

## CALL With Methodical Explanations

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Work on the design of a CALL package for Irish grammar is continuing at the University of Limerick. The CALL system is organised around a dictionary, which has an object-oriented structure. The main dictionary class has a subclass for each part of speech and within each subclass there may be further subclasses. As well as having the methods of higher classes available, each subclass may have its own methods. The methods specify various properties pertaining to inflexion and points of grammar. From these methods, exercises on inflexion and other grammatical points can be generated by the system. The system can offer explanations or directions on how to determine what the particular form of a word or phrase should be. The system should be suitable for a student working alone or as supplementary material for taught courses.

### KEYWORDS

Irish, CALL, explanations, automatic, object-oriented, dictionary

### INTRODUCTION

Work is continuing at the University of Limerick on the design of a CALL system (MacGallóglaiigh *et al.*, 1991, McElligott and Ó Néill, 1993a,b; 1994) on inflection and aspects of Irish grammar. The focus of this paper is on the automatic generation of explanations for the student. The

system is designed around a dictionary, which is object-oriented in organisation (McElligott and Ó Néill, 1993a). The approach is similar in ways to the work of Ide and associates (Ide *et al.*, 1993) and modelled on an approach suggested by Pratt and Adamski (1991). The computer dictionary is based on *An Foclóir Beag* (Roinn Oideachais, 1991).

### DEFINITIONS

Most Irish words are orthographically represented using 18 letters including vowels (Joyce 1920). In The Christian Brothers (1988) the 26 letters of the Roman alphabet are given, with the five vowels being subject to marking. Each letter may be lowercase or uppercase.

Some basic components are shown below:

Alphabet: {a..z,A..Z,á,Á,é,É,í,Í,ó,Ó,ú,Ú}  
% no order is implied by the order of specification

Vowels: {a,á,A,Á,e,é,E,É,i,í,I,Í,o,ó,O,Ó,u,ú,U,Ú}

broad: {a,á,A,Á,o,ó,O,Ó,u,ú,U,Ú}  
and (e follows a)

slender: {e,é,E,É,i,í,I,Í}  
and not (e follows a)

Consonants: Alphabet - Vowels

Other symbols: {',-}

Word:  $L_1L_2..L_m$   $m \geq 1$

%gives a structure for a word

where, for all  $i$ ,  $L_i$  in Alphabet  
 $(C|V)V_1V_2C^*$   
 where  $C$  in Consonants,  $V, V_1, V_2$  in  
 Vowels

Follows e follows a in S if  $S = S1aeS2$   
 where S, S1 and S2 are strings  
 and S1 or S2 may be null.

The primary parts of speech, together with some  
 characteristics, are (Mac Giolla Phádraig, 1963):

parts of speech: {adjective, noun, article, verb,  
 conjunction, adverb, pronoun, exclamation,  
 preposition}

gender: {feminine, masculine}

number: {singular, plural}

case: {nominative, vocative, genitive, dative}

tense: {present, future, past, past habitual}

mood: {conditional, imperative, present  
 subjunctive}

person: {first, second, third, autonomous}

noun: gender, case, number, declension  
 indicator  
 % a noun has a gender, one or  
 more cases, number and a  
 declension indicator

adjective: gender, case, number, declension  
 indicator

article: gender, case, number

verb: tense, mood, person, conjugation  
 indicator, root, verbal noun, verbal  
 adjective

declension  
 indicator:  
 noun: {1,2,3,4,5, irregular, null}

adjective: {1,2,3, irregular, null}

conjugation

indicator {1,2,irregular, defective, copula}

A word within a category may not have all the  
 properties specified for the part of speech, such as,  
 defective verbs and nouns which do not have plurals. For  
 some verbs, there are two forms of a tense, dependent and  
 independent. Other parts of speech also may have a choice  
 of forms for the same set of properties. These particular  
 details are obtained from the dictionary entry for the  
 relevant word and override the general case.

There is also some variation on classifications and  
 naming in grammars and dictionaries (Ó Siadhail, 1989,  
 Stationery Office, 1968, Ó Baoill, 1986), for example, some  
 authors give only four declensions. Although some words  
 have distinct endings for dative case (in current use), for  
 example, *lá* (day) has *lío*, the dative case tends to be one of  
 role. However, there is often initial mutation when a word  
 has the dative role. The accusative case occurs only with  
 certain pronouns. Generally then, the nominative is used in  
 this system for nominative, accusative and dative, but there

are a few entries in the dictionary with a distinct form given for the dative. In the *New Irish Grammar* (Christian Brothers, 1988), the word "common" is used.

In the following is shown the forms and the properties of the article (where the article remains a separate form)

an: feminine, singular, nominative  
 an: masculine, singular, nominative  
 an: masculine, singular, genitive  
 na: feminine, singular, genitive  
 an: feminine, singular, dative  
 an: masculine, singular, dative  
 na: feminine, plural, nominative  
 na: masculine, plural, nominative  
 na: feminine, plural, genitive  
 na: masculine, plural, genitive  
 na: feminine, plural, dative  
 na: masculine, plural, dative

### METHODS

The dictionary is organised in an object oriented manner (McElligott and Ó Néill, 1993a). Part of the class structure is indicated below

#### focal

*methods:* applicable to all words

#### ainmfhocal

*methods:* applicable to nouns

#### briathar

*methods:* applicable to all verbs

#### briathra rialta

*methods:* applicable to all regular verbs

etc.  
 aidiacht  
 etc.

There is a method at the top class for determining if a letter may be lenited and a further method for leniting a word.

Lenitable L:letter  
 L in {b, c, d, f, g, m, p, s, t}

Lenitable Word  
 L2@Word <>h  
 and  
 ((L1@Word lenitable and  
 L1@Word <> s)  
 or  
 (L1@Word = s and L2@Word not in  
 {c,f,m,p,t,v}))  
 % L2@ Word - second letter  
 within the word

#### Lenite

L:letter  
 Lenitable L  
 action : L → Lh  
 not(Lenitable L)  
 action: \_

#### Word

Lenitable Word  
 action: L1L2..Lm → (lenite L1) L2..Lm  
 not(lenitable Word)  
 action: \_  
 % \_ no action required

Other classes can then use the general methods for lenition.

## GRAMMATICAL POINTS

There may be methods associated with a word or set of words or class of words to deal with other grammatical points. Below is shown part of the specification of the effect of the article on the following noun. The part of speech is specified together with the subset of characteristics which apply. The class of the following word upon which the word has an effect is given together with the relevant characteristics. Each condition is specified together with the corresponding action.

The general format for specifying the effect of a word on a following word is

Part of speech<sub>1</sub> {form of word , subcategories}:

Properties<sub>1</sub>

Part of speech<sub>2</sub> {form of word,  
subcategories} : Properties<sub>2</sub>

condition

action: expression

condition

action : expression

:

where properties<sub>1</sub> is a subset of the properties of the part of speech<sub>1</sub> and properties<sub>2</sub> is a subset of the properties of part of speech<sub>2</sub> and properties<sub>1</sub> = properties<sub>2</sub>. Condition is a subset of properties<sub>1</sub>. Expression specifies the actions to be performed on the word (concatenation, removal of endings and so on) and is constructed from methods and Prolog operators, similar to frames (Lucas and Van Der Gaag, 1991).

Specification (partial) of effect of article on following noun

Article: number gender case

Word: noun: number gender case  
singular feminine nominative

action : lenite Word  
singular masculine nominative

action : \_

singular feminine genitive

action : \_

singular masculine genitive :

action : lenite Word

singular feminine dative

action : \_

singular masculine dative

action : \_

% typically the dative  
role would be  
determined by a  
preposition

The methods used for specifying the effect of one word on another can be used in different ways. It can be used to determine the effect the appropriate forms of the words to be used or if a phrase is consistent.

Example:

Given **an bhean** (the woman),

**an:**

feminine, singular, nominative  
masculine, singular, nominative  
feminine, singular, dative  
masculine, singular, dative

**bhean** is not in the dictionary, so the lenition is removed and the word **bean** is found.

**bean:**

feminine, singular, nominative

So the match between the article and the noun is:

feminine, singular, nominative

In the specification of the effect of the article on the noun, the action associated with the feminine, singular, nominative is lenition. When **bean** is lenited it gives **bhean** and hence, matches the given noun phrase. (The effect of prepositions on the noun and the article are separate and take precedence over the article and noun on their own.)

Similarly, given two parts of speech and a required condition, the forms of the words which match the condition can be determined. So, for example, given the article **an** and the noun **fear** (man) and the required condition genitive case singular, the form **an fhir** is generated. The dictionary returns the form **an** of the article and **fir** for the genitive case singular of **fear**. The rule determined by the article noun combination is applied to return **fhir**.

### EXERCISES

The system can generate and correct exercises automatically. The exercises are based on the methods and the grammatical points. So, at the simplest level, there is a method for the lenitable letters. Hence, there is an exercise on lenitable letters. There are various methods for the various parts of speech and so, for example, there are exercises on forming the tenses of the verb. As just indicated in the previous section, there is information on the effect of the article on the following noun and hence, there are various exercises possible.

### EXPLANATIONS

The explanations are obtained by applying the information contained in the methods and grammatical points. A simple exercise is to give the student a word and request the lenited form, for example, **bord** (the lenited form is **bhord**). The student can supply the form or request the system to return the form. In either case, the student can request an explanation. The explanation is determined from the methods:

to lenite **bord**

check

**bord** lenitable

check

L2 = o is not h

and

L1 = b lenitable : L1 in

{b, c, d, f, g, m, p, s, t}

word lenitable

therefore to lenite **bord**

**bord** → (lenite b → bh)

gives **bhord** (applying the  
action specified)

Check corresponds to a condition which must be matched -  
in this instance lenitable Word

In the example of the effect of the article on the noun there is an additional level which requires the consideration of properties. The properties of article and noun which are required are number, gender and case. The total number of properties a part of speech possesses may be greater than the number of properties used in some particular situation. A noun, for example, may also be

categorised as belonging to a declension (although such categorisation is not an essential quality of a noun).

**an fhir**

**an**

the properties to consider are  
number gender and case  
the article **an** matches  
feminine, singular,  
nominative  
masculine, singular,  
nominative

**fhir → fir**

the noun **fir** matches  
masculine, singular,  
genitive  
masculine, plural,  
nominative

the conditions common to  
**an and fhir**

are  
masculine, singular, genitive

with such a match  
the word **fir** is lenited giving **fhir**

(the student can then, of course, request an explanation of "lenited.")

Phrases such as "the conditions common to" are predetermined, the structure of the responses is based on the application of the methods and related material. The system is Prolog based and from the properties of Prolog derive the general workings of the system (Lloyd, 1987, Lucas and Van Der Gaag, 1991).

## SPECIFICATION

Although the style of the specification is formal, it resembles the approach used in grammar books. Hence, it is hoped that it will facilitate the generation of specifications suitable for processing by computer, while allowing the grammarian to use his or her more usual approach.

The explanations also provide a mechanism for testing the specifications.

## SYSTEM USE

The system is developed with different kinds of user in mind. It is hoped that the system can be used by a (determined) student working on his or her own with little or no access to a teacher. It can also be used as supplementary material in taught courses. In a taught course it can serve to give as many examples and exercises as the student needs, without the time constraint caused by the class time. It can also be useful in revision during a course, either at the prompting of the teacher or as the student deems necessary.

## INTERFACE

The system is being developed in a Windows environment, which should facilitate ease of use. The system is intended for use by children (from about ten years of age) or adults.

## RESTRICTIONS

The system can cope with much of inflection, mutation and other grammatical points. However, in some situations to determine whether a word should undergo mutations requires semantic information. For example, on page 15 in *New Irish Grammar* (Christian Brothers, 1988),

is given *lámh duine* instead of *\*lámh dhuine* since the first noun denotes part of a person. The dictionary requires to be extended to include information on semantics to allow for automatic treatment of such cases.

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### *Teaching Forum*

## TEACHING SPEAKING IN THE CELTIC LANGUAGES

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"Sheltered Initiation Language Learning" [SILL] is an innovative initial method for teaching foreign languages, aimed at creating confident and creative speaking abilities. "Its startling methodological assumptions, instructional procedures, and degree of success present a bold challenge to prevalent language acquisition theory." (Marianne Celce-Murcia, ed., 1991, *Teaching English as a Second or Foreign Language*, second edition, Rowley, Mass.: Newbury).

SILL is based in acquisition theory, but its approach, relying on "output" (production) over "input" (comprehension), is opposite to mainstream methods (see "Sheltered-Initiation Language Learning," in *Applied Language Learning*, vol. 4, #1-2, 1993). Instead of "immersing" students in a mass of linguistic data (which they may understand communicatively but possibly not grammatically), SILL presents an orderly sequencing of words and sentence-patterns (and, later, of grammatical detail as well). Learning five or so words at a time in a tightly incremented sequence of short lessons, each focusing on a sentence pattern (starting from "X, please," and moving on, lesson by lesson, to descriptive and narrative sentences), students gradually learn to express given meanings, without wading through masses of input.

Immersion may work well for languages like Spanish (at least when students are able to study for the many hours per week that it requires), but it is not widely practical for Less Commonly Taught Languages. While "immersion weekends" may be wonderful motivators, they are not sufficient to produce true speaking abilities. But speaking is the very definition of "knowing a language" in the mind of