

Chapter 5

Culture online

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Abstract: *Many Indigenous projects, such as language recording, use existing information technology (IT) resources for cultural sharing on the internet or storing culture on computer systems separate from the web to ensure privacy. However, existing resources are not always suitable for the needs of Indigenous users, and many very creative IT language projects are designed for material in a single language.*

This chapter documents the design of web resources used in the reclamation of the Dharug language of Sydney.¹ We discuss a Web 2.0 framework for the creation of highly interactive websites that allow users to share these teaching techniques or materials between language groups. Such a framework should deal with the issues involved in teaching and learning Aboriginal languages, including the scarcity of speakers for many languages, the need for audio and video materials online, and the complexity of these languages, which requires novel teaching techniques.

We also look at international projects that use technology to support community knowledge sharing spaces. These include engineered interfaces that enable users to physically ‘interact’ with images and computer-generated objects or to use mobile phones to project images and place audio information into the real world, thereby recreating past or future environments. Further, we look at web services that are being used to recreate the community of survivors of recent earthquakes and develop a learning space. Finally, the limited possibilities of existing work on text to speech and speech to text are presented. We relate this work to Australian Indigenous cultural projects and discuss how links might be made, especially with open source software.

Introduction

Indigenous cultural data on the internet is sparse, and much of the existing language knowledge is not easy to distribute publicly. This issue is often a product of the intellectual property and Indigenous protocol concerns involved when non-Indigenous linguists have collected the resources. Also, the language analysis tools available to linguists, such as Audiamus (Thieberger 2006) and ELAN (Crasborn and Sloetjes 2008), are not easy for untrained members of the community to use.

We present online resources that enable Indigenous people themselves to nominate the interface and context of where the knowledge is shared. If this context for the resources can be guaranteed — that is, if access is secure — then the viewing rights to resources can be established directly by the knowledge holder. It is important that the process is not reliant on researchers, as the ways knowledge holders understand the suitable use of information is constantly changing. An example of this is the language site developed by Richard Green, a Darug storyteller from Sydney.²

We also look at international projects that use technology to support community knowledge sharing spaces. These include engineered interfaces that enable users to physically ‘interact’ with images and computer-generated objects, or use mobile phones to project images and place audio information into the real world, thereby recreating past or future environments. Websites are being developed to enable users to recreate communities that existed prior to disasters; for example, by survivors of recent earthquakes (and to develop a learning space for others to engage with communities as they existed). In the final section we present the limited possibilities of existing work on text to speech, and text parsing. We relate this work to Australian Indigenous language projects and discuss how links might be made, especially with open source developments and research projects.

The language of storytelling

This chapter is the result of a journey of the two authors, which intersected many times before their work came together to develop the website to support students and community members learning the Dharug language of the Darug people of Sydney. Richard Green has been searching over many years for information and resources on his language and the history of his people, and has worked with linguists such as Jaky Troy (1994) and Michael Walsh at the University of Sydney to gain a high level of proficiency in a language that was considered dormant, if not dead. Cat Kutay has worked as a technical designer and developer on many engineering and IT projects, and trained users of this technology in Indigenous communities around Australia and the Pacific. She is now working in e-learning, as computing resources are highly flexible and can be redesigned to be appropriate for use by many cultures and

many applications. Green and other language tutors approached Kutay to develop IT resources to share teaching resources, stories and their experiences in language.

IT resources are written in a variety of logical languages based on English, but in order to make training resources more user-friendly we need to adapt them to the language of the user, either Aboriginal English, simplified English, or Indigenous languages. For any online training, a major barrier is language, not only for understanding the training but also for accessing the information on the internet. Computer databases provide a resource to support the many different languages in Australia through storage, analysis and sharing. As a first stage, providing language learning resources in IT seemed an ideal way to involve Aboriginal people in this media, and it is hoped these users will provide the impetus for more web resources that assist in sharing cultural knowledge.

The aim of the Dharug project was to develop a web resource that uses existing open source software to support Green as a language teacher. Most importantly, it had to provide an interactive site for listening to stories, and for Green to upload and link these stories to relevant textual and video learning material.

The Dharug Dalang website was designed as a vehicle for the language story to develop. We used audio and video material provided by Green and others speaking language. We linked these to text that explains the language and gave examples of its use, and we included on the site previous work on the Sydney language by linguists and early colonialists. This included archival material including images of early text-based records of language from the National Library of Australia's Trove website and the State Library of New South Wales. Green also added, in a wiki format, historical information from various sources on the non-Aboriginal settlement of the Sydney area, and the experiences of his ancestors.

The design was to accentuate the flow of language through the site. As a user accesses the front page of the site, they can hear the sounds of individual words and then follow links to further information on different topics of language including plants, animals and country. The site is able to provide this expansion of themes from words and examples to songs because Richard Green is a *Yellamundie*, a storyteller of his people.

The web server translates each page, when accessed, to include links to any uploaded sound files for the word, examples or related song. This allows the site to respond to the user's needs. The system can be used in any language if the database of words is provided; for example, as an export from Miromaa language maintenance software.³

Aboriginal languages are languages of storytelling, though not the modern idea of storytelling, where multiple viewpoints are expressed that may conflict or contradict and where people argue to have their particular version of the story told. Aboriginal languages are languages designed for storytelling as a group, where the storyteller knows where their story fits into the whole and can pass on the story to those who know

the surrounding context. We found from our experience in schools that teaching the Dharug language is not about teaching the grammar and the structure of the language; it is about learning to express your story in the language. From this experience, the structure comes. For example, storytelling is highly poetic. It requires language to be flexible to enable sounds and visions to be presented in a cohesive, coherent and, particularly, a memorable manner, so the hearer can remember and repeat the story.

At the same time, it is acknowledged that all languages have structure and, to reclaim the language, the actual grammar has to be understood while not overly stressed. Green's great ability with languages, the ability to absorb these rules and represent them as a coherent language spoken in story and sung in song, has enabled the reclamation of language in Sydney to advance as far as it has. This focus on storytelling has brought the language to life, and made the site popular among his people and school users.

Teaching language

The Dharug Dalang website was funded by the National Parks and Wildlife Service, and the project was auspiced by the Aboriginal Housing Company in Redfern. It is designed to support the teaching style developed by Green, an approach to language that starts with the country. For example, Green's students live in western Sydney surrounded by Dharug words used as placenames and in slang. This is the vocabulary he starts with in his teaching. Green works in the school system, as well as undertaking some teaching in the community. Hence, his lessons are based around what is done in school, the days of the week, greetings and so on. But he also takes the language out of the classroom to talk about the environment, as his main aim in using and reclaiming the language is to talk about the country and its maintenance.

The website was developed as an open source content management system. This enabled Green to edit textual resources about his language and link these to audio resources that he uploaded using the embedded repository system.

Using the content management interface, we added various resources. We started with a word list database with a simple interface in table format with automated links to sound files, which are saved using the same name as the language word. Green uploaded these files to the repository as he recorded them. Gradually, more and more text items were added as articles on the content management site. These text items were sorted into topics, so that a learner could look at an array of items (under plants, for example) that would deal with individual words, example sentences and the history of plant use in the region.

However, we wanted an emphasis on the sound and how the words are used in language. While the text approach can teach grammar, there is in fact much more to the language than simple grammatical sentences. To support the linking of text and sound, if a sound file exists the main interface provides a mouse-activated link that

plays the sound file of that word. The website was therefore designed around the needs of both the novice user developing the site, and learners who will want to focus on the flow between text and sound that is vital in language learning.

As the site developed, we also realised that history of the people was needed as an integral part of the site. That is, the language, in particular its present near-dormant state, is a result of this history. Also, much of the language that Green was using was about the country and the people as they are now, which is of course very different to the way they were when the language was last used. To discuss this history, we added a wiki site embedded within the content management system.

Finally, we wanted to encourage more users to add material to the site. As learners in the community develop, they can add their contributions and put questions to Green. We embedded a blog system in the site to enable this process, while restricting the addition of language learning material to specially registered users.

All these resources are available for any language group to use. The next site being developed is with Les Bursill for the Dharawal and Dhurga languages of southern Sydney.⁴ When these websites are first registered and installed, there is no content. However, the teaching structure used in one site can be repeated in another, moving from words to sentences to context. In addition, editing the language word and example sentences and uploading sound bites to link to the word will reuse the word database and the pictures already attached. Through this process, it is easy to develop a well-populated site with many interlinked examples.

Perhaps the greatest advantage for language teaching in using Web 2.0 sites, where many users can register to edit and upload material, is the sharing of the work. It is always very tedious for linguists and the speakers assisting them to collect and annotate sound files for the language they are studying (Thieberger 2004). In this way, we hope to encourage language speakers to collect their own material, which will be automatically labelled with the word spelling they use to name their file and then can be linked to any occurrence of that word on the site. This linkage can be made automatic. However, this relies on standardised spelling of words. A non-ideal solution is that the pages written by one speaker will link to his or her spelling of that word, and hence to his or her voice saying that word.

Language context

Aboriginal languages are considered to be highly inflected and complex, hence the teaching of these languages is viewed as requiring understanding of this complexity. However, for the speakers of this language, proficiency comes through the use of the language in context and this has become an important part of teaching these languages. We discuss here the context of the language and how to understand and teach this complexity.

First, the languages are used in storytelling, and this is often conveyed in song or poetry. This requires a language that is highly flexible to enable the retention of

rhythm and sound through different expressions of country and care of country, human relations and so on (Magowan 2001). By practising the language in different contexts, students can become familiar with different options for formatting sentences and structures, rather than learning rules. For instance, they absorb the way syntactic coherence is not created by word order but by inflection of verbs.

Many of the language inflections and irregularities relate to pronunciation. Some sounds are not easy to enunciate when placed together and, as a language ages, elisions increase (Reyes-Rodriguez 2006). When words are used in verse, elision also increases. It is possible much of the inflection results from this poetic use of language, and so should be learned in this context.

Second, the language is for the encoding of the stories of country and it must describe the country in all its detail. As Bradley (2010) says of the Yanyuwa people, the deep introspection and knowledge required to learn and sing the language reflects the effort involved in learning and understanding the complexity of country. The complexity of language may ensure that similar complexity of thought is required when speaking the language. Perhaps an obvious example is how geocentric languages have developed in areas without directional landmarks, such as the sea, so that speakers necessarily use geographical location when giving direction (Deutscher 2010).

Language reclamation in context

We consider an important issue in promoting language reclamation to be an understanding of how the many Australian languages co-existed pre-settlement, and hence the need to reclaim each one within its area. These languages often vary in structure, yet did not develop to dominate each other, nor develop pidgin forms. Presumably these different languages were seen to have different uses or applications. This is important in light of the competition for funding and access to school programs. With the dominance of English, many previously robust Aboriginal languages are succumbing to Kriol (O'Shannessy 2005), a development of concern to linguists and older speakers alike, as the stories in these languages will be lost.

Many dialects of Dharug were used in the Sydney area, and many other languages (none of which was dominant) were shared, both with traders and as people moved through marriage and ceremony among the region's different groups. As the stories of land use and environmental care were told in the local language, visitors to each area would have to learn the local language to understand these stories.

When the level of difference between two languages was great, it was necessary for speakers to explain the meaning of expressions in full detail, retaining a complexity of expression in each language used around the Sydney region. Comparison can be made with smaller European languages that retain much of their complexity of expression. The complexity may be to provide semantic clarity and assist comprehension for novice listeners. European researchers within the Variflex research program, which

looks at variation in inflection, consider how language learning is both affected by and affects inflection (Blom and Geert 2004).

Through the Sydney experience of teaching languages both on and off country, we have found the ability to relate the language to the location of the learner is a much more important factor for long-term learning than the immediate availability of tutors and teaching resources. Green found two supporters for language teaching in Sydney, through a western Sydney school and through the National Parks and Wildlife Service, an organisation concerned with land and environmental preservation, which is greatly enhanced by retrieving the history of land care and environmental change in the area. We are also gathering stories about caring for country for the language site, although many of these will now be told only in English, and hence will have lost much of their descriptive and explanatory detail.

Relating to virtual worlds

We have also researched how we can use virtual worlds in our teaching. There are two ways these can assist in knowledge sharing. Much material that is called knowledge is simply information that will make no sense unless connected to more information, or located in a suitable context. This context can be a virtual world inside the computer, or a virtual world projected onto the real world.

There are interfaces available that enable users to physically ‘interact’ with images and computer-generated objects. People can use an image of an environment and locate information on this model. This may be a Google map or a virtual world such as Digital Songlines.⁵

Mobile phones can also project images and place audio information into the real world, recreating past or future environments. This technology has been employed in a history project at Parramatta (DigiMacq n.d.). We are seeking funding for the development of a storytelling audio and imaging system for mobile phones to be based on the Aboriginal history of Parramatta.

Using existing software frameworks developed to enable organisations to create their own location-based mobile games such as Viking Ghost Hunt (Naliuka et al. 2010), it is possible to insert the voice and images at specified locations for users to encounter as they walk to that location. Such interfaces allow gaming structures, such as when the user answers questions or makes a selection to choose a path through the story.

Online repository of oral history

The next stage of this work is to link more detailed language stories to word examples, and to the location of such stories using Google Maps, for instance. This work relates to shared knowledge repositories where different users can upload material to form a

community narrative (Cronin 2010). By linking knowledge in this manner, we aim to emulate some of the features of the traditional method of storytelling about country (Kutay and Ho 2009), such as the role of different knowledge holders in retelling a story and the different perspectives that are incorporated within group stories.

It is interesting that many people, particularly in Europe, are developing similar web-based services to collect oral histories about special sites. There are various requirements for such websites, and we discuss some here and how they may be applicable to Aboriginal users in Australia.

Live memories at Trento University

This Italian research project (Magnini 2009) provides web resources for communities to collect and link images, text and recordings about places in the past and how they used to be. For instance, after the earthquake in L'Aquila, people in the region wished to develop a site where they could share memories of what their community was like before it was flattened.

Researchers on this project have found that the main obstacle is gaining stories to place on the site, and in this work we consider some of the issues that may arise when seeking contributions to such sites in Australia. It is interesting that the title of this project is reminiscent of the Living Memories tour of New South Wales, which was developed by the State Records Authority of New South Wales to present records of the Aborigines Welfare Board.

Virtual Campfire in Afghanistan

There is a similar need in Afghanistan, where many communities have been wiped out by war and many historical monuments and buildings lost forever, except in people's memories. Initially this project, developed by the Information Systems department at RWTH Aachen University in Germany, was to assist archaeologists planning to work in the region (Klamma 2009). Before going to the site, they could be trained using material collected from people in the area.

The material can be uploaded from mobile phones or edited online. This allows community members to not only view the resources, but also add to them in what is called a 'social software' system. The approach creates what is known as content 'prosumers', consumers and producers in parallel, anywhere and anytime. The aim is to provide more flexibility in content and context to other social data-sharing systems such as Facebook.

The example service called Virtual Campfire (Cao et al. 2010) is a mashup of many services that provide a system of highly interlinked video, audio and text files. A mashup is an important feature of open source development. This is where different, independently developed programs provide different functionality. To create a fully functioning software resource or website, the programmer collects the relevant software and edits each part to fit within the whole, providing a single login to access

all functions, or tools to link items in one interface (like Google Earth) to items in another, such as videos about tagged locations.

In Virtual Campfire these services provide a framework to create, search and share multimedia artefacts across communities using context awareness. The aim of this project is to support the linking of knowledge ‘in the cloud’ (Knorr and Gruman 2008), where knowledge from many sources, and in many media formats, resides on the internet and can harness web links to interconnect a growing pool of knowledge.

Each user can create a new project on the web service provided by Virtual Campfire. A project establishes the theme for a particular knowledge repository, but the various services are available to all projects, so the enhancements developed for one context can be used in another project.

An example of the use of a similar system developed by the same team for mobile sharing of multimedia is a personalised learning environment tool (Cao et al. 2009). This system allows users to share translations and multimedia resources relating to classical Chinese poetry, and offers tools to link users’ translations with text, audio, video and images in an interface that they can view on a mobile phone or the internet. This research shares many of the aims of the work presented in this chapter; namely, providing access for many users so as to improve Dharug translation resources, as well as a variety of content and media formats for the materials available in this learning system.

Application in Australia

We are looking at a similar mashup system for use in Australia. The aim is to reuse existing web services where possible and provide an interface that is user-friendly for novice computer users and accessible for upload by mobile phones. In existing community narrative sites (such as the Clarence River History site⁶) users may elect to create visual links for their stories to other material on the website such as maps.

From previous research into Aboriginal use of the internet (Dyson and Underwood 2006; Kutay 2010), the main issues influencing participation, and hence the number of stories uploaded, are:

- trust — knowledge can be misinterpreted if used out of context, so issues of security, such as the download and sharing of artefacts, are of concern for users
- access — mobile access as mentioned above is vital for many users who lack computer or internet access on a regular basis
- language — the language used on sites to assist users must be simple English, or audio links
- interface — as well as language, the way users can navigate the site, and the relevance to people’s lives of the story themes on the site, will greatly encourage, or discourage, contributions

- relevance — the interface, content matter and approach to material, such as preference for audio over text, tend to make a website more or less relevant and accessible to Indigenous people.

In addition to these points, we found integration or context to be an important issue. To start a story, we need to focus on materials that inspire people to respond. This can provide a context for the materials, which also assists with the issue of trust mentioned above.

Text to speech and speech to text

There are areas of software research that may be useful to the future development of learning sites for Australian Aboriginal languages. These are for the generation of sound examples and the automatic translation of users' examples of language.

The collection of sound files for language words is very slow, even given the open user access provided by the language sites presented in this chapter. This process either involves the annotation of archival tapes, specifying the start and end time of each word that can then be used to link to that word (as used on the Dharawal website) or the recording and uploading of each word separately as used on the Dharug and Wiradjuri (Kutay 2008) websites.

A similar approach was taken on the William Dawes website,⁷ where the designers aimed to include modern-day pronunciation of words alongside the old spelling system devised by Lieutenant William Dawes. However, little material has been made available so far.

Another approach to providing language support is through text to speech synthesis and language translation parsers. Progress in speech to text has been slow. In English this has been mainly due to the irregular phonetics of the language. Work done to support Aboriginal languages using these computer resources was carried out on the Wiradjuri language of central New South Wales, which is being taught in three schools in Sydney.

Wiradjuri speech synthesis

Working with students at the University of New South Wales, we developed a speech synthesis system for Wiradjuri (Wu 2007) using a method called concatenative synthesis. In this method, we put together diphones or pieces of pre-recorded sounds of all the pronunciations of a language and then applied signal processing to synthesise the speech. We used a free concatenative speech synthesis system (the Festival Speech Synthesis System; see CSTR n.d.).

Since Wiradjuri has been written as a phonetic language, where the pronunciation of a word almost completely matches the spelling of the word, it was easy to derive the diphones required to construct each word by concatenation. Therefore, a rule-based

approach is sufficient for covering the vast majorities of the words; if there are exceptions, these words can be explicitly defined inside the lexicon file. Similarly, for intonation pitch we assumed a simple stress on the last syllable for one- and two-syllable words, and on the second-last syllable in all other words except for repetitions such as *birra-birra* (very tired).

The resulting speech formation was fairly mechanical and not considered a suitable tool for school learners. While preferring to use modern speakers, we are still interested in using such an approach as an additional aid for adult learners to verify the sound of the language from written archival material.

Wiradjuri parser

Another project developed with students at the University of New South Wales was a Wiradjuri parser (McLeod 2007) based on Steven Bird's Natural Language Toolkit written in python (Bird et al. 2007). As the name suggests, this program provides a toolkit that is editable for each language. The rules of the language can be coded in to the system, including exceptions, to provide guidance for the word/segment differentiation and phrase translation by the parser.

The Wiradjuri Toolkit design is shown in Figure 1. This system deals only with simple grammar, and provides a literal translation rather than an English expression.

The parser has limited use in schools, as the output is not in correct English format. However, it does provide a very simple translation tool that tutors can use to check their own understanding of the language. As we are dealing with tutors who are often learning the language themselves as part of reclamation work, this type of support is quite helpful.

The language parser has been linked to a Wiradjuri database, which includes sound files for each word, and amalgamated into a tutors' support tool. This tool assists tutors to develop example sentences and worksheets for students in Wiradjuri but can be used in any language if the database is changed (Kutay et al. 2010).

Conclusion

This paper has described the process of development of language learning resources for Australian Indigenous languages. The open source community has provided most of the software used in the projects discussed. When the code has been adapted for the specific applications, this has been made available online for other users, where possible. Also, as the code designed for Indigenous users is developed, it can be made available for further enhancement by the open source community if licence conditions are maintained. It is important that the Australian Indigenous community be given access to these free resources in a format that is useful, and with an understanding that it is the code, and not the data, that is open to editing.

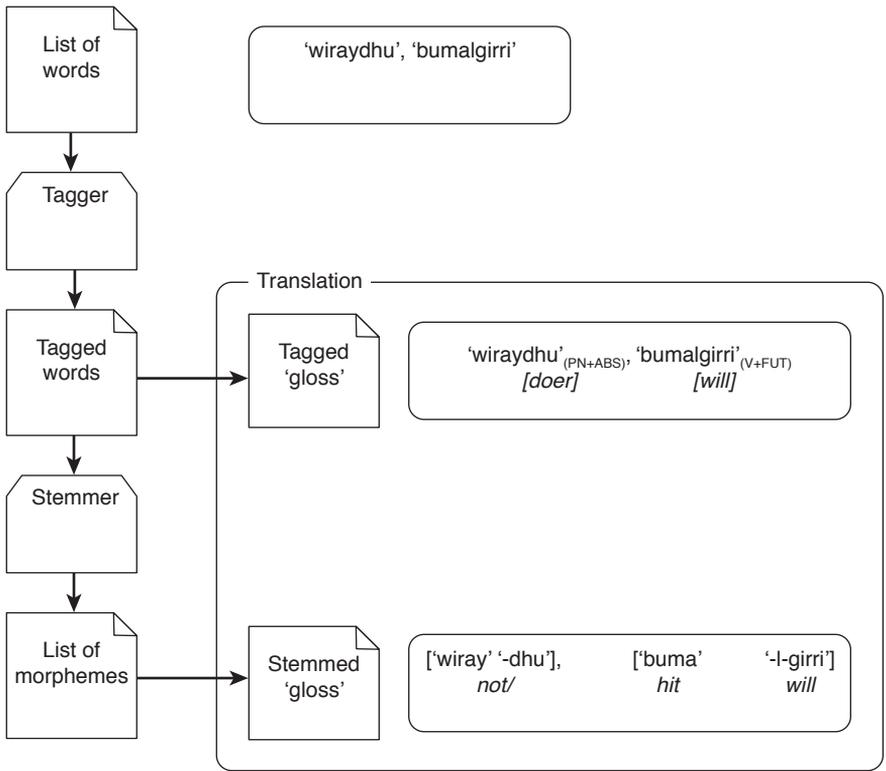


Figure 1: Wiradjuri Toolkit components

In the first instance, however, it is important to clarify the software needs of the users. While code exists for many applications, it may not quite fulfil the expressed needs and computer skills of the users and hence require redesign or redevelopment. Therefore, some funding is still needed to develop the mashups linking different functions that exist in web services or to provide extra enhancements to existing systems.

We believe that IT in its many forms provides an important avenue for language reclamation and cultural exchange for Indigenous people in Australia, and that government departments at all levels should be proactive in supporting the development of relevant software e-learning systems rather than individual language resources written in software. Also, IT provides the opportunity for highly creative use of audio-visual material to make interesting learning environments. In particular the emphasis should be on designs that are flexible and have multiple, rather than single, applications.

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Notes

1. Throughout this chapter ‘Dharug’ has been used to refer to the language and ‘Darug’ to refer to the people.
2. University of New South Wales and Richard Green, ‘Dharug dalang: A collaborative tool for language teaching’, <www.dharug.dalang.com.au> accessed 23 May 2013.
3. See Miromaa Aboriginal Language and Technology Centre, <<http://www.miromaa.org.au/Miromaa/Download-a-Brochure.html>> accessed 23 May 2013.

4. Above n 1 accessed 23 May 2013.
5. The Digital Songlines game engine was developed as part of a digital storytelling project undertaken by the Indigenous Communities Program at the Australasian CRC for Interaction Design (ACID). The engine was developed in collaboration with Cyberdreaming Pty Ltd (see <<http://brettleavy.wix.com/digital-songlines#!>> accessed 16 May 2013).
6. Clarence River History website, <www.clarencriver.teachingforchange.edu.au> accessed 23 May 2013.
7. Available at <www.williamdawes.org>.

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