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 (MacGallóigligh et al., 1991, McElligott and Ó Néill, 1993a,b; 1994) on inflexion 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 Íde and associates (Íde 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,â,Á,é,É,i,i̇,ó,Ó,ú,Ú\}
% no order is implied by the order of specification

Vowels: \{a,á,Á,e,e,É,i,i̇,i,ı,ó,ó,Ó,u,u,Ú\}

- broad: \{a,á,Á,o,ó,Ó,u,u,Ú\}
- and (e follows a)

- slender: \{e,é,E,É,i,i,ı,ı\}
- and not (e follows a)

Consonants: Alphabet - Vowels

Other symbols: {\‘,\-}

Word: \(L_1L_2...L_m\) m>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
decension indicator

decension
indicator:

nour: {1,2,3,4,5, irregular, null}

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

conjunction
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 Baoil, 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 ló, 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

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   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 \rightarrow Lh
   not(Lenitable L)
   action: _

Word
   Lenitable Word
   action: L1L2..Lm \rightarrow (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 speech₁ {form of word, subcategories}:
  Properties₁
  Part of speech₂ {form of word, subcategories} : Properties₂
  condition
  action: expression
  condition
  action : expression

where properties₁ is a subset of the properties of the part of speech₁ and properties₂ is a subset of the properties of part of speech₂ and properties₁ = properties₂. Condition is a subset of properties₁. 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

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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 fhír is generated. The dictionary returns the form an of the article and fhír for the genitive case singular of fear. The rule determined by the article noun combination is applied to return fhír.

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.

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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).

\[ \text{an fhír} \]

\[ \text{an} \]

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

\[ \text{fhír} \rightarrow \text{fír} \]

the noun fír matches
masculine, singular,
genitive
masculine, plural,
nomative

the conditions common to
an and fhír
are
masculine, singular, genitive

with such a match
the word fír is lenited giving fhír
(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).

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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
grammarians 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,
motion 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 láimh duine instead of "láimh 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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REFERENCES


"Teaching Forum"

TEACHING SPEAKING IN THE CELTIC LANGUAGES

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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