

Integrating Dialogue within an iCALL Platform for Irish

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Abstract

This paper describes an intelligent Computer-Assisted Language Learning platform for Irish that exploits Irish synthetic voices along with a dialogue system where an avatar functions as a conversational tutor to prompt the learner. Irish is an endangered minority language with many complex linguistic features that are challenging for L1 English speakers. The task focused on is the training of the irregular verbs. The system is currently under development and its main features are described here. The sociolinguistic and linguistic challenges for Irish language teaching are briefly discussed as is the potential impact of the present system.

1 Introduction

This paper describes a dialogue-based CALL initiative where explicit tutoring (form-focused instruction) delivered by an interactive agent is being integrated into a wider iCALL platform. The individual CALL applications described, all of which use the available speech technology of the ABAIR initiative, are prototypes and have undergone initial evaluations. They were originally designed for second level learners but have since been piloted with third level and autonomous learners outside the education system and have been well received.

The general theoretical underpinning motivating this work is that language is a system of communication (Richards & Rodgers, 2001) and that language should be taught using realistic settings and contexts. The creation of meaning-focused activities that promote comprehensible interaction (Long, 1996) has long been the goal in second language acquisition research. The current work seeks to explore how combining a knowledge of the Irish language context and linguistic background with the affordances of interactive

dialogue-based CALL can advance solutions for effective teaching/learning for all learners.

2 The Irish Language Context

Irish has been classified as ‘definitely endangered’ (Moseley, 2010). It is mainly spoken as a community language in pockets in the rural West of Ireland called ‘Gaeltacht’ areas. Although there are many speakers in urban areas it tends to be mostly in individual homes and Irish is relatively rarely overheard on the street. The latest census data shows Gaeltacht areas have a population of 96,090 people (CSO, 2016). Even in the Gaeltacht areas, the language is losing ground. Only 66% of those living in the Gaeltacht indicated they could speak Irish and of that group only 21% reported speaking the language daily (CSO, 2016). As with many minority languages there is no spoken standard, but rather three main dialects. An artificial written standard based on these three dialects was devised and first published in 1958 (*An Caighdeán Oifigiúil*, 2017).

Nonetheless Irish is the first official language in the Republic of Ireland and is a compulsory subject until school leaving age. There are approximately 700,000 learners of Irish in the education system in the Republic of Ireland (Ní Chiaráin, 2014). There are also large numbers in the education system in Northern Ireland and many learning Irish abroad, although these numbers are more difficult to quantify. There are many challenges, particularly in limited access to native speaker models of the language. One of the most common complaints from learners is the fact that they have limited opportunities to interact through the medium of Irish.

3 Speech and Language Technology Development for Irish

Synthesis development has been ongoing for some time as part of the ABAIR initiative (Section 3.1). Work towards the development of speech

recognition systems has begun as part of the ABAIR initiative and is, as yet, at a preliminary stage. Some pilot work is also being done on dialogue systems in the context of CALL. Since recognition systems are not yet available for Irish end-to-end dialogue is not possible. For now, learners can hear the system prompts spoken aloud by an ABAIR voice but must type out their responses, which they can opt to listen to spoken by one of the synthetic ABAIR voices.

3.1 The ABAIR initiative

Multidialect text-to-speech synthetic voices have been developed and voices representing the three main dialects are freely available online at www.abair.ie. The website is used widely, with 155K hits in the first three months of 2019 for example. Education, access, and the documentation and preservation of endangered dialects are core to the initiative. Applications have been built for specific user groups, e.g. a screenreader and multimedia school books for the visually impaired. Next steps involve building voices for the more endangered dialects. We have also focused on piloting educational applications that deploy the synthetic voices and the linguistic components underpinning them. For more general information on ABAIR see Ní Chasaide et al. (2017 & 2019).

Two specific CALL platforms are the focus of the present paper, which to date have been independently implemented, but are now in the process of being refined and integrated.

3.2 *Taidhgín*: the Irish chatbot

The first pilot CALL platform was a chatbot where the learner conversed with a talking monkey. The dialogue partner was developed using AIML (Artificial Intelligence Markup Language) and was hosted on the open source platform *Pandorabots* (2019). The monkey asked the learner questions on topics such as their family, hobbies, holidays, etc. aligned with the Leaving Certificate (school leaving) oral examination curriculum. 11 topics consisting of 3,670 categories were added (Ní Chiaráin, 2014). This was sufficient for *Taidhgín* to respond to the relatively unpredictable questions and responses of the learners in a seemingly intelligent fashion. The response strings were generated based on the AIML matching algorithm finding the most suitable predefined response to the input given by the user. It combined units from the input with its own predefined stored lexicon and output novel utterances.

Corrective feedback was an important core feature and *Taidhgín* corrected (predicted) errors by recasting.



Figure 1: *Taidhgín*

This application was evaluated by 228 students in 13 schools and it was clear both from the content of the logfiles collected and from the researcher's experience in the classroom that it was very successful in engaging the students in a virtual conversation and led them to extend their own language production. For more information see Ní Chiaráin and Ní Chasaide (2016).

3.3 *An Scéalaí*: the Irish iCALL platform

The second platform, which is currently under development, is an iCALL platform which focuses particularly on improving writing accuracy skills, but where the spoken word is constantly centre stage. The name *An Scéalaí* ('the Storyteller') and tagline *tarraingíonn scéal scéal eile* ('one story begets another') refers to the old tradition of storytelling in Ireland and aims to encourage learners to produce their own stories in Irish, continuing that old tradition into a modern idiom. The effectiveness of immediate corrective feedback is a key research area in L2 learning (see Li, 2010) and *An Scéalaí* aims to contribute to knowledge in this area, exploiting different modes (speech and text).



Figure 2: *An Scéalaí* homepage

It is a complex program, which invites the learner to follow a number of steps, as illustrated in Figure 3. These include registration and completing a learner profile with some general information and some linguistic background information.

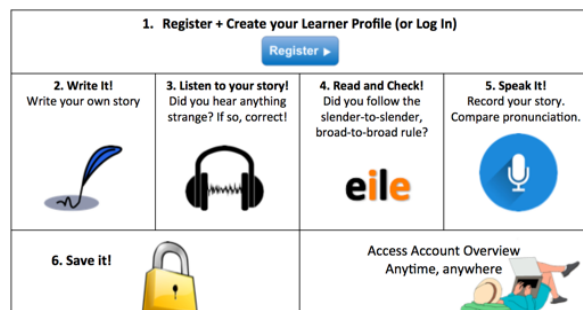


Figure 3: *An Scéalai* steps

Step 2 invites the learner to write their own story. Step 3 involves auditory prooflistening where learners listen back to their story and correct anything that ‘sounds wrong’. In Step 4 they read and correct with text-based NLP prompting. Note that the NLP prompting exploits linguistic components of the TTS system, such as the LTS rules, but also other external tools that are available such as *An Gramadóir*; the Irish grammar checker (Scannell, 2005). In Step 5 learners record themselves reading their story aloud and can compare themselves to a native (synthetic) speaker reading the same material. This audio data is saved in the learners’ account and can be accessed by them at any time. (For more information on *An Scéalai* see Ní Chiaráin & Ní Chasaide, 2019).

3.4 Current Dialogue System Development

Building on the experience with AIML, a new ‘tutorial’ chatbot is currently being developed using RiveScript. This is a plain text, line-based scripting language released under an open source license, which allows easy integration of the ABAIR voices. ‘Trialacha Taidhgín’ (*Taidhgín’s tries/tests*) is the name given to the form-focused exercises within the *Taidhgín* project where it is intended that a suite of topics will be developed.

3.5 Integrating *An Scéalai* & *Trialacha Taidhgín*

The chatbot facility is becoming the conversational agent who does the prompting in the *An Scéalai* platform, which hitherto was done via text prompts. This can be triggered by the level or type of errors in the written text, or the learner can

choose to activate the avatar. The prompts and explanations of what needs to be corrected are then delivered in spoken form as well as through text.

4 Illustration of the current task

The present illustration focuses on a specific learning task, i.e. the conjugation of the irregular verbs of Irish. This section describes the form-focused interactive conversational agent under development and its main pedagogical and technological traits.

4.1 Relevant Linguistic Features

Irish has a number of structural features that differ from most other Western European languages (excluding, of course, other Celtic languages). It is a VSO language, which is morphologically rich and has a complex phonological system. A major feature is the system of initial mutations – lenition and eclipsis – alternations of initial consonants where a voiceless stop goes to a voiceless fricative or to a voiced stop in specific grammatical contexts. Nouns are inflected for gender, case and number, and verbs are inflected for person and tense or mood (Ó Siadhail, 1989). Verbal forms can have as many as 42 inflected forms (Ní Chasaide et al., 2017). Letter-to-sound mappings are complex and there are multiple ways to spell a given sound – c. 177 graphemes (Ó Raghallaigh, 2014) represent about 49 phonemes. The orthography is complex, as will be clear from the example in Figure 4 below.

Tense	Positive	Negative	Translation
past	fuair /fʲ uːə rʲ/ faigheann	ní bhfuair /nʲ iː vʲ uːə rʲ/ ní bhfaigheann	got/did not get gets/does not get
future	gheobhaidh /j oː ʃ/ gheobhadh	ní bhfaighidh /nʲ iː vʲ ai ə nʲ/ ní bhfaigheadh	will/will not get would/would not get
conditional	fuarthas /j oː x/ fuarthas	ní bhfuarthas /nʲ iː vʲ ai x/ fuarthas	was/was not got
passive	fuair /fʲ uːə rʲ ə sʲ/ faigheann	ní bhfuair /nʲ iː vʲ uːə rʲ ə sʲ/ ní bhfaigheann	was/was not got

Figure 4: the verb ‘faigh’ (*to get*)

Irish has 11 irregular verbs which change in unpredictable ways for the different tenses and for the positive, negative and question forms, along with the passive form. The conjugation of the verb ‘faigh’ (*to get*) is illustrated in Figure 4. The conjugation of all 11 verbs form the basis of the content being ‘taught’ by the new chatbot.

4.2 Trialacha Taidhgín

In the current implementation the learner is presented with two options, a general quiz and a lesson. The avatar is designed to provide motivational support to the learner. The interaction with the dialogue system is conversational, and the tone is informal and friendly. Instead of correcting errors the chatbot recasts the learners' erroneous input with the corrected version.

The learner can choose to take the general quiz where different ways are used to elicit the verbal forms, including multiple-choice, fill-in-the-blank and yes/no questions. In this large quiz all the verbs and all the verbal forms are included. If the learner chooses to begin here, they will typically soon produce a number of errors, at which point the chatbot interrupts and suggests they take a lesson with a more limited set of materials.

A lesson is provided for each verb in each tense. For a given verb/tense, the material is first presented with examples of each conjugated form. The learner then engages in a number of tasks, such as filling in the gap where the learner must type the appropriate verb form to complete the sentence. The typed version is read aloud by one of the ABAIR voices. To keep the learners' attention, the chatbot (in a different ABAIR voice) gives short, encouraging interjections such as 'maith thú' (*well done*) or 'tá sé agat anois!' (*you have it now!*) or at the end of each subpart asks the learner 'ar mhaith leat leanúint ar aghaidh go dtí an chéad chéim eile?' (*would you like to continue to the next step?*). This task-based approach breaks learning down into manageable steps that guide learners in the completion of a task.

Once the learner is engaged in a lesson, errors lead to further interjections from the chatbot, who prompts the learner to correct his/her material. Once the verbal form in three different sentences has been correctly responded, the chatbot offers the learner the possibility of progressing to the next step, or to stay with the current task, practicing more examples. All materials are presented in random order and so even if the task is repeated it is unlikely they will encounter the same material.

When any subpart has been completed, there is a mini-quiz within the lesson allowing the learner to ascertain their mastery of the material. If there is new vocabulary presented within a particular lesson, the chatbot offers the learner the possibility of linking to an online Irish-English dictionary.

In building the dialogue much emphasis has been placed on the importance of personalised 'chit chat'. A feature of this chatbot interlocutor is that it, from the outset, uses the learner's name. This, and other information from the initial profile learners complete upon registration, allows a degree of personalisation and builds a bond between the learner and the avatar.

5 Discussion and Next Steps

The system, as described, is currently still being developed and it is hoped that evaluations can be carried out early in the coming year. Incorporating the dialogue system into the iCALL platform functions as a motivational hook to engage learners in tasks that would normally be perceived as unbearably boring. It also engages the learners in dialogue (in this case a meaning-focused conversational activity), increasing their exposure to the spoken language, which is particularly critical in a minority language where learners have limited access to proficient speakers. The current approach encourages comprehension practice as well as production practice which is important: results of previous studies show that, given the same grammatical instruction, output-focused practice is more effective than input-focused practice for the development of certain skills (Nagata, 1998). It remains to be seen if the presentation of the material in this form combined with the inclusion of the chatbot encourages learners to undertake such tasks with enthusiasm.

The irregular verbs are only one aspect of Irish structure that learners find challenging. Should initial pilot testing indicate that this is a successful approach, we hope to expand the content and functionality of the chatbot in the near future.

The critical next step for Irish dialogue systems will be the inclusion of speech recognition. Although a fully functioning recognition system for Irish will take some time, the goal is to first work towards limited domain systems, specifically targeting this kind of CALL application. Locating CALL development within the same group which is building the speech technology is an optimal developmental environment. On the one hand it makes the technology available for CALL, creating opportunities for learners to engage with the material in a new way, and potentially making a very real contribution to the wider acquisition and use of the language. On the other hand a dialogue-based CALL platform can offer an ideal testbed for the evaluation of the quality of the speech technology

itself. Furthermore the data gathered from platform use (text initially and later audio) will contribute towards future speech technology and dialogue system development.

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