uses the reversal of sounds to suggest a similarity in meaning between two semantically-distinct phrases.

WISCRATIC does not use spoonerisms, as it is unclear at this stage how such a technique might be applied to idioms.

## **4.3 Conclusion**

Potentially all three of these techniques could be implemented in WISCRATIC. However, at this stage, the principle strategy employed is word substitution as this

lends itself most directly for use with idioms. An attempt was also made at using syllable substitution for a subset of WIS<sub>CR</sub>AIC jokes. These techniques will be explained and developed in chapter 5.

We can state therefore that the majority of WIS<sub>CR</sub>AIC jokes (those based on idioms) use word substitution such that:

- the substitute word is a homophone or alternate meaning of a word in an idiom
- this word is substituted in the question of the joke, rather than the punchline, when the joke is presented in question-answer format

# Chapter 5

## Design

### 5.1 Introduction

As described in section 4.2, a common mechanism in jokes that use phonological ambiguity is substitution. WISCRAIC uses this mechanism to construct a sentence using an altered idiom which is phonologically identical to the original idiom. The choice of substitution is guided by the availability of a noun phrase profession (e.g. the doctor, the chef) which in some way creates a semantic link, through shared context, to the substitute word.

All the witticisms:

- use word-word substitution as their main mechanism
- substitute phonetically identical words
- substitute into an idiom
- *either* use the pseudo-idiom thus constructed in the question part of the joke if it is presented in question-answer format  
e.g Who met the woman half whey ? *The obliging dairy-farmer*
- *or* construct a sentence using this pseudo-idiom  
e.g The friendly gardener had a lot of thyme for the woman !

The jokes also use adjectives to ensure that the meaning of the original idiom is suggested, if not obvious. In the examples above, “obliging” suggests “meeting someone half way” while “friendly” hints at “having time for someone”.

## 5.2 Top Level

WISCRATIC attempts to construct a witticism based on a common idiom. It has several distinct knowledge bases and processing modules with which to accomplish this task.

### 5.2.1 Knowledge Bases

- a dictionary of idioms, containing a list of adjectives associated with each idiom.
- a dictionary of professions, containing a list of thematic vocabulary for each which defines a context for the profession.
- a general dictionary of nouns, verbs and adjectives, containing a phonetic transcription and values for four psycholinguistic indicators for each entry.
- a lexicon, containing a list of defining words with each entry.
- a grammar containing information on such things as verb conjugation, valid noun phrases and plural forms of nouns.

A distinction is drawn between “dictionary” and “lexicon” as they are used in WISCRATIC.

The lexicon contains more structured information than the dictionaries. For example, the lexicon has variable names for each word entered as part of a definition for a lexeme. For instance, the lexeme “bough” has the variable “is\_part\_of\_a” before the word “tree” in its definition.

These variables are not used in the construction of witticisms but are used in another sub-type of joke WIScRAIC produces. This type of joke will be examined in section 5.10

The dictionaries however contain no such qualification. The profession “chef” for example has “kitchen” as one of the words in its list of associated vocabulary but there is no indication of how the two are related.

The reason for this design choice was to stay true to the original idea of manipulating context. The context in which any word appears is not defined through the use of syntactic categories, but rather by the frequency with which the given word occurs in writing or speech with other words. Words which are immediately associated with a given word provide a suitable context with which to make jokes based around puns on that word.

NOTE: all information contained in the lexicon, dictionaries and DCG is completely general in nature. In other words it is humour-independent.

## 5.2.2 Processing Modules

- **Joke Constructor**

This module contains information on what elements and relations between elements must be present for a joke to be constructed.

**Uses:** dictionary of idioms, dictionary of professions, general dictionary, lexicon

- **Surface-form Generator** This module is responsible for taking the elements provided by the Constructor above and converting them into a complete joke form (the form which is printed to screen).

**Uses:** the grammar

- **Explanation Generator** Takes the elements provided by the Constructor and generates an explanation of the relations between them.

Uses: the grammar

## 5.3 Specialised Dictionaries

### 5.3.1 Idioms

#### Definition

A formal definition of an idiom is:

*“an expression in the usage of a language that is peculiar to itself either grammatically (as “no, it wasn’t me”) or in having a meaning that cannot be derived from the conjoined meanings of its elements (as Monday week for “the Monday a week after next Monday”)”*

It is important to note that although attention is focused on idioms throughout this thesis, WISCRAIC is designed in such a way that it will handle any verb phrase. Given any verb phrase, including ones which incorporate instantiated noun phrases (for example, “break the woman’s heart” as opposed to “break someone’s heart”), WISCRAIC will search the words which make up the phrase for homophones, and find a protagonist whose context includes that word.

#### Why Idioms ?

Idioms were chosen as the subset of verb phrases to be explored in detail for a number of reasons.

First, they provide a class size which allows a detailed exploration to be carried out, without being trivial. Second, they are of particular relevance to second language learning, where idiomatic expressions are an important, yet often elusive part of mastering a language. Another important factor is that idioms are usually

quickly recognised as such. Because the reader has a clear idea of what the text should be, it makes the pun more effective. As we saw in section 2.3.2, the reader must have a prevailing sense that the text is the way it should be. If standard verb-phrases were used as the basis of the jokes, there is such a range of word combinations, none of which would be identified as a semantic unit, that it may well be difficult for the reader to distinguish between an attempt at a joke and just nonsense sentences.

Some phrases were included in WISCRAIC's dictionary which, while not idioms, were considered to be sufficiently common so as to be used as the basis of jokes. "Need dough" is one such example. Another is "show someone one's muscles".

### **What information is included**

As with the information on professions, the data here was gathered by means of a questionnaire completed by volunteers.

They were asked to provide adjectives they thought would be suitable to describe someone performing the action of the idiom. In other words, given the idiom "take a bow", volunteers were asked to provide adjectives that might describe someone taking a bow. Responses included 'flamboyant' and 'entertaining'.

This information can then be used to create the following sentence:

"The flamboyant man took a bow".

Table 5.1 shows some sample entries in the idiom dictionary.

<i>Idiom</i>	<i>Adjectives</i>
<i>take a bow</i>	performing, entertaining, flamboyant
<i>need dough</i>	hard-up, insolvent, poor, desperate

Table 5.1: Sample Idiom Entries

<i>Job</i>	<i>Associated Vocabulary</i>
<i>chef</i>	food, cooking, cuisine, kitchen, saucepan
<i>lumberjack</i>	forest, axe, saw, chainsaw, forest, logs, chop, touque, trees, wood, lumber

Table 5.2: Sample Profession Entries

### 5.3.2 Professions

#### What information is included

For each profession in its database, WIS<sub>CRAIC</sub> has a list of what could be termed ‘thematic vocabulary’, which is used to establish a context for that profession. These words were gathered from volunteers by means of a questionnaire. The volunteers were asked to write down any words that came into their heads when they thought of a particular profession. The choice of words was not constrained in any way during data collection.

Sample entries in the profession dictionary are shown in Table 5.2.

## 5.4 General Dictionary

WIS<sub>CRAIC</sub> needs some method of assessing the readability of a given joke. The choice of adjective and homophone substitute needs to be guided somehow. WIS<sub>CRAIC</sub> achieves this by using a selection of information taken from the MRC psycholinguistic database.

The MRC psycholinguistic database is a compilation of psycholinguistic data from a range of sources. There is a total of eleven psycholinguistic measures, though many words in the database do not have data for all eleven measures.

The measures that have been chosen for inclusion in WIScRAIC's general dictionary are: "Familiarity", "Concreteness", "Imageability" and "Age of Acquisition". The technical definition of these terms is explained fully in appendix A.

The only measure that the system actually uses at this stage is "Imageability", though the others could easily be applied as additional filters during the production of jokes. For this initial implementation, it was believed that too many filters may over-constrain joke production and lead to few jokes being produced.

#### **5.4.1 What information is included**

In addition to the psycholinguistic measures, the general dictionary contains a phonetic transcription for each entry. This is also taken from the MRC database.

A summary of the information in the dictionary and an indication of which parts are used by WIScRAIC is shown below:

Phonetic transcription

Used by the Joke Constructor to find identical or similar sounding words to words in an idiom.

Familiarity score (FAM)

Concreteness score (CONC)

Imageability score (IMAG)

Used to filter the adjectives available for use with each idiom. Higher scores are preferable to lower ones.

<i>Word</i>	<i>Phonetic</i>	<i>FAM</i>	<i>CONC</i>	<i>IMAG</i>	<i>AGE</i>
<i>bow</i>	bau	489	572	546	271
<i>bough</i>	bau	000	000	000	000
<i>stupid</i>	'stjupid	550	351	381	000
<i>need</i>	nid	589	314	327	000
<i>knead</i>	nid	000	000	000	000

Table 5.3: Sample General Dictionary Entries

Age of Acquisition score (AGE)

While measures FAM, CONC and AGE are not used in **WIScRAIC** there is one more filter which the system uses. Any word (adjective, noun or verb) which does not have an entry in this dictionary will never be used in the production of a joke.

Sample entries in the General Dictionary are shown in 5.3.

## 5.5 Lexicon

### 5.5.1 What information is included

The lexicon contains information on some of the words that **WIScRAIC** finds as homophones for the nouns and verbs and nouns comprising an idiom. For instance, when **WIScRAIC** finds that 'bough' is a phonetic match for 'bow', it looks in this file to find out what a 'bough' is.

Again, as with the professions, the information entered in the lexicon for a particular word consists of the words that best describe the entry. The entry for a word is restricted to five defining words, though this restriction is not strictly necessary. The entries for the definition do not have pre-defined lexical slots. In other words, the user can name the slot accordingly. In other words, the lexical

slot could have any value which for the user helps to clarify the meaning of the word. For instance, a lexical slot could be "is made from", "is related to", "is a type of" or "lives in". To re-iterate, these entries are not used in building a witticism, only in explaining it to the user if requested.

Sometimes, only one defining word is required for WISCRAIC to make a link to a profession. For example the information in Table 5.5.1 contains sufficient information for WISCRAIC to make the link with a rabbit-keeper.

<i>Word</i>	<i>Data</i>
<i>hare</i>	is like a : rabbit

Further examples of lexical entries are shown in Table 5.4 while Table 5.5 shows how the information appears to WISCRAIC for the purposes of joke building.

## 5.6 Homophones

### 5.6.1 Definition

*“One of two or more words pronounced alike but different in meaning or derivation or spelling (as the words to, too, and two)”*

<i>Word</i>	<i>Data</i>
<i>bough</i>	synonym = branch is part of a : tree is made from : wood
<i>fool</i>	synonym = blancmange is a type of : food is made of : mousse

Table 5.4: Sample Lexical Entries

<i>Word</i>	<i>Associated Vocab</i>
<i>bough</i>	branch, tree, wood
<i>fool</i>	blancmange, food, mousse

Table 5.5: Effective Lexical Entries

## 5.6.2 Procedure for finding homophones

WIS<sub>CRAIC</sub> uses the phonetic information contained in the general dictionary to look for identical-sounding words.

For instance, the entry for "bow" contains the phonetic entry "bau". The entry for "bough" has the same phonetic entry, "bau".

WIS<sub>CRAIC</sub> searches for homophones for all nouns and verbs in the idiom. A list of matches is built, but whether or not a particular homophone is used will depend on;

1. whether or not it has a lexical entry
2. whether or not it can be semantically linked to one of the professions

## 5.7 Adjectives

### 5.7.1 The Role of the adjective

The sentence "The lumberjack took a bough" is a valid grammatical sentence, but it also semantically valid. It makes perfect sense for a lumberjack, someone who works with trees, to take a branch of a tree for some reason. What we have lost therefore is the meaning of the original idiom "take a bow". This idiom creates the mental image of a performer on stage acknowledging his audience's appreciation. As we saw in section ?? the delivery of a joke often suggests a joke - the ambiguity or innuendo is stressed through mechanisms such facial expression or vocal stress.

A joke is rarely delivered in the same fashion as a factual statement. Computer generated witticisms do not have access to these mechanisms.

In **WIScRAIC**, the adjective is used as an indicator of what is to come - the reader expects the regular idiom, and does not spot the ambiguity immediately.

To this end, **WIScRAIC** selects an adjective from a list of adjectives associated with each idiom to qualify the protagonist in the sentence. For instance, the list for the idiom "take a bow" is : performing,entertaining,flamboyant.

Any of these adjectives may be chosen to qualify lumberjack and will result in a reversion to the original meaning of the idiom "take a bow", and hopefully the realisation on the part of the user that the word bough is replacing bow from that idiom.

The use of the adjective to suggest the original idiom, and the simultaneous existence of the semantic link between the substituted word and the protagonist of the sentence ensure that Veatch's three conditions (see section 2.3.2) are satisfied. The reader of a **WIScRAIC** witticism has in mind the simultaneous view that the situation is normal and also that there is some sort of violation of the way things should be.

### **5.7.2 Choosing an adjective**

**WIScRAIC** uses the MRC Psycholinguistic Database to gather information about a number of psycholinguistic indicators for each of the adjectives appearing in the list. The adjective with the highest imagability score is selected first. Upon backtracking, the next highest adjective is selected and so on until the list is depleted. Any adjective appearing in the list which does not have an entry in the MRC Database will never be selected. This ensures that obscure adjectives will not be used in the joke.

## 5.8 Worked Example

Starting with the idiom “take a bow”, WISCRAIC searches for homophones for all nouns and verbs in the idiom.

The phonetic search returns the word 'bough' as a phonetic match for 'bow'. WISCRAIC looks in its lexicon for an entry for bough.

The lexical entry for 'bough' will tell WISCRAIC that bough is a synonym of branch, it is made from wood and is part of a tree. WISCRAIC then uses this information to look for an appropriate subject.

WISCRAIC also has a file containing information on professions and other potential subjects. Each entry has a list of words associated with the profession. For example, the entry for lumberjack contains things that people associate with the job. The list includes axe, trees, and forest.

WISCRAIC decides that lumberjack is a suitable profession to associate with the word bough as a bough is part of a tree, and a lumberjack works with trees.

WISCRAIC can now produce the following sentence:

The lumberjack took a bough.

## 5.9 WISCRAIC'S Algorithm

1. Apply constraints in order to select joke parameters from Knowledge Bases (??)
2. Generate surface form joke using these parameters
3. Check that the generated joke has not been produced before
4. Generate an explanation of the joke

The constraints mentioned in step 1 above consist of a set of preconditions which must be satisfied in order for a joke to be produced. These are examined in detail in section 5.9.1.

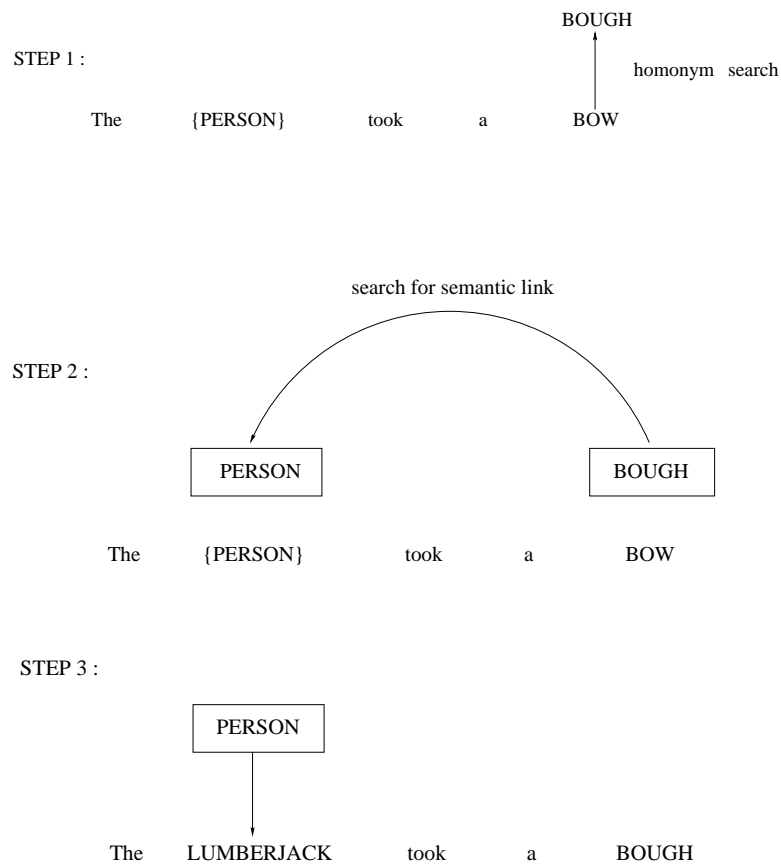


Figure 5.1: Creating sentence from altered idiom

### 5.9.1 Joke Constructor

The constraints that the Joke Constructor must enforce can be formally expressed in predicate logic as follows:

$$\exists A,B,C,D,E \text{ idiom}(A), \text{verb\_or\_noun}(B), \text{adjective}(C), \text{profession}(D), \text{substitute\_word}(E) \\ \text{is\_part\_of}(B,A) \wedge \text{is\_alternate\_meaning\_or\_homophone\_of}(E,B) \wedge \text{has\_lexical\_entry}(E) \\ \wedge \text{reinforces}(C,A) \text{ has\_dictionary\_entry}(C) \wedge \text{semantically\_linked}(D,E)$$

Another way of expressing this is to say that WIScRAIC must verify that the following hold:

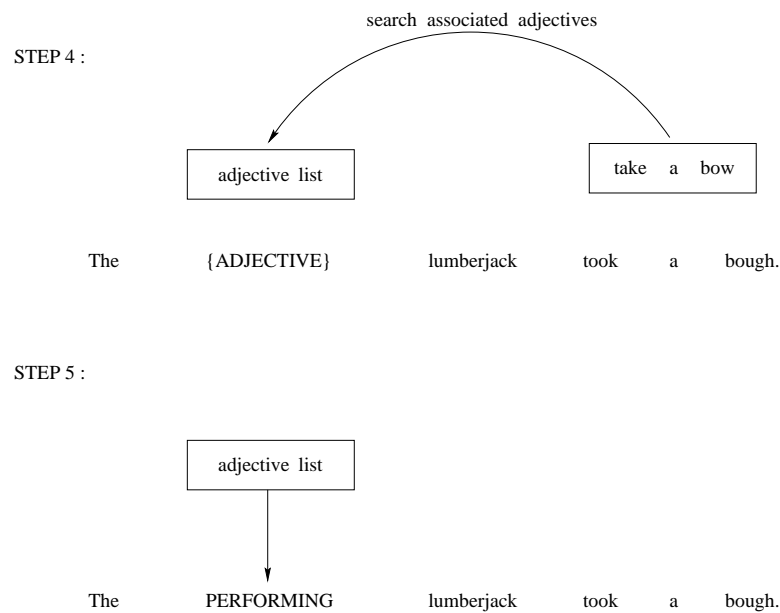


Figure 5.2: Inserting an adjective into altered-idiom sentence

1. There is an idiom A in the idiom database
2. There is a word B in the text of A which the word dictionary shows to be a verb or noun
3. There is a word E which is a homophone or alternate meaning of the B and is defined in the lexicon
4. There is a word C, specified as being suitable for use with idiom A, which the dictionary shows to be an adjective
5. There is a profession D which is semantically linked to the substitute E

The details of how WISCRAIC attempts to satisfy each of these conditions is now considered:

#### Condition 1

WISCRAIC chooses the first idiom in the database of idioms and extracts the idiom and the list of adjectives associated with that idiom

#### Condition 2

WISCRAIC scans all the words in the text of the idiom, picking out the nouns and verbs

#### Condition 3

WISCRAIC performs a phonetic search on each noun and verb to find homophones and returns a list of noun-homophone and verb-homophone pairs e.g (need,dough) becomes ((need,knead),(dough,doe))

#### Condition 4

WISCRAIC goes through the list of adjectives associated with the idiom and checks that each one has an entry in the dictionary. It extracts the imagability rating for each word with an entry from the dictionary. Any adjective without an entry in the dictionary is discarded. The adjective with the highest rating is chosen for use in the joke.

#### Condition 5

WISCRAIC chooses the first profession from the database of professions and extracts the vocabulary associated with that entry. Then WISCRAIC scans this vocabulary to see if any word in this list matches a word in the list of words which make up the lexical entry for the substitute word. If so, the profession is suitable for use in this particular joke. If not, the next profession is considered and so on until a suitable candidate is found.

### **5.9.2 Surface-form Generator**

The second stage in the process of building a joke is to construct the surface form of the joke. WISCRAIC must:

1. locate the position of the word in the idiom which is to be replaced by the substitute
2. convert words such as “someone” or “one’s” to suitable instantiations

3. conjugate the verb from the idiom to a suitable third person form (the protagonist could be replaced by “He/She”)
4. put all this information together in sentence form, or in question-answer form ensuring that the protagonist appears in the punchline

The generator uses a DCG to convert dictionary entries such as “someone” or “one’s” into actual noun phrases. For example, “someone” may become “the woman” and “one’s” may become “his”. By expanding the DCG to include more noun-phrases, there will be more variation in the jokes produced - though the impact on the funniness of the joke is arbitrary at this stage.

When information is passed to the generator, it automatically makes both question-answer and witticism forms: the one displayed will depend on the format the user has requested.

### **5.9.3 Explanation Generator**

This part of WIS<sub>CRAIC</sub> performs the greatest amount of linguistic processing. The explanation is the most prone to grammatical variation and several constraints need to be considered before an acceptable, grammatically sound surface form can be generated.

WIS<sub>CRAIC</sub> uses a number of rules which:

1. convert verbs into present participle form
2. identify collective nouns
3. convert other nouns to plural form
4. identify explanations involving animals

The reason for each rule is explained below:

#### Rule 1

An example of the application of a verb requires its present participle form e.g “kneading” is done to dough

#### Rule 2

Collective nouns do not need to change in plural form. Without this rule, WISCRAIC could produce sentences such as “shearing is done to sheeps”

#### Rule 3

Nouns other than collectives need to be converted to plural form for sentences such as “A lumberjack works with trees”

#### Rule 4

This rule is added so that a general verb “tend” may be applied to all animals. For example, “a deer-keeper tends deer” is generated rather than “works with deer”.

## 5.10 Other Sub-classes of Jokes

In order to see if the methods of joke building WISCRAIC uses could be extended to jokes which are not based on idioms or verb phrases, it was decided to find another sub-class of jokes which could be manipulated in the same basic fashion.

WISCRAIC was extended to allow it to produce jokes about a limited number of foods (lemonade,fool,muesli) and one event (yuletide).

### 5.10.1 Food/Event Jokes

In order to remain faithful to the original design of WISCRAIC, the same Knowledge Bases were used in the construction of these jokes as were used to construct

the witticisms.

However, some additional information had to be gathered. As with every sentence, a joke needs a verb. In the witticisms, this was provided in the idiom. When the basic building block of the joke is a noun however, there needs to be some way of identifying a suitable verb for use in the joke. Also, because there is no idiom, the adjective in the joke will have to be associated with something else.

These two requirements are addressed as follows:

- Each food item has a verb associated with it.  
If the food is a drink, then “drink” is an appropriate verb. All other foods could have “eat”, though “berries” may equally have “pick”, while “cake” may have “bake” as its verb.
- Each substitute noun has a list of adjectives associated with it.  
As with the idioms, the adjectives here are those that best describe, or are most readily associated with, the noun in question. For instance the word “fool” has “stupid,silly” as its list, while “aid” has only one entry, “helpful”.

These words were gathered informally by asking a group of people for the first verbs they associated with the respective words. A questionnaire was not distributed as was the case for some of the original Knowledge Bases. However, this is not considered to be an important factor as this second sub-class of jokes is a much less studied attempt at producing humour than our other sub-class, punning idiom-based witticisms. We simply wish to discover if the same basic principles behind WISCRATIC could be exploited to produce a different sub-class of jokes.

A further piece of information that this class of joke requires is a syllabic transcription of each lexical entry. Such information is undoubtedly available in machine readable form, just as the phonetic transcriptions are, but as this class

only deals with four initial lexemes (the three foods and one event), it was decided to enter this information by hand, using an intuitive informal breakdown of words into their constituent syllables.

### **Worked Example**

Each food has four slots:

Food-name, Associated verbs, Syllabic transcription, Qualifying foods

For example the entry “fool” has the following entries:

fool, make, [fool], [raspberry, gooseberry]

This information can be interpreted as follows:

Fool must be made from something, in this case, raspberry or gooseberry. The verb associated is something that can be done to raspberry or gooseberry fool - in this case “make”. You can make a raspberry fool.

The lexical entry for “raspberry” is as follows:

raspberry, pick, [rasp,berry], []

which means that a verb often associated with “raspberry” is “pick” and “raspberry” is made from two distinct syllables, “rasp” and “berry”. The list for qualifying foods is empty, as “raspberry” is not composed from other foods.

If a food has a qualifying food, the punning is done on a syllable from the qualifier. So, in the case of fool, one of the syllables in “raspberry” or “gooseberry” will be replaced by a near phonetic match.

For instance, we have seen that “raspberry” comprises two syllables, “rasp” and “berry”. WISCRATIC performs a phonetic search using the general dictionary

as before, but this time, it looks for a partial rather than exact phonetic match. Through this process, “rasp” could become “gasp”, yielding the nonsense punning noun, “gaspberry”.

If a food has no qualifying entry, but has more than one syllable in its syllabic transcription, then one of these syllables can be substituted to make a joke.

For example, the word “lemonade” has no qualifying food, but has two syllables in its transcription, “lemon” and “ade”. (Note that strictly, “lemon” is made from two syllables itself, and although it would be possible to develop rules which would determine what should be treated as a syllable for the purposes of joke construction, that is not explored here.) A search for a near phonetic match can be performed for either of these syllables. In the case of “ade”, an exact phonetic match “aid” will be found.

WISCRATIC replaces the “ade” with “aid”, and recombines it with the original initial syllable, “lemon”, yielding the punning pseudo-noun, “lemonaid”

We have already seen that the issue of choosing an adjective for use in this type of joke is addressed by associating adjectives with the substitute nouns. In the case of “aid”, the adjective is “helpful”. This will be used to describe the protagonist in the joke.

The next step is to choose the protagonist. There are currently two ways implemented of doing this. One uses the same method as the idiom based jokes. A word is looked up in the lexicon and matched to a profession. Hence, “fool” will be matched to “chef”, through the common word “food”.

The second method makes use of the variable names in the lexicon which in the idiom based jokes are only used during explanation production. For example,

given the entry “lemonade”, WISCRAIC finds “aid” as a phonetic match. Then it takes the first syllable, “lemon” and looks it up in the lexicon, this time using the variable “is\_a\_type\_of” to identify lemon’s superclass. The entry is “fruit” and this is a suitable protagonist for the joke.

At this stage of the process, WISCRAIC now has the following linguistic data with which to build the joke:

“helpful” “fruit” - “lemon-aid”

Two further things need to be done at this point - a verb must be chosen for the joke, and a surface form must be generated.

One of the verbs associated with the particular food is chosen (in the case of lemonade, “drink”), and the joke is fitted into the following template:

What does a (Adjective,Protagonist,Verb)? (Compound-Word).

This gives us:

What does a helpful fruit drink? *lemonaid*

## 5.11 Summary

In this chapter we have seen that WISCRAIC

- uses 5 distinct Knowledge Bases
- has 3 Processing Modules
- handles any verb phrase but focus is currently on idioms

- uses data capture techniques which emulate statistical methods of deriving word context
- produces witticisms primarily but also another sub-class of jokes

# Chapter 6

## Comparison of WIS<sub>CR</sub>AIC and J<sub>A</sub><sup>P</sup>E

### 6.1 Introduction

The aim of this chapter is to lay out the workings of both WIS<sub>CR</sub>AIC and J<sub>A</sub><sup>P</sup>E so that they may be compared at both a conceptual and technical level.

We will also look at whether or not either system could be adapted (while maintaining conceptual fidelity) to produce the output of the other.

First, we will examine how J<sub>A</sub><sup>P</sup>E works.

### 6.2 How J<sub>A</sub><sup>P</sup>E works

The final version of J<sub>A</sub><sup>P</sup>E developed by Binsted can generate riddles which:

- use typical subtypes of juxtaposition, substitution or comparison as their punning mechanism
- use the constructed word or phrase in the punchline, rather than the question part of the riddle

The program uses the following:

**Schemata** - these constrain the relations between lexical items, and assert relations between non-lexical (constructed) items and *small adequate descriptions*

An example of the constraints that a schema might specify is taken from (Ritchie 99):

$$\exists \text{LexA, LexB, WordA, WordB} : \text{noun}(\text{LexB}) \wedge \text{written\_form}(\text{LexB, WordB}) \\ \wedge \text{homophone}(\text{WordA, WordB}) \wedge \text{written\_form}(\text{LexA, WordA})$$

Such constraints would be satisfied by the lexemes “bizarre” and “bazaar”.

**A SAD generator** - this constructs the Small Adequate Descriptions mentioned above. A SAD is a linguistic description which sufficiently describes an entity.

For example, a SAD for the word lemon may be “yellow citrus-fruit”. We will see how  $J_A^P E$  constructs this SAD in section 6.2.2

**Templates** - translate the relations asserted in an uninstantiated schema into the surface form of the riddle

We will now look at each of these three elements in more detail.

### 6.2.1 Schemata

The schema specifies the relationships between entries in the lexicon and concepts artificially constructed for the expressed intention of producing humour.

For this reason, the schemata of  $J_A^P E$  are not humour-independent.

There are two types of constraint on the variables in a schema: lexical preconditions, which are lexical relationships which must hold between the instantiated variables; and SAD constraints which are relations between lexemes and SADs.

A schema has three slots:

Lexical preconditions: these must be true (found in the lexicon) for a given schema to be considered applicable. They may take the form of constraints on lexemes, phonemes and surface form.

SAD constraints: contain a set of “described\_by” relations which when instantiated relate a sequence of lexemes to a SAD which plausibly describes the concept to which the sequence of relations refers. Any SAD which satisfies the constraints in this slot can be used in a pun.

Relationships: These are relationships between SADs or between SADs and the texts they describe which are defined with the explicit purpose of making jokes - the relationships do not need to be consistent with the information in the lexicon. The three relationships are:

**describes** - a relation between a SAD and the text it describes.

**describes\_same** - a relation between two SADs that describe the same concept.

**describes\_diff** - a relation between two SADs that describe different concepts.

### 6.2.2 Small Adequate Descriptions (SADs)

Any single lexeme in the lexicon derives its meaning from the set of relations which exist between that lexeme and other lexemes in the lexicon. However, not all these relations are needed to define the entity in question. Certain sub-sets of the overall set of relations between lexemes may be selected which sufficiently describe the entity. This is what is meant by “adequate description”. Binsted states that a lexeme’s synonym is always an adequate description of it.

The notion of a SAD then is a minimally adequate description, in other words, a set of relations which, if any one were removed, would no longer constitute an adequate description.

SADs are constructed through the use of USADs (Uninstantiated Small Adequate Descriptions).

USADs specify the relationships which, if they hold, constitute a SAD. Binsted maintains that it should be possible to generate SADs (and USADs) for any lexicon from the slots and entries particular to that lexicon. USADs specify all the relationships that constitute a SAD for an entire lexicon, but not every USAD will be instantiated for a particular lexical entry.

Binsted illustrates this with the example of the entry “lemon”. J<sub>A</sub><sup>PE</sup>-1 used a hand-built lexicon. The set of USADS for that lexicon are :  
synonym,specifier,class,cross-between,adj,inact-verb,inact-verb,location,has,adj,class,inact-verb

The entry for “lemon” in the lexicon may include, among others, the relations *class(lemon,citrus-fruit)*, *adjective(lemon,sour)*, *specifier(lemon,yellow)* and *has(lemon,peel)*.

There is not a SAD for every USAD in this case, as the lexical entry for “lemon” does not contain *synonym*, *cross-between* or *location*.

It would not be sufficient to describe “lemon” as “something yellow” as many objects fit such a description. However the relations *class* and *specifier* together constitute a SAD as “yellow citrus-fruit” which we have already said is a sufficiently accurate definition of “lemon”.

It is easy to generate SADs for an actual lexeme in the lexicon (as we can see from the “lemon” example, it is simply a matter of taking information from the slots specified by the USADs) but it is not that straightforward for words or phrases such as “ferry liquid” that have been “constructed” for the purpose of a joke.

When a schema constructs non-lexicalised items, it specifies a suitable sequence of lexemes which can be used by the SAD generator to build a SAD which describes the new compound-word.

The SAD generator uses two assumptions: that the last lexeme in the sequence is the head of the phrase being described and that other lexemes modify the head.

So for instance, given the artificially constructed compound noun “lemon-aide”, the sequence of lexemes specified by the schema will be [lemon,aide]. The SAD generator builds a SAD as shown below:

If the lexical entry for “lemon” is:

```
{specifier(lemon,yellow),class(lemon,citrus_fruit),adjective(lemon,sour),
inact_verb(lemon,eat),has(seeds)}
```

and the lexical entry for “aide” is:

```
synonym(aide,assistant),act_verb(aide,help),adjective(aide,helpful)
```

then the SAD generator might generate the following sets of SADs:

lemon\_aide:

```
class(lemon_aide,assistant),specifier(lemon_aide,sour)
```

```
class(lemon_aide,assistant),inact_verb(eat)
```

J<sub>A</sub><sup>PE</sup> uses a number of translation rules to specify the different ways in which USAD relations may be derived from the lexical entries for the lexemes in the sequence presented to the SAD generator.

The sets of SADs given above could be used to construct the description “an assistant who is sour”.

The rules and constraints governing the construction of SADs are more complex than those outlined here, but we have highlighted the essential elements. Further detail is not required for the purposes of the current thesis.

### 6.2.3 Templates

Templates are responsible for transforming various relations of the types we have seen into suitable surface forms. They are used therefore to link a USAD and a suitable surface form.

*A template consists of variables which are to be instantiated to text segments and lexemes, constraints on the relations the templates can be given, and a sentence form into which the words and lexemes the template is given can be slotted. A sentence form is a piece of text containing some gaps, and grammatical functions for filling those gaps.*  
(Binsted 96)

The “grammatical functions” refer to a simple DCG grammar which is used to convert lexemes such as [depressed,train] into “a depressed train”.

Sample sentence forms are shown below:

1. `spec_class(L1,L2,Str) →`  
What do you call `np(L1,L2)`? Str.
2. `inact_verb(L1,L2,Str) →`  
What kind of `np(L1)` can you `verb(L2)`? Str.

We can see how these sentence forms might be used to build jokes using the SADs provided by the SAD generator for “lemon-aide”:

```
lemon_aide:  
class(lemon_aide,assistant),specifier(lemon_aide,sour)
```

Using sentence form 1 above, L1 becomes instantiated to “sour” and L2 becomes “assistant”.

“Str” is the non-lexicalised construct “lemon-aide” which these SADs describe.

What do you call a sour assistant? A lemon-aide.

```
class(lemon_aide,assistant),inact_verb(eat)
```

Using sentence form 2 above, L1 becomes instantiated to “assistant” and L2 becomes “eat”.

“Str” in this case is the non-lexicalised construct “lemon-aide” which these SADs describe.

What kind of assistant can you eat? A lemon-aide.

The ordering of variable-argument instantiation (what L1 and L2 in the examples above get instantiated to) is also under the control of the templates, into which explicit joke building knowledge has been coded.

### **6.3 Differences in the design of $J_A^{PE}$ and $WIS_{CRAIC}$**

There are broad architectural similarities between  $J_A^{PE}$  and  $WIS_{CRAIC}$ . Both manipulate data from a lexicon, both use DCG grammars to help build surface forms and ensure grammatical correctness and both specify a set of preconditions which must be met in order for a joke to be constructed.

However, there are also important differences in the type of information stored in the respective Knowledge Bases, in the approach to data representation and in the scope and type of jokes produced.

Perhaps the most obvious difference between the two systems is the type of

joke each produces.  $J_A^{PE}$  produces a wide range of question-answer punning riddles built around compound nouns and phrases.  $WIS_{CRAIC}$  on the other hand focuses principally on witticisms based around idioms and some other verb phrases.  $WIS_{CRAIC}$  also produces a limited range of more traditional question-answer riddles, like  $J_A^{PE}$ , though as we shall see, the mechanism used is somewhat different.

One important difference between the two systems is that to a large degree  $J_A^{PE}$  uses explicit syntactic and semantic information to derive jokes whereas  $WIS_{CRAIC}$ 's knowledge is often implicit.  $WIS_{CRAIC}$  aims to derive meaning from context rather than word definitions. For instance,  $J_A^{PE}$  uses categories such as "inact\_verb", "act\_verb", "used\_to", "used\_to\_object" and "specifier". The information therefore is very structured, and as was the case with  $J_A^{PE-1}$ , volunteers are quite restricted in how they can define a given word.  $WIS_{CRAIC}$  uses a more open-ended approach. Only broad syntactic categories such as noun, adjective, and verb are explicitly coded into  $WIS_{CRAIC}$ . The important element in  $WIS_{CRAIC}$  is that two words are semantically related in some respect - the nature of the link is not considered in the production of a joke. Of course,  $WIS_{CRAIC}$  data is not completely free of structure or constraint. When gathering data for the idiom dictionary, volunteers were told to think of adjectives associated with a particular idiom. In the case of the data on the professions, volunteers were told only that the words they provided should be nouns - the association and reasons behind choosing a particular word were never declared or considered in the design. All that mattered is that there was some type of association in the mind of the volunteer. One of the aims in designing  $WIS_{CRAIC}$  was to see if a word could be sufficiently defined by context alone to form the basis of jokes that others would find funny and clever, without the basis for this funniness and cleverness being explicitly stated at any stage of production. For this reason it can be said that  $WIS_{CRAIC}$ 's semantic knowledge is largely implicit - it is tacit in the minds of the people who provided the words, yet is sufficiently explicit to allow jokes to

be built.

J<sub>A</sub><sup>PE</sup> on the other hand has been designed from a standpoint of having analysed jokes and identified certain semantic and syntactic patterns: this allow rules to be derived which when applied and satisfied will reproduce a particular range of jokes.

One interesting question we should ask is how much either system would have to be altered (if at all) to reproduce the output of the other. Let us look again at how each system operates, this time in diagrammatic form. Figure 6.1 shows the information and processing flow in J<sub>A</sub><sup>PE</sup> and Figure 6.2 shows the same for WIS<sub>CR</sub>AIC.

Whereas J<sub>A</sub><sup>PE</sup> uses schemata to specify the different combinations of lexemes that are acceptable for joke creation, WIS<sub>CR</sub>AIC's joke constructor specifies the semantic links that must hold for a joke to be validly constructed. As we have seen, this "reasoning" is implicit, whereas it is explicit in J<sub>A</sub><sup>PE</sup>.

In order for J<sub>A</sub><sup>PE</sup> to produce the witticisms of WIS<sub>CR</sub>AIC, it would need to have access to the same Knowledge Bases as the latter. However, there would also need to be some significant changes to J<sub>A</sub><sup>PE</sup>'s joke production mechanism. The schemata would have to be altered to assert semantic preconditions without the use of detailed syntactic information. It is feasible that this could be done as both systems have a set of conditions, or rules that can be clearly specified in predicate logic: extra schemata could be written to handle the new information. It is difficult to say how far this would lead J<sub>A</sub><sup>PE</sup> away from its original design. It is possible to tweak the schemata in their current form, by adding arguments in such a way that the schema always matches to the same template, which in turn can be tuned to produce a whole range of output which may not be in keeping with the original concept. The important point is that it is often possible to get code to produce a desired result through educated "hacking", but it is not clear how elegant the resulting functionality would be in the case of J<sub>A</sub><sup>PE</sup>.

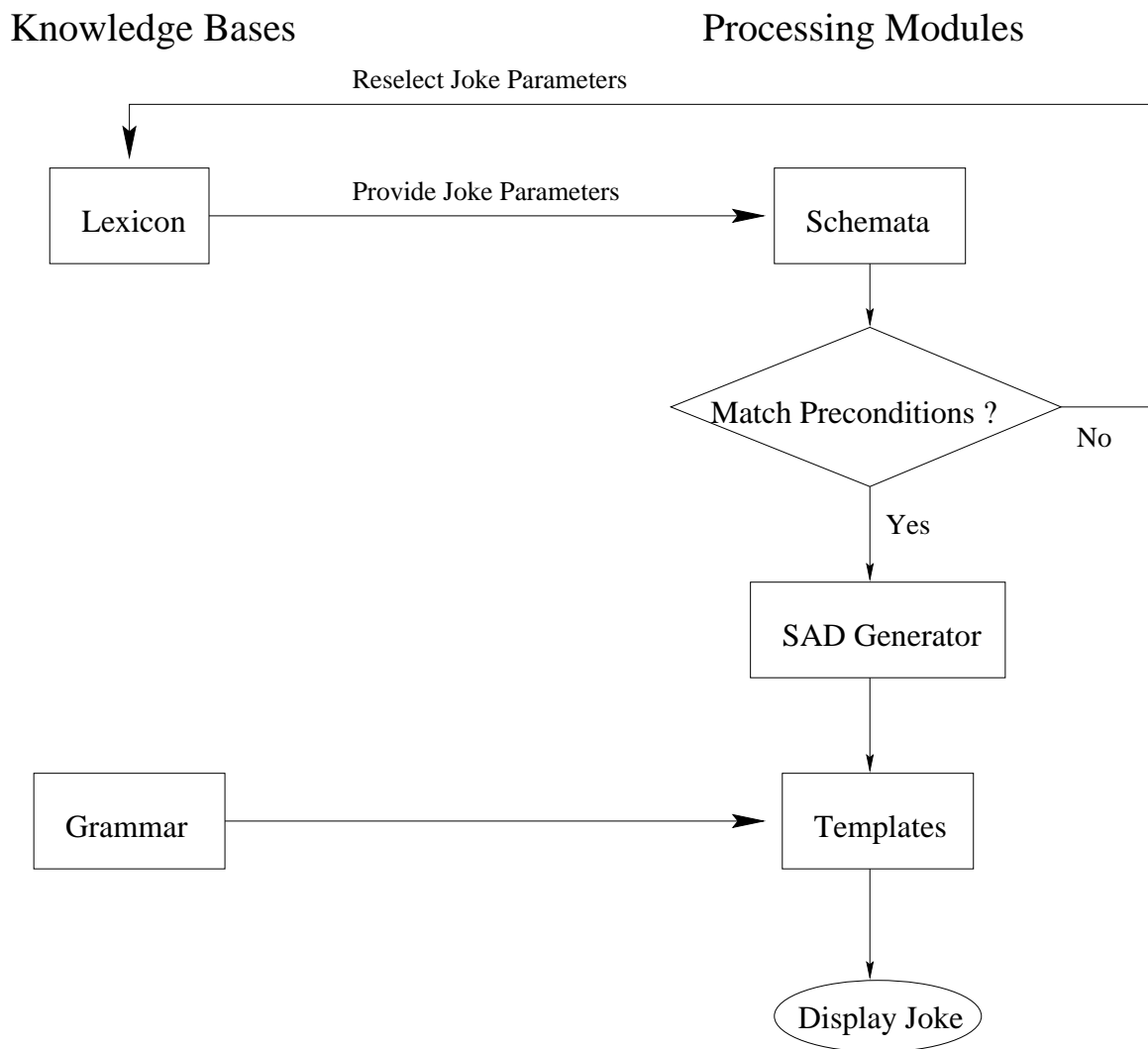


Figure 6.1: Information and Processing flow in JAPE

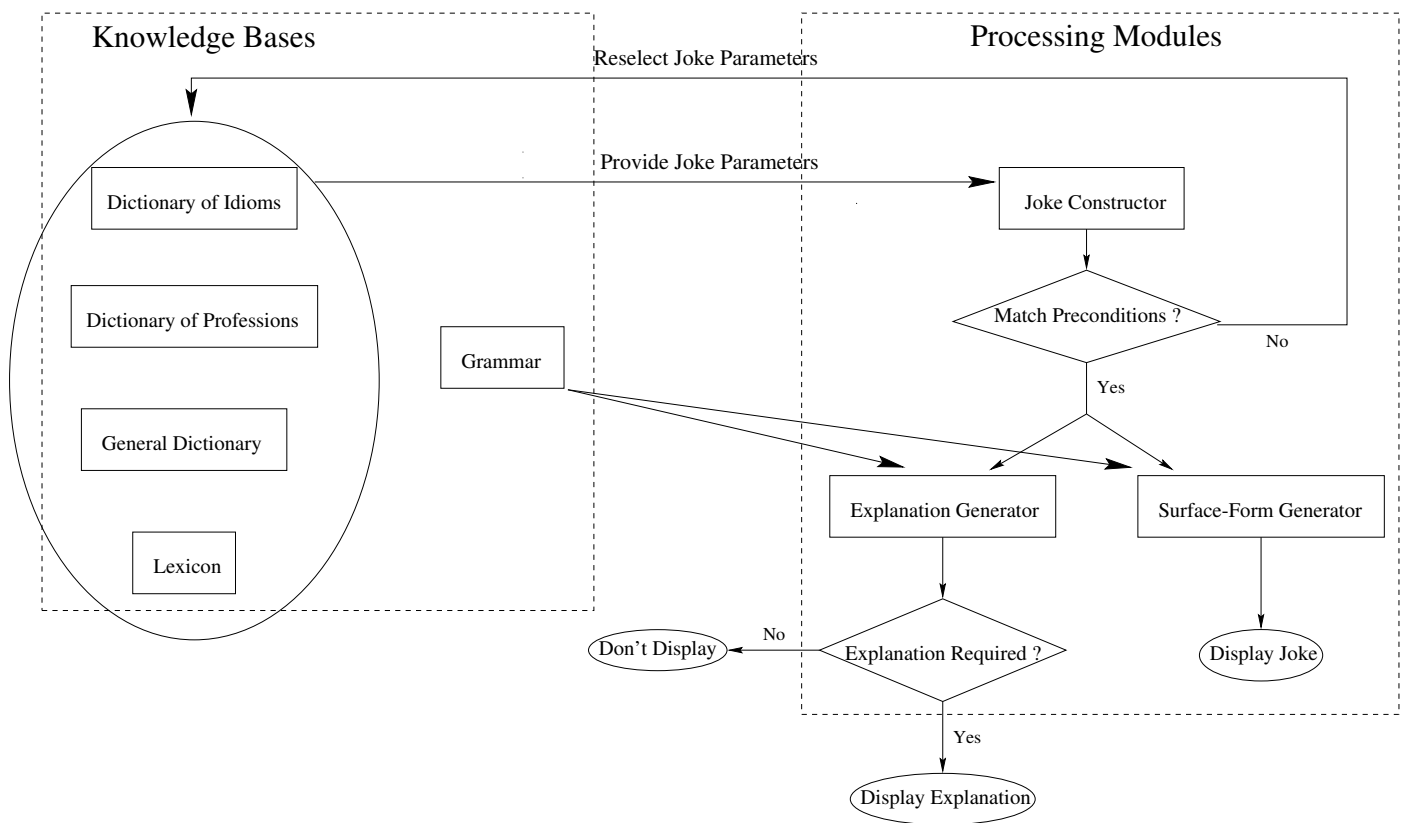


Figure 6.2: Information and Processing flow in WISCRAIC

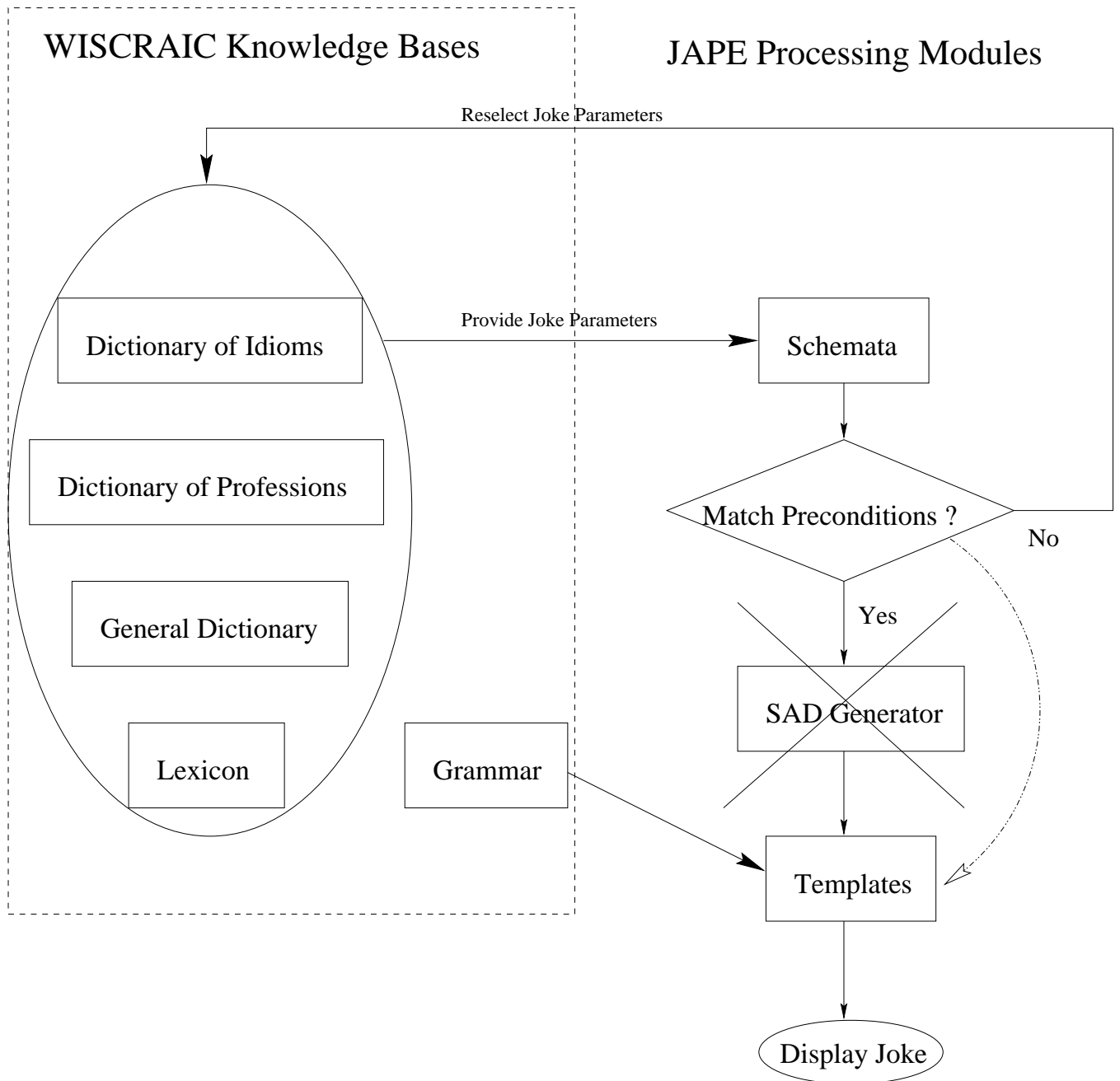


Figure 6.3: A hybrid Joke-Production System

As indicated in figure 6.3, there is almost certainly no use for a SAD generator, or SADs themselves of any kind if  $J_A^PE$  were adapted to produce idiom based witticisms. Often idioms do not have precise definitions. Rather they convey a certain sentiment, for which it could well be difficult to build a Short Adequate Description. What would an appropriate SAD be for “show someone a good time”, and if one could be constructed, how would it be used as the basis for a joke ? This is not a trivial matter, and for this reason is not explored further in this thesis.

In chapter 5, we saw how  $WIS_{CRAIC}$  produces a small range of jokes other than witticisms, using the variable names provided for the purposes of explanation as semantic and syntactic categories. This can be extended further given the current architecture. By specifying a set of rules (as  $J_A^PE$  does) rather than relationships which must hold,  $WIS_{CRAIC}$  could feasibly produce  $J_A^PE$  type jokes.

# Chapter 7

## Evaluation

### 7.1 Introduction

Once the development of WIS<sub>CRAIC</sub>'s model had been completed and its implementation finished, it was necessary to evaluate its performance.

The purpose of this evaluation is to test whether or not a number of hypotheses (see section 7.2) hold. The most fundamental question we must answer of course is "Does WIS<sub>CRAIC</sub> produce jokes?" We also wish to determine the factors which contribute to the quality of a joke. In order to evaluate the quality of the jokes (and determine the factors which contributed to or detracted from the quality), questionnaires were developed and distributed to native English-speakers, who judged a selection of WIS<sub>CRAIC</sub>'s output.

A further aspect we wish to evaluate is the quality and effect of the explanation generated by WIS<sub>CRAIC</sub>. To this end, another questionnaire was developed and distributed to non-native English speakers. The evaluation of the explanations was not carried out to test any specific hypotheses, but rather to provide a basis for discussion and to give some preliminary indication of the value of the system as a teaching tool.

## 7.2 Hypotheses

The purpose of this evaluation is to summatively evaluate the behaviour of a wit-ticism generation and explanation system, **WIScRAIC**.

Through this evaluation we hope to show that :

1. **WIScRAIC**'s output is in fact jokes.
2. Puns without the supporting adjective will have lower funniness ratings than the same pun with the adjective.
3. Cleverness is correlated with funniness : jokes with higher cleverness ratings than other jokes will also have higher funniness ratings.
4. Texts without homonym substitution into the idiom but with semantic links derived from the homonym will sometimes be thought of as weak jokes.
5. Texts demonstrating normal use of an idiom will be judged as regular sentences.

Two secondary questions which we hope to test are :

6. Is there any relationship between the form of the texts and their perceived joke/non-joke status ?
7. Do jokes which use more obscure (less common) words get higher cleverness ratings than those using common vocabulary ?

The questionnaires are designed in such a way that the main hypotheses can be addressed, and data gathered to inform the secondary questions.

## 7.3 Materials

The initial materials are the set of jokes produced by **WIScRAIC** to be judged. The judges ability to distinguish jokes from non-jokes needs to be checked, so

non-jokes are also included in the questionnaires distributed to judges.

One type of non-joke is a text which uses the idiom in a normal, non-humorous context. For example:

*The mysterious man disappeared into thin air !*

Such non-jokes acts as a control set for the evaluation of the actual jokes.

Two other relevant non-jokes are also included in the evaluation questionnaires : texts which do not use homonym substitution but include semantic links with a potential homonym, and texts which use substitution but the word substituted has no semantic support (substitution based on superficial word-sound similarity alone - see section 3.6.1).

An example of a text which includes substitution but excludes semantic links might be:

*The strong policeman met the woman half whey !*

Here, the word “way” from the idiom “meet someone half way” has been changed to the phonologically identical “whey”. However, there is not semantic link between the substitute word “whey” and the protagonist of the sentence, the policeman. In addition, the adjective “strong” in no way suggests the original idiom.

An example of a text which does not substitute a word into the idiom, but does contain semantic links between the protagonist and a potential substitute might be:

*The strong fisherman showed the woman his muscles !*

In this text, the original idiom “show someone one’s muscles” has been used, making a normal sentence. However, there is also an implicit link between the protagonist “fisherman” and the potential substitute “mussels”.

Finally, the questionnaires include a joke with the supporting adjective removed. For example:

*The lumberjack took a bough !*

In this joke, an adjective such as “flamboyant”, which is usually used to rein-

force the original idiom “take a bow” has been removed.

Thus, five sets of materials have to be prepared:

1. the WIScRAIC generated jokes.
2. the sentences illustrating normal use of the idioms.
3. the WIScRAIC jokes with the adjective removed.
4. texts with homonym substitution but no semantic links.
5. texts with the original idiom intact but semantic links with a potential, phonetically identical substitute.

All five sets are reproduced in appendix D.

### **7.3.1 Questionnaire Design**

Each questionnaire comprises 10 texts to be judged - 6 jokes (set 1 above) and one text each from sets 2,3,4 and 5.

The resulting questionnaire therefore contains six complete jokes, a normal idiomatic expression (control), a joke with the adjective removed, a text with substitution but no semantic links and a final text containing semantic links to a non-substituted homophone.

It is important that a range of jokes is evaluated and also that the ordering of the jokes, controls and hypotheses-testing texts is varied across the questionnaires.

To this end, the jokes, controls and other texts were divided into groups. For every substitution that can be performed on a single idiom a group was created. For example, given WIScRAIC’s current lexicon, the idiom (see our definition of idiom in section 5.3.1) “need dough” has two possible substitutions:

1. “knead” replaces “need”
2. “doe” replaces “dough”

If an idiom has only one substitution possible then only one group was created.

A group consists of all variations of the joke (jokes using one idiom but different adjectives, witticism and question-answer formats), the normal control use of the idiom and the three different hypothesis-testing texts. Groups were also created for the sub-class of jokes that WIS<sub>CR</sub>AIC produces based on syllable substitution into common food and event names.

A program was written which would pick 10 different groups at random, and select one text from each group until the requirements for each set had been fulfilled.

This ensures that one questionnaire does not contain variations on the same joke and also ensures a random distribution of jokes across the questionnaires.

The program generated ten questionnaires.

## **7.4 Participants**

An initial e-mail asking for volunteer joke-judges was sent to the MSc students of Edinburgh University, as well as a number of outside parties. The mail explained that those willing would be asked to judge a set of jokes as part of project exploring written humour.

Those interested replied to the e-mail and a questionnaire was sent to them, also by e-mail. The ten questionnaires were distributed on a 1 through 10 cycle in the order that people responded i.e the first and eleventh respondents got questionnaire no.1, and so on.

The majority of volunteers were British, aged between 25 - 30 and educated to first degree level or higher.

The questionnaires had spaces for scores and explanations. Respondants used the reply function on their e-mail software to include the original text and fill these spaces in before sending.

## 7.5 Procedure

Each text in the questionnaire has three potential rating slots : Joke Rating, Funniness Rating and Cleverness Rating.

The volunteers were asked to indicate whether or not they considered each text to be a joke. If they thought a particular text was indeed a joke they were asked to mark a 'J' in the Joke Rating box.

This classification allows us to quickly ascertain how much of WIScRAIC's output is considered to be jokes.

For each text marked 'J', two additional values must be provided: a funniness rating and a cleverness rating. The scales for these two ratings are provided in the questionnaire so everyone judges by the same scale.

If the reader considers a text not to be a joke, one of four ratings other than 'J' should be placed in Joke Rating slot. These are shown below (taken from the actual instructions accompanying the questionnaires):

O - Obscure - I'm not familiar with certain words used.

S - Not a joke - simply a regular sentence.

N - Nonsense - doesn't make any sense.

V - Recognisably an attempt at a joke but doesn't work as a joke for some reason.

The respondants were also asked to provide a brief explanation of the semantic links between words for some of the texts they considered to be jokes.

This will allow us to do an informal comparison of the explanations provided by WIScRAIC and human-generated explanations of the same jokes.

The respondents were also invited to add their own comments at any point in the questionnaire.

## **7.6 Results**

The evaluation provided adequate data to assess the hypotheses described in section 7.2. It also provided some interesting answers to the secondary questions as well as informing the discussion on the value of using humour in second language learning.

Each text on the questionnaires distributed to native speakers was evaluated on three levels:

**Jokiness:** Only texts marked as “J” are considered to be jokes. “V” rated texts (those which are recognisably attempts at jokes, but fail for some reason) are evaluated separately. The average of all the scores for any given group will be the ‘jokiness’ of the text.

**Funniness:** The average of all the “Funniness Rating” scores will be taken as the measure of how funny any given group is.

**Cleverness:** The average of all the ‘Cleverness Rating’ scores will be taken as the measure of how clever a particular group is.

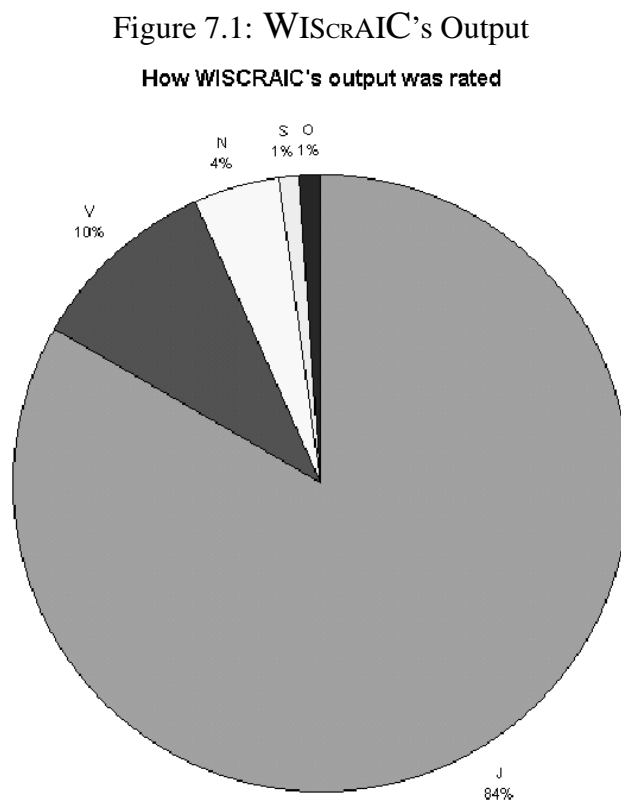
### **7.6.1 Jokiness**

This stage of the evaluation was designed to see what percentage of WIScRAIC’s output was considered to be jokes. Figures were also gathered for the various other possible classifications of WIScRAIC’s output.

It was found that:

1. 84% of WISCRAIC's output was considered to be jokes.
2. 10% of WISCRAIC jokes were judged as being recognisably attempts at jokes which didn't work for some reason.
3. 4% of the jokes were considered to be nonsense - they made no sense.
4. 1% of the jokes were judged to be regular sentences.
5. A further 1% were judged as obscure.

This data is presented in figure 7.1.



In addition it was found that:

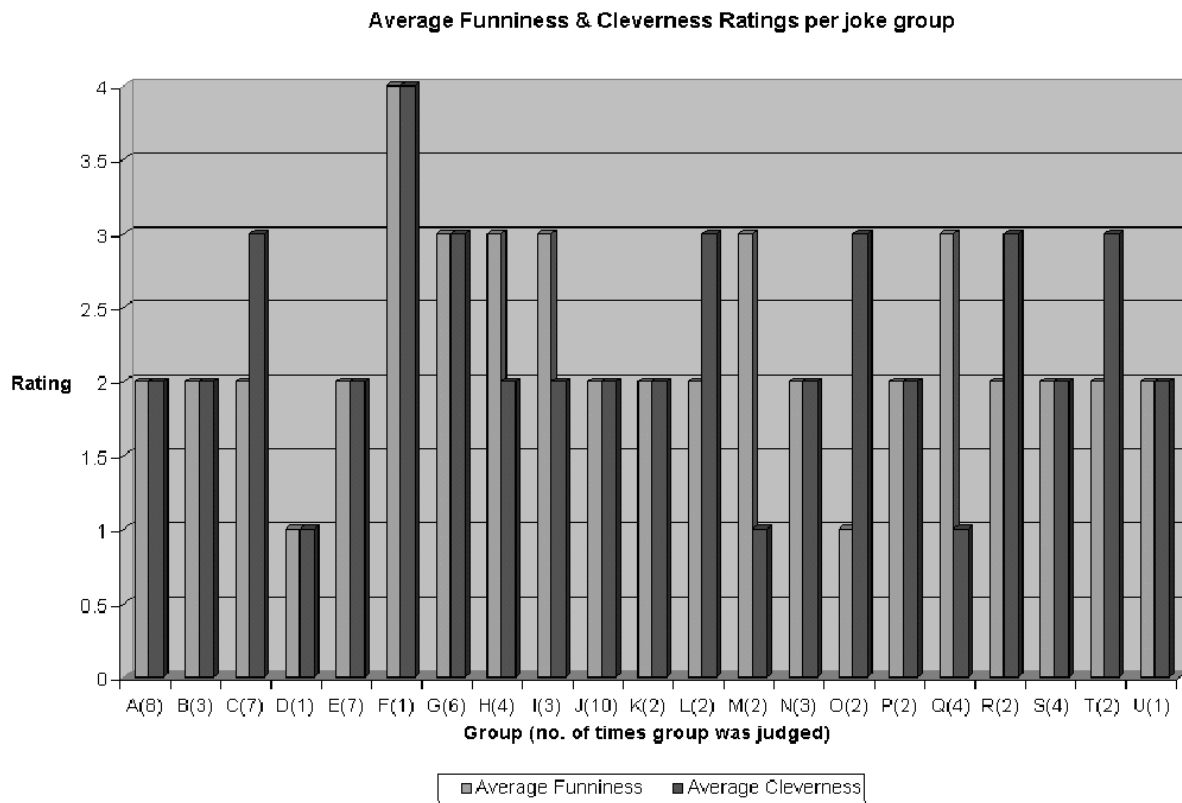
- 80% of WISCRAIC jokes with the adjective removed were considered to be jokes.

- 50% of suggested jokes (texts without substitution but with semantic links) were considered to be jokes.
- 20% of the normal sentence texts were considered to be jokes.

## 7.6.2 Funniness & Cleverness

The results for these two measures for all the jokes evaluated are shown in figure 7.2. The averages are calculated per group.

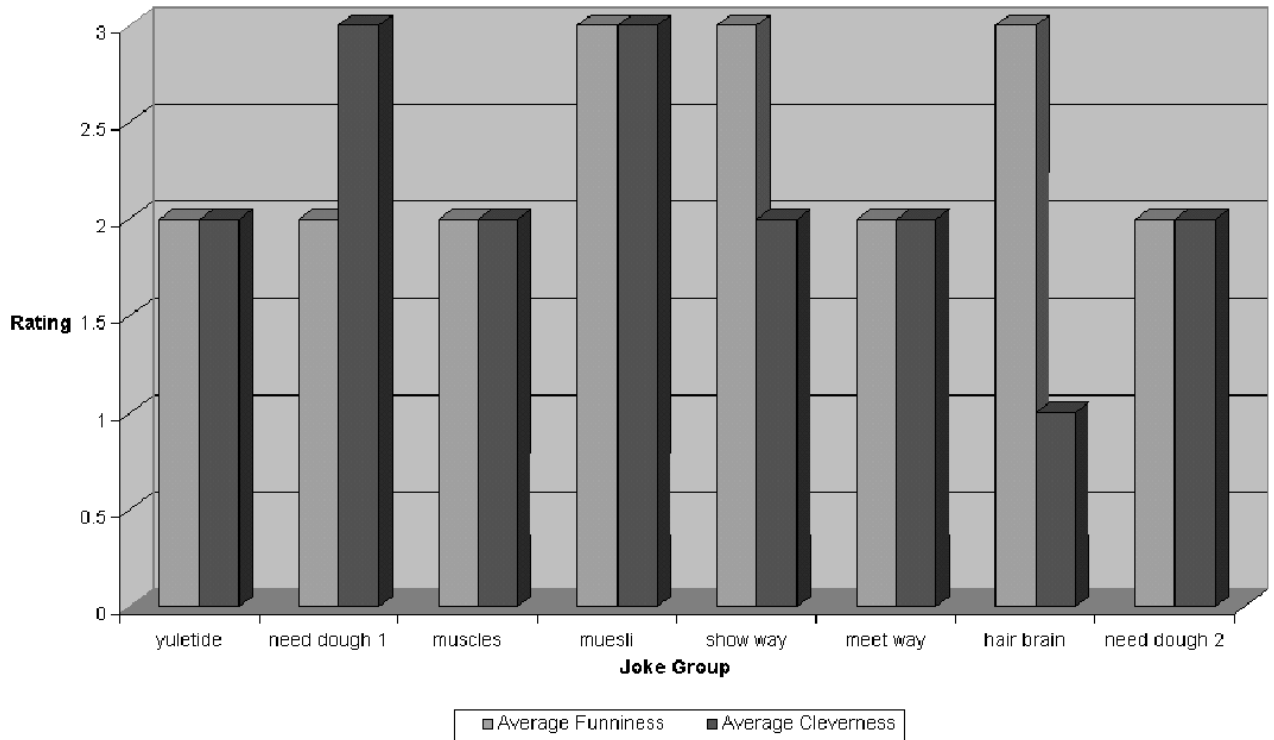
Figure 7.2: Scores for all joke groups



Because some jokes were evaluated very few times, jokes which had been evaluated at least 4 times, and those that had been evaluated at least 5 times were isolated in order to provide a more accurate view of the results. These two groupings can be seen in figures 7.3 and 7.4 respectively.

Figure 7.3: Jokes with at least 4 evaluations

Average Funniness & Cleverness Ratings for jokes evaluated 4 times or more



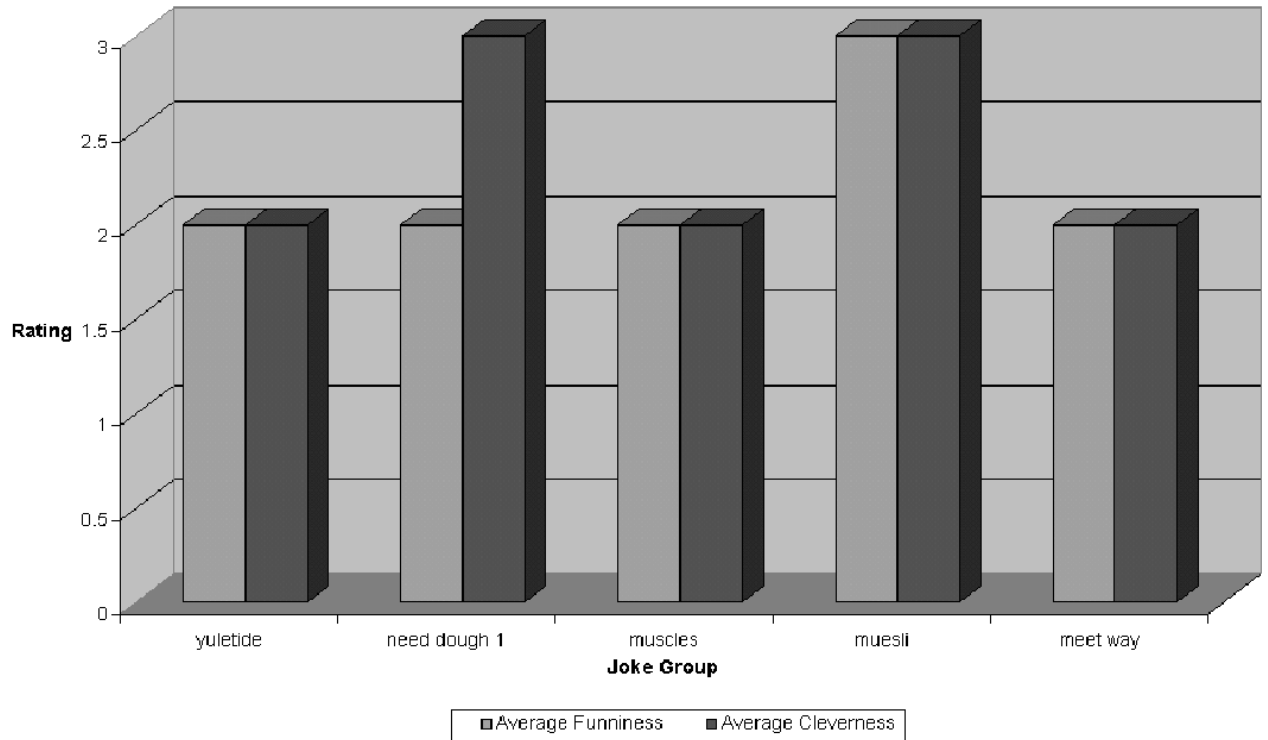
## 7.7 Other Results

The following results were also found:

- Suggested Puns (semantic links - no substitution)  
40% rated “J”  
Average Funniness - 1.88
- Missing Adjective Jokes  
Average Funniness - 2.41
- Normal Use of Idiom Texts  
50% rated as normal sentences

Figure 7.4: Jokes with at least 5 evaluations

Average Funniness & Cleverness Ratings for jokes evaluated 5 times or more



20% rated “J”

20% rated “V”

## 7.8 Results from Non-Native Speakers

Although there was not a sufficient number of results gathered from the non-native questionnaires to gather any significant conclusions, the preliminary response seemed promising.

The significance of these results will be discussed in chapter 8.

# Chapter 8

## Discussion

### 8.1 Introduction

In this chapter, we will examine some of the issues raised by the implementation and evaluation of WISCRAIC. We will also look at some avenues of further research and development.

The evaluation revealed that although WISCRAIC does indeed produce jokes, they are not particularly funny. We will examine the results obtained and see how they hold up or refute our original hypotheses.

### 8.2 Evaluation

#### 8.2.1 Subjects

A factor which affected the results of the evaluation was the number of subjects who actually completed and returned the questionnaires. Of over 50 people who received the request to take part in the evaluation, a small number agreed to do so and only 15 completed questionnaires were eventually returned.

Another problem is that because only a small number of questionnaires were returned, the planned distribution of the jokes was essentially lost. Some jokes were evaluated ten times whereas others were only rated once. Another factor in this phenomenon however was the fact that some jokes were rated not as jokes but as one of the other categories. Therefore, when the results show that a group was evaluated only once, it means that it received a “J” rating only once, but may have been considered a number of other times but labelled as something else.

## **8.2.2 Comments from Volunteers**

A number of volunteers made constructive and informative comments about WIScRAIC’s jokes.

One volunteer observed that the joke,

*The helpful dairy-farmer showed the woman the whey !*

works in written form but not verbally.

Several people made the observation in their explanations of the jokes that the idioms were in fact, “recognised expressions”. This is one advantage the use of idioms offers over regular verb phrases as discussed in section 5.3.1

One volunteer made several interesting observations. He identified the substitution in the following text,

*The dairy-farmer met the woman half whey !*

but said that there was no context to make it funny. This text was in fact one of the texts designed to test the hypothesis that the adjective was important in establishing the expectation of a joke, as discussed in section 2.3.1

The same volunteer then stated that the text,

*The rude chicken-farmer was foul mouthed !*

*“would have been funnier if “rude” wasn’t used”.*

Again, this text was not a joke, but a suggested joke where the semantic support and adjective are present but the substitution hasn’t been made.

A number of the non-native English speakers indicated that they had learnt quite a few new words. The tendency seemed to be for them to look up the idiom first, then the homophones. The homophonic substitute was almost always new. On several occasions, they indicated that they didn’t understand the joke initially, but after the explanation, scores of 3 for funniness were given. These are encouraging results but the research would need to be carried out on a larger scale if any concrete conclusions are to be drawn.

### **8.2.3 Materials**

By forcing people to choose between N,V,O and S rather than simply “Not J” we get a much more detailed picture of how the texts and jokes were perceived.

Also, the program which generated the questionnaires allocated the texts on a random basis, so there may well not have been an equal number of texts generated for assessment. This seems to be confirmed by fact that some groups were evaluated much more than others, though some other factors may have been the cause of this.

## **8.3 Significance of the Results**

We will now look at how the results relate to our original hypotheses. They are presented here in abbreviated form. The full hypotheses are stated in section 7.2

1. **WIScRAIC** produces jokes  
Confirmed - 84% considered jokes.
2. Lower funniness scores for jokes without adjectives.  
Unconfirmed - 80% considered jokes - slightly higher funniness score than average.
3. Cleverness correlated with funniness  
Confirmed - of the jokes rated 5 times or more, 80% had the same funniness and rating scores, either 2 or 3 for both measures.
4. Suggested Jokes thought of as weak jokes  
Confirmed - 40% judged 'J' - lower than average funniness rating
5. Texts showing normal use of idiom judged as regular sentences  
Unconfirmed - just over half judged as regular sentences

## **8.4 Implementation**

## **8.5 Factors influencing WIScRAIC's performance**

### **8.5.1 The domain - idioms**

Although most of the idioms used here should be well known to the volunteers, some, such as “wear a cat suit” may not be instantly recognisable. Also, jokes are not often based around idioms, so people may not be in “joke-mode” when they are presented with texts of this genre.

### **8.5.2 Lack of Constraints on Profession Choice**

The method currently implemented in WIScRAIC of finding a match between a noun and a profession is very simple. If there is a single match in the two lists

(context for profession, definition for noun), then the profession is deemed to be a suitable choice for use in the joke. While this seems to work on the scale we have implemented in this version of WIScRAIC, it is clear that the method could produce some strange results, or simply jokes where the link is too tenuous to be in any way obvious or useful for explanation purposes. For example, it is quite feasible that the profession french-polisher would have the word “wood” as part of its context. This would mean therefore that the joke “The performing french-polisher took a bough” would be just as valid in WIScRAIC terms as “The performing lumberjack took a bough”.

## **8.6 Alternative Implementation Methods Considered**

### **8.6.1 Using Dictionary Definitions**

One method attempted was to use the definitions of words in a machine-readable dictionary to match nouns and potential protagonists. The dictionary in question was developed by Marco Carvalho, a PhD student at the University of Edinburgh.

After filtering the definitions for basic prepositions and other “stopwords”, lists of words were established and the lists searched for a match.

However, this method had very poor results and failed to match the simplest of items. For example, we tried to match “fool” with “chef”. In the definition of “fool”, “dessert” was mentioned, but not “food”. The definition of “dessert” still failed to render “food”. The definition for “chef” returned “cook” which in turn gave us “food”. So there did not seem to be an easy way of establishing that “fool”, which is a dessert is a type of food. Also, the branching factor of the search was very high, as the definition of “cook” returned over a hundred words, each of which needed to be searched in turn.

Dictionaries which are more hierarchical in nature, such as Wordnet, could possibly be used to provide a better result, though rules would have to be devised to determine which syntactic categories would be more likely to yield matches. This however moves away from the notion of common contextual definitions and towards a structured declarative definition that has already been explored in systems such as J<sub>A</sub><sup>PE</sup>.

## 8.6.2 Statistical Methods

It was hoped that WISCRAIC would use statistical methods to derive the list of nouns constituting the context of the professions, rather than using the questionnaire method we eventually opted for. A number of methods were considered, including one technique which uses the notion of “seed sets” developed by Marco Carvalho and a system called Latent Semantic Analysis (LSA). Statistical methods require a huge body of texts to be analysed and often use techniques such as co-location measures to determine, for example, the suitability of a word in a given context.

In order to establish if LSA would serve our purposes, words were submitted to the system through its web interface. We tested to see if the word “bough”, a homonym of “bow” from the idiom “take a bow” shared context with “lumberjack”.

The results of the search are shown in Table 8.1

The results are rather surprising. “Bough” and “lumberjack” do match on “tree” so WISCRAIC could use this information to produce the joke, “The flamboyant lumberjack took a bough”.

However, there is also the rather obscure match on “capsizing” and “freighted”. It would take some rather complicated and undoubtedly confusing (not to mention computationally intractable) explanation on the part of WISCRAIC, to justify the

<i>Word Entered</i>	<i>Context Vocabulary Returned</i>
<i>bough</i>	pettishly, tree, crotch, boughs, willow, oak, trunk twigs, tunneled, freighted, capsizing, squirrel, twitter branches, middays, twig, blotted, souging, limb
<i>lumber jack</i>	gloveless, clenches, blares, inkslinger, conrad, decontaminated, tree, moosewood, says, dimpling, freighted, capsizing, spruce, patronising, moccasin, boots, grabs, latrine, snowshoe

Table 8.1: LSA context using “Near Neighbours Method” (general reading up to 1st year college)

link. For this reason, as well as the fact that some other common word tests refused to yield any match at all, it was decided that LSA could not be reliably used in the development of WISCRAIC.

However, the fact that there was the match on “tree” suggests that perhaps some filtering could be applied, or changes made to the method used to derive the context, which would result in more applicable results.

### **Considerations when using Statistical Methods**

By using statistical methods only, it may be possible to produce witticisms, but the following points must be considered:

- the link between the substitute noun and the protagonist may be tenuous
- a link may not exist when intuition says it should
- the richness and range of jokes is limited
- explanations cannot be provided

If statistical methods were used, the semantic and syntactic categories which are currently provided in the hand-built lexicon would not be provided with the consequence that the sub-class of jokes using this method could no longer be produced.

More importantly, without this information it is impossible to generate an explanation of the links between words. It is difficult to imagine that any statistical method could provide such information.

It is important then that a combination of methods be used - statistical methods to derive context for the professions and a dictionary such as Wordnet to provide the definitions of the nouns found as homonyms of words in the idioms - this would allow a system to produce a rich combination witticisms with explanation and J<sub>A</sub><sup>PE</sup> type jokes.

## 8.7 Possible Extensions and Improvements

WIS<sub>CRAIC</sub> could be improved in a number of ways:

- the program could be developed to use statistical methods for determining context
- the program could be adjusted to use online dictionaries such as Wordnet as lexical resources
- the constraints which specify how to match nouns to professions could be made tighter
- the type of jokes produced could be extended

As we have seen, statistical methods have drawbacks, but also advantages. If a suitable system were developed (or an existing system adjusted) it could be used by WIS<sub>CRAIC</sub> to determine context for a wide range of potential protagonists, not

only professions.

If the system using statistical methods were combined with an online resource such as Wordnet, rules could be developed which would allow WISCRAIC to expand the type of witticism it creates (perhaps to exploit common stereotypes, information about which could probably be derived online also).

We have said that the lack of constraints on profession choice is a potential problem if the system were scaled up. Solutions include taking a measure of co-location for a given noun and profession. Professions with higher co-location scores could be chosen over others.

We have already said that WISCRAIC's design allows it to handle any verb phrase. This could possibly be developed so that the system could produce jokes which were not simply one liners. Perhaps a stereotypical situation based on a character or profession could be set up in an initial sentence. A second sentence would then use a pun of some type to alter the initial interpretation of the first clause.

Another possibility would be to exploit syntactic or morphological ambiguity rather than phonological.

## **8.8 Summary**

In this chapter we have examined the significance of the results of the evaluation as well as highlighting limitations of the program and avenues for further research.

We have seen that:

- 3 of the original hypotheses have been retained.

- the other 2 were not rejected but the evidence was not strong enough to confirm them either.
- a limited evaluation seems to suggest that the explanations did aid understanding and promote learning
- a lack of constraints on some of WIS<sub>CRAIC</sub>'s mechanisms mean that jokes are prone to tenuous links. This would become more apparent if the system were scaled up to use online rather than hand-built methods.
- a combination of WIS<sub>CRAIC</sub>'s notion of deriving meaning from context and the syntactic rules of J<sub>A</sub><sup>PE</sup> could feasibly produce a powerful and diverse joke production system.

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# Appendix A

## Psycholinguistic Terms Defined

(The following information is taken from the MRC psycholinguistic database)

### BROWN-FREQ

This stands for the frequency of occurrence in verbal language derived from the London-Lund Corpus of English Conversation by Brown (1984). There are 14529 entries for 8985 different strings in the WORD field. The range of entries is 0 - 6833 with a mean of 35 and a standard deviation of 252.

### FAM

This stands for 'printed familiarity'. The FAM values were derived from merging three sets of familiarity norms: Pavio (unpublished), Toglia and Battig (1978) and Gilhooly and Logie (1980). The method by which these three sets of norms were merged is described in detail in Appendix 2 of the MRC Psycholinguistic Database User Manual (Coltheart, 1981a). This method may not meet with everyone's approval. FAM values lie in the range 100 to 700 with the maximum entry of 657, a mean of 488 and a standard deviation of 99: note that they are integer values (in the original norms the equivalent range was 1.00 to 7.00).

### CONC

This is concreteness, and it too is derived from a merging of the Pavio, Colerado, and Gilhooly-Logie norms: details of merging are given in Appendix 2 of the MRC Psycholinguistic

Database User Manual (Coltheart, 1981a). CONC values are integer, in the range 100 to 700 (min: 158; max 670; mean 438; s.d. 120).

The measure that adjectives are selected on is imageability which is derived from merging the three sets of norms referred to above, and having values in the range 100 to 700 (min 129; max 669; mean 450; s.d. 108).

#### AGE

This is age of acquisition from the norms of Gilhooly and Logie (1980), multiplied by 100 to produce a range from 100 to 700 (min 125; max 697; mean 405; s.d. 120).

# Appendix B

## Questionnaire Instructions

Hello!

Thanks for offering to help out with my experiment - this questionnaire should only take a few minutes of your time.

Your job is to be a joke-judge.

You will be asked to 'judge' jokes and witticisms based on idioms, common phrases and other common classes of words such as 'foods' and 'events'.

The instructions on how to judge are below.

Just hit 'reply' on your e-mail software and include the original text to fill this in.

Thanks,  
Justin

### INSTRUCTIONS

=====

How to fill in the questionnaire

-----

There are 10 pieces of text below. You have to judge whether or not they are jokes.

For each you consider to be a joke, you have to give 2 ratings - one for funniness, one for cleverness (scales to use are outlined below).

Also, for some of the texts you consider to be jokes, could you please give a brief outline of the semantic links (connections between meanings) you feel are necessary to explain the joke. In other words, if you had to explain to a non-native speaker of English why a given sentence or joke is witty / funny what would you say ? Only the essentials are important - clear, concise wording or diagrams are acceptable.

Please feel free to add your own comments or observations at any point in the questionnaire, be they of a general nature or related to a specific joke.

#### Joke Rating Scale

-----

O - Obscure - I'm not familiar with certain words used.

S - Not a joke - simply a regular sentence.

N - Nonsense - doesn't make any sense.

V - Recognisably an attempt at a joke but doesn't work as a joke for some reason.

NOTE: Jokes rated O,S,N or V do not get a funniness or cleverness rating.

J - This is a joke

All jokes which you mark 'J' should be given a funniness score and a cleverness score.

#### Funniness Scale

-----

1 - not funny in the slightest.

2 - mildly amusing.

3 - funny.

4 - really funny.

5 - oh please...no more - it's too much!

Cleverness Rating Scale

-----

- 1 - obvious - minimal thought required
- 2 - had to think a little
- 3 - took some working out
- 4 - took quite a bit of working out
- 5 - really clever

Please enter the rating in the brackets '[']' associated with each measure.

**\*\*Example 1\*\***

Q. Where do jam-makers live?  
A. In Jamaica

Joke Rating [J]  
Funniness Rating [2]  
Cleverness Rating [2]  
Explanation -->

**\*\*Example 2\*\***

Q. Where do chickens live?  
A. In Jamaica

Joke Rating [V]  
Funniness Rating []  
Cleverness Rating []  
Explanation -->

**\*\*Example 3\*\***

The pregnant widow had mourning sickness !

Joke Rating [J]  
Funniness Rating [3]  
Cleverness Rating [3]  
Explanation -->

- a pregnant woman can have 'morning sickness'
- a widow mourns
- 'morning' sounds like 'mourning'

=====

Let's Begin !!

Please read the texts attached below, and judge each according to the rating information above.

# Appendix C

## Sample Questionnaire

1. Q. What does a ghost celebrate ?  
A. ghoultime !

Joke Rating            []  
Funniness Rating    []  
Cleverness Rating []  
Explanation -->

2. Q. Who kneaded dough ?  
A. The insolvent baker!

Joke Rating            []  
Funniness Rating    []  
Cleverness Rating []  
Explanation -->

3. The proud King gave the woman a heart attack !

Joke Rating            []  
Funniness Rating    []  
Cleverness Rating []  
Explanation -->

4. The deer-keeper broke the woman's heart !

Joke Rating            []  
Funniness Rating    []

Cleverness Rating []  
Explanation -->

5. Q. Who had his whey with the woman ?  
A. The lusty dairy-farmer !

Joke Rating []  
Funniness Rating []  
Cleverness Rating []  
Explanation -->

6. The strong fisherman showed the woman his mussels !

Joke Rating []  
Funniness Rating []  
Cleverness Rating []  
Explanation -->

7. The obliging dairy-farmer met the woman half way !

Joke Rating []  
Funniness Rating []  
Cleverness Rating []  
Explanation -->

8. Q. What does a chilly chef make ?  
A. raspberry cool !

Joke Rating []  
Funniness Rating []  
Cleverness Rating []  
Explanation -->

9. The hilarious comedian took a bow !

Joke Rating []  
Funniness Rating []  
Cleverness Rating []

Explanation -->

10. The friendly chicken-farmer gave the woman a wring !

Joke Rating []

Funniness Rating []

Cleverness Rating []

Explanation -->

That's it! Thanks again.

Justin

# Appendix D

## Sets used in Evaluation

The group and type of text is easily understood from the code that was used to write the questionnaire generator. It has been left in that format.

Text-Types are as follows:

witty = witticism

qawitty = question-answer format witticism

normal = normal use of the idiom

suggested = semantic links but no substitution

substitution = substitution made, but no supporting semantic links

Text-Type(JokeGroup,"Joke").

witty(1,"The obliging dairy-farmer met the woman half whey !").

witty(1,"The considerate dairy-farmer met the woman half whey !").

qawitty(1,"Q. Who met the woman half whey ?\n A. The obliging dairy-farmer !").

qawitty(1,"Q. Who met the woman half whey ?\n A. The considerate dairy-farmer !").

normal(1,"The empathetic boss met his employees half way !").

suggested(1,"The obliging dairy-farmer met the woman half way !").

substitution(1,"The strong policeman met the woman half whey !").

missingadj(1,"The dairy-farmer met the woman half whey !").

witty(2,"The friendly gardener had thyme for the woman !").

witty(2,"The obliging gardener had thyme for the woman !").

witty(2,"The considerate gardener had thyme for the woman !").

qawitty(2,"Q. Who had thyme for the woman ?\n A. The friendly gardener !").

qawitty(2,"Q. Who had thyme for the woman ?\n A. The obliging gardener !").

qawitty(2,"Q. Who had thyme for the woman ?\n A. The considerate gardener !").

normal(2,"The patient teacher had time for the pupil !").

suggested(2,"The friendly gardener had time for the woman !").

substitution(2,"The sad baker had thyme for the woman !").

missingadj(2,"The gardener had thyme for the woman !").

witty(3,"The magic king vanished into thin heir !").

qawitty(3,"Q. Who vanished into thin heir ?\n A. The magic king !").

normal(3,"The mysterious man disappeared into thin air !").

suggested(3,"The magic king vanished into thin air !").

substitution(3,"The haughty doctor vanished into thin heir !").

missingadj(3,"The king vanished into thin heir !").

witty(4,"The cruel deer-keeper broke the woman's hart !").

witty(4,"The bastard deer-keeper broke the woman's hart !").

witty(4,"The callous deer-keeper broke the woman's hart !").

qawitty(4,"Q. Who broke the woman's hart ?\n A. The cruel deer-keeper !").

qawitty(4,"Q. Who broke the woman's hart ?\n A. The bastard deer-keeper !").

qawitty(4,"Q. Who broke the woman's hart ?\n A. The callous deer-keeper !").

normal(4,"The charming playboy broke the woman's heart !").

suggested(4,"The cruel deer-keeper broke the woman's heart !").

substitution(4,"The beautiful nurse broke the woman's hart !").

missingadj(4,"The deer-keeper broke the woman's hart !").

witty(5,"The flamboyant lumberjack took a bough !").

witty(5,"The flamboyant monkey took a bough !").

witty(5,"The entertaining lumberjack took a bough !").

witty(5,"The entertaining monkey took a bough !").

qawitty(5,"Q. Who took a bough ?\n A. The entertaining monkey !").

qawitty(5,"Q. Who took a bough ?\n A. The flamboyant monkey !").

qawitty(5,"Q. Who took a bough ?\n A. The entertaining lumberjack !").

qawitty(5,"Q. Who took a bough ?\n A. The flamboyant monkey !").

normal(5,"The hilarious comedian took a bow !").

suggested(5,"The entertaining lumberjack took a bow !").

substitution(5,"The angry teacher took a bough !").

missingadj(5,"The lumberjack took a bough !").

witty(6,"The dominant dairy-farmer had his whey with the woman !").

witty(6,"The horny dairy-farmer had his whey with the woman !").

witty(6,"The lusty dairy-farmer had his whey with the woman !").

qawitty(6,"Q. Who had his whey with the woman ?\n A. The lusty dairy-farmer !").

qawitty(6,"Q. Who had his whey with the woman ?\n A. The dominant dairy-farmer !")

qawitty(6,"Q. Who had his whey with the woman ?\n A. The horny dairy-farmer !").

normal(6,"The nagging woman had her way with the shopkeeper !").

suggested(6,"The horny dairy-farmer had his way with the woman !").

substitution(6,"The desperate deer-keeper had his whey with the woman !").

missingadj(6,"The dairy-farmer had his whey with the woman !").

witty(7,"The surprising deer-keeper gave the woman a hart attack !").

witty(7,"The shocking deer-keeper gave the woman a hart attack !").

witty(7,"The scary deer-keeper gave the woman a hart attack !").

qawitty(7,"Q. Who gave the woman a hart attack ?\n A. The scary deer-keeper!").

qawitty(7,"Q. Who gave the woman a hart attack ?\n A. The shocking deer-keeper!").

qawitty(7,"Q. Who gave the woman a hart attack ?\n A. The surprising deer-keeper!").

normal(7,"The loud bang gave the man a heart attack !").

suggested(7,"The scary deer-keeper gave the woman a heart attack !").

substitution(7,"The proud King gave the woman a hart attack !").

missingadj(7,"The deer-keeper gave the woman a hart attack !").

witty(8,"The strong fisherman showed the woman his mussels !").

witty(8,"The vain fisherman showed the woman his mussels !").

qawitty(8,"Q. Who showed the woman his mussels ?\n A. The vain fisherman!").

qawitty(8,"Q. Who showed the woman his mussels ?\n A. The strong fisherman!").  
normal(8,"The handsome actor showed the fans his muscles !").  
suggested(8,"The strong fisherman showed the woman his muscles !").  
substitution(8,"The stupid chimney-sweep showed the woman his mussels !").  
missingadj(8,"The fisherman showed the woman his mussels !").  
  
witty(9,"The hospitable gardener showed the woman a good thyme !").  
witty(9,"The rambunctious gardener showed the woman a good thyme !").  
qawitty(9,"Q. Who showed the woman a good thyme ?\n A. The rambunctious gardener !  
qawitty(9,"Q. Who showed the woman a good thyme ?\n A. The hospitable gardener !")  
normal(9,"The friendly guide showed the tourists a good time !").  
suggested(9,"The hospitable gardener showed the woman a good time !").  
substitution(9,"The scary chicken-farmer showed the woman a good thyme !").  
missingadj(9,"The gardener showed the woman a good thyme !").  
  
witty(10,"The helpful dairy-farmer showed the woman the whey !").  
qawitty(10,"Q. Who showed the woman the whey ?\n A. The helpful dairy-farmer !").  
normal(10,"The helpful policeman showed the woman the way !").  
suggested(10,"The helpful dairy-farmer showed the woman the way !").  
substitution(10,"The watchful chef showed the woman the whey !").  
missingadj(10,"The dairy-farmer showed the woman the whey !").  
  
witty(11,"The sleek chimney-sweep wore a cat soot !").

witty(11,"The secretive chimney-sweep wore a cat soot !").  
witty(11,"The stealthy chimney-sweep wore a cat soot !").  
witty(11,"The foxy chimney-sweep wore a cat soot !").  
qawitty(11,"Q. Who wore a cat soot ?\n A. The foxy chimney-sweep !").  
qawitty(11,"Q. Who wore a cat soot ?\n A. The stealthy chimney-sweep !").  
qawitty(11,"Q. Who wore a cat soot ?\n A. The secretive chimney-sweep !").  
qawitty(11,"Q. Who wore a cat soot ?\n A. The sleek chimney-sweep !").  
normal(11,"The careful thief wore a cat suit !").  
suggested(11,"The sleek chimney-sweep wore a cat suit !").  
substitution(11,"The funny lumberjack wore a cat suit !").  
missingadj(11,"The chimney-sweep wore a cat soot !").  
  
witty(12,"The rude chicken-farmer was fowl mouthed !").  
qawitty(12,"Q. Who was fowl mouthed ?\n A. The rude chicken-farmer !").  
normal(12,"The rude children were foul mouthed !").  
suggested(12,"The rude chicken-farmer was foul mouthed !").  
substitution(12,"The intelligent baker was fowl mouthed !").  
missingadj(12,"The chicken-farmer was fowl mouthed !").  
  
witty(13,"The scatty rabbit-keeper was hare brained !").  
witty(13,"Who was hare brained ?\n A. The scatty rabbit-keeper!").  
normal(13,"The mad professor was hare brained !").

suggested(13,"The rude chicken-farmer was foul mouthed !").

substitution(13,"The proud lumberjack was hare brained !").

missingadj(13,"The rabbit-keeper was hare brained !").

witty(14,"The tired chef took the woman for a fool !").

witty(14,"The foolish chef took the woman for a fool !").

witty(14,"The ignorant chef took the woman for a fool !").

qawitty(14,"Q. Who took the woman for a fool ?\n A. The ignorant chef!").

qawitty(14,"Q. Who took the woman for a fool ?\n A. The foolish chef!").

qawitty(14,"Q. Who took the woman for a fool ?\n A. The tired chef!").

normal(14,"The impatient teacher took the student for a fool !").

normal(14,"The short-sighted clerk took the pen for a pencil !").

missingadj(14,"The chef took the woman for a fool !").

witty(15,"The poor baker kneaded dough !").

witty(15,"The desperate baker kneaded dough !").

witty(15,"The insolvent baker kneaded dough !").

qawitty(15,"Q. Who kneaded dough ?\n A. The insolvent baker!").

qawitty(15,"Q. Who kneaded dough ?\n A. The desperate baker!").

qawitty(15,"Q. Who kneaded dough ?\n A. The poor baker!").

normal(15,"The baker kneaded dough !").

suggested(15,"The poor baker needed dough !").

substitution(15,"The proud fisherman kneaded dough !").

missingadj(15,"The baker kneaded dough !").

witty(16,"The poor deer-hunter needed doe !").

witty(16,"The desperate deer-hunter needed doe !").

witty(16,"The insolvent deer-hunter needed doe !").

qawitty(16,"Q. Who needed doe ?\n A. The insolvent deer-hunter!").

qawitty(16,"Q. Who needed doe ?\n A. The desperate deer-hunter!").

qawitty(16,"Q. Who needed doe ?\n A. The poor deer-hunter!").

normal(16,"The poor student needed dough !").

suggested(16,"The poor deer-hunter needed dough !").

substitution(16,"The happy fisherman needed doe !").

missingadj(16,"The deer-hunter needed doe !").

witty(17,"The friendly chicken-farmer gave the woman a wring !").

witty(17,"The predatory chicken-farmer gave the woman a wring !").

witty(17,"The worried chicken-farmer gave the woman a wring !").

qawitty(17,"Q. Who gave the woman a wring ?\n A. The worried chicken-farmer !").

qawitty(17,"Q. Who gave the woman a wring ?\n A. The predatory chicken-farmer !").

qawitty(17,"Q. Who gave the woman a wring ?\n A. The friendly chicken-farmer !").

normal(17,"The concerned woman gave her friend a ring !").

suggested(17,"The friendly chicken-farmer gave the woman a ring !").

substitution(17,"The desperate doctor gave the woman a wring !").

missingadj(17,"The chicken-farmer gave the woman a wring !").

food\_event(21,"Q. What does a chilly chef make ?\n A. raspberry cool !").

food\_event(21,"Q. What does a scary chef make ?\n A. raspberry ghoul !").

food\_event(21,"Q. What does a swimming chef make ?\n A. raspberry pool !").

food\_event(21,"Q. What does a strict chef make ?\n A. raspberry rule !").

food\_event(22,"Q. What does a chilly person celebrate ?\n A. cooltide !").

food\_event(22,"Q. What does a stupid person celebrate ?\n A. fooltide !").

food\_event(22,"Q. What does a scary person celebrate ?\n A. ghoultide !").

food\_event(22,"Q. What does a swimming person celebrate ?\n A. pooltide !").

food\_event(22,"Q. What does a strict person celebrate ?\n A. ruletide !").

food\_event(23,"Q. What does an orgasmic chef make ?\n A. gaspberry fool !").

food\_event(24,"Q. What does a ghost celebrate ?\n A. ghoultide !").

food\_event(25,"Q. What does an inspired chef eat ?\n A. museli !").

food\_event(26,"Q. What does a helpful fruit drink ?\n A. lemonaid !").

food\_event(26,"Q. What does a dying fruit drink ?\n A. lemonaid!").