

Generation of Idiom-based Witticisms to Aid Second Language Learning

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Abstract

In this paper, we discuss a model of simple idiom-based witticisms, which we have implemented on a computer. The resulting program, WISCRAIC (Witty Idiomatic Sentence Creation Revealing Ambiguity In Context) generates jokes by deriving meaning partially from the normal context in which key words appear and partially from humour-independent lexical entries. WISCRAIC also produces explanations of the jokes it creates, with a view to helping second language learners master the idioms that form the basis of the jokes.

After reviewing some of the humour research that is most relevant to WISCRAIC, we look briefly at the motivation for using humour as a tool for language learning, before examining the design of the system itself. Finally we present the results of an evaluation of the system's output by a group of joke judges.

Keywords: Computational Humour, Second Language Learning

1. INTRODUCTION

WISCRAIC (Witty Idiomatic Sentence Creation Revealing Ambiguity In Context) is the implementation of a model of a sub-class of puns, namely simple idiom-based witticisms. The program generates jokes by deriving meaning (semantic associations) partially from the normal context of words and partially from humour-independent lexical entries. The system produces a range of jokes, but focuses primarily on witticisms (question-answer and one-liners) that use phonological ambiguity to create jokes based around pseudo-idioms (idioms altered during the course of joke production).

WISCRAIC also produces explanations of the jokes it creates, with a view to helping second language learners master the idioms that form the basis of the jokes. Although the results of our informal evaluation suggest that users were helped by the system, they are not conclusive, and a full-scale formal evaluation is beyond the scope of this research. WISCRAIC is different from previous methods of producing computational humour not only in its capacity to produce explanations of jokes produced, but also in that it tries to derive meaning implicitly from context, rather than using explicit syntactic and semantic categories. For this reason it does not require a structured lexicon which systems such as JAPE [0] depend upon. WISCRAIC's 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 tested on human joke judges with positive results.

2. HUMOUR RESEARCH

2.1 AMBIGUITY AND WIT

Pepicello and Green [11] hold the common view that humour is closely related to ambiguity. Linguistic ambiguity, the type that we are concerned with in WISCRAIC, 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 [11]

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 '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 [11]

The ambiguity here arises because the question can be parsed in two distinct ways. Under one interpretation, the choice of death is by gorilla or by elephant, whilst under a second, the listener is asked if he would like to be the elephant's victim, or would he prefer that the gorilla were the victim.

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 punch line resolves it in some unexpected way. Although this is true of the question-answer format produced by WISCRAIC,

Q. Who broke the woman's hart?
 A. *The cruel deer-keeper.*

there is no such resolution in the one-line witticisms, as there is no punch line.

The cruel deer-keeper broke the woman's hart!

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 (of the text, or simple reflection on the sentence heard), the ambiguity is revealed and a second interpretation is made possible.

Indeed it could be argued that the ambiguity is never resolved, as both interpretations are equally valid.

2.2 HUMOUR COMPUTATION

Attardo and Raskin put together a simple joke generating system, LIBJOG (Light Bulb JOke Generator) [7], mainly to show how poorly simple cut-and-paste methods work. However, the most significant work in the area of computational humour was carried out by Binsted.

Binsted [1] examined the based the linguistic structure of a class of jokes, namely punning riddles, and devised a set of rules that allow for the production of question-answer riddles. These rules were implemented in a system called JAPE.

The final version of JAPE 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 punch line, rather than the question part of the riddle

A comparison of JAPE and WISCRAIC is given in section 6.

3. HUMOUR AND LEARNING

Minsky's Frame Theory can be applied to linguistic humour, specifically puns, which work by changing the meaning or sense of a word. Minsky believes that a common element to all kinds of humour is “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”[2].

We believe that this frame shifting is of benefit to language learners in that it gives the learner/speaker a way of linking semantic frames, and each connection in the frame network provides another way of remembering a given word, or associated idiom. The good feeling associated with such humorous frame shifting may reinforce and strengthen the connection between words. Even bizarre or tenuous shifts in frame (and possibly logic) may allow a learner to recall a word that cannot be remembered directly.

Research has also been carried out into the use of humour in teaching. This work has shown that humour has benefits in teaching whether it is related to the subject matter or not [4]. There have been no conclusive findings as to whether or not the use of humour aids the learning process. However, research does show that relevant humour actually aids retention [3].

An example of a WISCRAIC witticism and associated explanation is given below:

The friendly gardener had thyme for the woman !

The word time, which is part of the idiom [have,time,for, someone] is a homonym of the word thyme.

A HOMONYM is a word that sounds like another word.

/ LINK | between thyme and gardener :

/ thyme is a type of plant

/ a gardener works with plants

"friendly", which is associated with the idiom [have,time,for, someone] was selected from other adjectives as it has the highest imagability score : 439

By outlining the semantic and phonetic associations underlying the joke, we believe that the system promotes deeper thought about the words being used, introducing new or potentially troublesome (on account of its homonymy) vocabulary in a novel and hopefully memorable way.

4. WHAT MAKES A JOKE?

We will now look briefly 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 that WISCRAIC is designed to produce.

4.1 QUESTION-ANSWER RIDDLES

A riddle is a puzzling (and often misleading) question posed as a problem to be solved.

A sub-genre of riddles, which was addressed by Binsted[1] in the development of JAPE is punning riddles.

A pun consists of using a word in a manner that suggests two or more of its meanings, or the meaning of at least one of its homonyms.

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*

4.2 WITTICISMS

A witticism is a clever and often 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 [12]

“I have had a perfectly wonderful evening. But this wasn’t it.” - Groucho Marx [12]

“Avoid all needle drugs. The only dope worth shooting is Richard Nixon.” – Abbie Hoffman [12]

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 attempt to return a witticism about the named person, searching its existing knowledge bases for the necessary semantic connections.

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 !

5. SYSTEM DESIGN

A common mechanism in jokes that use phonological ambiguity is substitution.

WISCRAIC uses this mechanism to construct a sentence using an altered idiom that 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) that in some way creates a semantic link, through shared context, to the substitute word.

Strictly, an idiom refers to an expression in a given language whose meaning cannot be derived solely from the meaning of the words comprising the expression. 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.

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”.

The set of preconditions that must be satisfied in order for a joke to be produced are as follows:

- There is an idiom A in the idiom database
- There is a word B in the text of A which the word dictionary shows to be a verb or noun
- There is a word E which is a homophone or alternate meaning of B and is defined in the lexicon

- There is a word C, specified as being suitable for use with idiom A, which the dictionary shows to be an adjective
- There is a profession or character D (in the database) which is semantically linked to the substitute E

WISCRAIC 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.

5.1 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 that 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 WISCRAIC.

WISCRAIC's lexicon defines a relation between each word entered as part of a definition for a lexeme and the lexeme itself. For instance, the definition for the lexeme "bough" asserts that the relation *is_part_of_a* holds between "bough" and "tree". The lexemes in this lexicon are the words that are found as homophones for words comprising the idioms. These relations are not used in the construction of witticisms but are used rather to produce the explanations, as shown above.

WISCRAIC's other knowledge sources however contain no such relations. In the profession database, 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 semantic 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 that all information contained in the lexicon, dictionaries and DCG is completely general in nature. In other words it is humour-independent.

5.2 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 ADJECTIVES

5.3.1 The Role of the adjective

The sentence "The lumberjack took a bough" is a valid grammatical sentence, but it also semantic ally 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.

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.

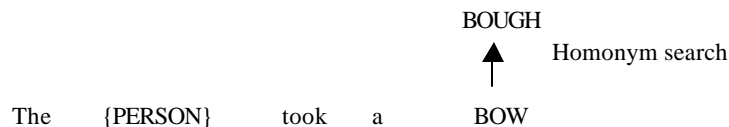
The use of the adjective to suggest the original idiom, and the simultaneous existence of the semantic link between the substituted word and the protagonist of the sentence result in the reader having the simultaneous view that a) the text constitutes a normal usage of the idiom, and b) something is not quite right about that interpretation. In general terms, 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.

5.3.2 Choosing an adjective

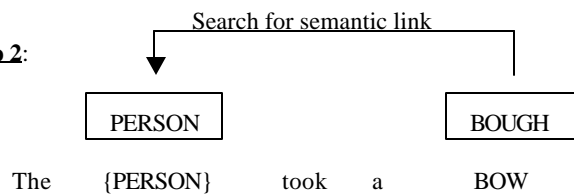
WISCRAIC uses the MRC Psycholinguistic Database to gather information about a number of psycholinguistic indicators for each of the adjectives appearing in the list. The adjective with the highest imageability score is selected first. Upon backtracking, the next highest adjective is selected and so on until the list is depleted. Any adjective appearing in the list that 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.

5.4 WORKED EXAMPLE

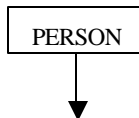
Step 1:



Step 2:

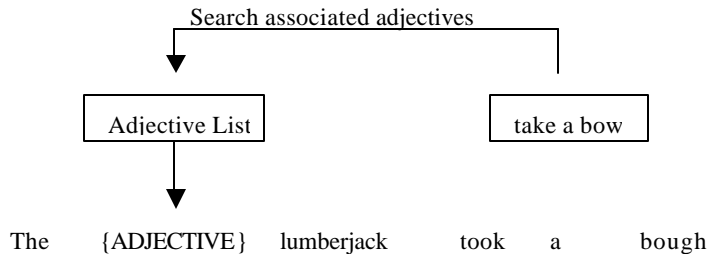


Step 3:

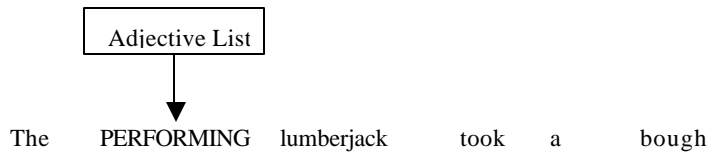


The LUMBERJACK took a BOUGH

Step 4:



Step 5:



6. DIFFERENCES IN THE DESIGN OF JAPE AND WISCRAIC

There are broad architectural similarities between JAPE and WISCRAIC; 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 that 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. JAPE produces a wide range of question-answer punning riddles built around compound nouns and phrases. WISCRAIC on the other hand focuses principally on witticisms based around idioms and some other verb phrases. WISCRAIC also produces a limited range of more traditional question-answer riddles, like JAPE, though the mechanism used is somewhat different.

One important difference between the two systems is that to a large degree JAPE uses explicit syntactic and semantic information to derive jokes whereas WISCRAIC's knowledge is often implicit. WISCRAIC aims to derive meaning from context rather than word definitions. For instance, JAPE 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 JAPE-1, volunteers are quite restricted in how they can define a given word. WISCRAIC uses a more open-ended approach. Only broad syntactic categories such as noun, adjective, and verb are explicitly coded into WISCRAIC. The important element in WISCRAIC 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, WISCRAIC 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 WISCRAIC 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 WISCRAIC'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.

JAPE 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.

7. EVALUATION

Once the development of WISCRAIC's model had been completed and its implementation finished, it was necessary to evaluate its performance.

The purpose of the evaluation was to test whether or not a number of hypotheses hold. The most fundamental question we must answer of course is ``Does WISCRAIC produce jokes ?''

We also wished to determine the factors that contributed 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 WISCRAIC's output.

A further aspect we wished to evaluate is the quality and effect of the explanation generated by WISCRAIC. 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.

Through this evaluation we hoped to show that :

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

7.1 EXPERIMENT DESIGN

The judges' ability to distinguish jokes from non-jokes needed to be checked, so non-jokes were also included in the questionnaires distributed to judges.

Five sets of materials were prepared:

- the WISCRAIC generated jokes.
- the sentences illustrating normal use of the idioms.
e.g. *The mysterious man disappeared into thin air !*
- the WISCRAIC jokes with the adjective removed.
e.g. *The lumberjack took a bough !*
- texts with homonym substitution but no semantic links.
e.g. *The strong policeman met the woman half whey !*
- texts with the original idiom intact but semantic links with a potential, phonetically identical substitute.
e.g. *The strong fisherman showed the woman his muscles !*

Each questionnaire comprised 10 texts to be judged - 6 jokes (set 1 above) and one text each from sets 2,3,4 and 5. It was important that a range of jokes be evaluated and also that the ordering of the jokes, controls and hypotheses-testing texts be varied across the questionnaires. Steps were taken to ensure this were so.

7.2 PARTICIPANTS & PROCEDURE

An initial email asking for volunteer joke-judges was sent to the Masters-level AI and Cognitive Science 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.

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

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, by marking a 'J' in the Joke Rating box. 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 a text is not given a 'J' rating, it must be given one of the following ratings (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.

7.3 RESULTS & DISCUSSION

We now present a summary of the results and how they relate to our original hypotheses (presented in section 7).

- WISCRAIC produces jokes
Confirmed - 84% considered jokes.
- Lower funniness scores for jokes without adjectives
Unconfirmed - 80% considered jokes - slightly higher funniness score than average.
- 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.
- Suggested Jokes thought of as weak jokes
Confirmed - 40% judged 'J' - lower than average funniness rating
- Texts showing normal use of idiom judged as regular sentences
Unconfirmed - just over half judged as regular sentences

A factor that 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.

Although most of the idioms used by the system should be well known to the volunteers, some, such as "wear a cat suit" might 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. CONCLUSION

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, WISCRAIC.

Three of our original hypotheses have been retained. While the other 2 were not rejected, the evidence was not strong enough to confirm them. The limited evaluation carried out seems to suggest that the explanations did aid understanding and promote learning.

A lack of constraints on some of WISCRAIC's mechanisms means 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.

9. CURRENT RESEARCH

Since the development of WISCRAIC, our focus has been on developing and implementing interactive models of humour. These systems are able to learn new semantic relations through user interaction.

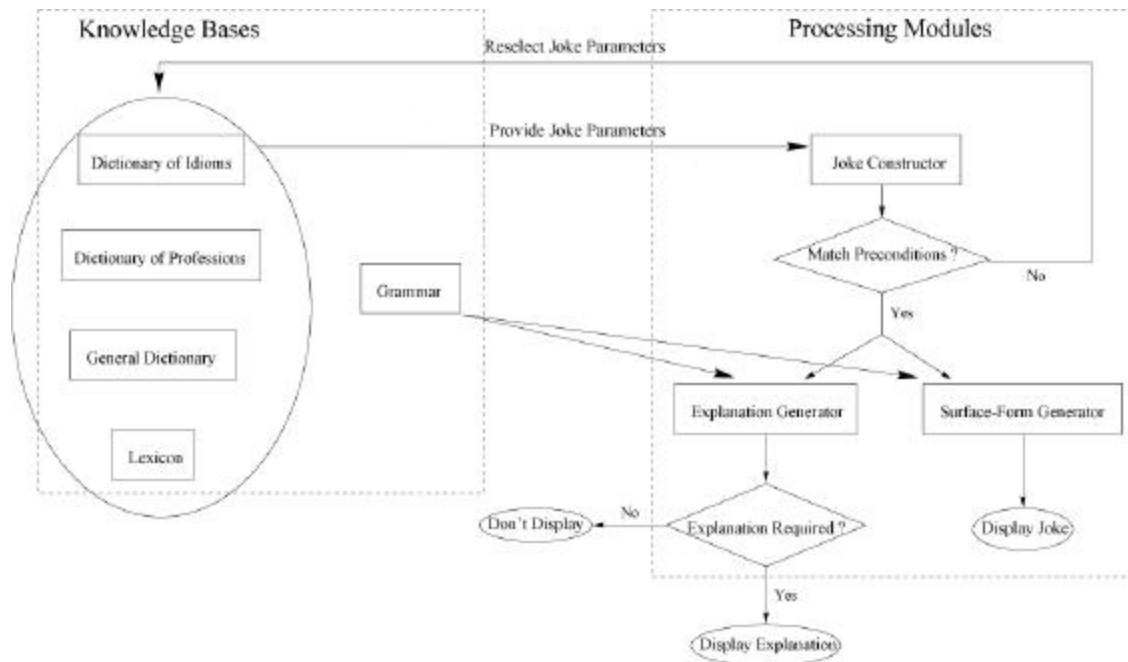
An important part of the interactive process is being able to converse with the system. Consequently, we have concentrated on developing dialogue engines that can introduce jokes (both system and human generated) into dialogue at a contextually appropriate juncture.

Such systems are still in the early stages of development, but progress so far has been encouraging.

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APPENDIX



Information & Processing Flow in WISCRAIC

