# MARCS
## Summer Scholarships

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**Project Title 5:** Obstruents in Aboriginal English: link to indigenous languages?

**Supervisory team:** Dr Robert Mailhammer; Dr Paola Escudero

**Contact information for Supervisor:**
Dr Robert Mailhammer (02) 9772 6189 r.mailhammer@uws.edu.au

**Project Description**

This project aims at detecting and ascertaining the influence of Australian Indigenous languages on a local variety of Indigenous English spoken on Croker Island, NT in the area of phonetics/phonology. The goal is to compare Voice Onset Timing in stops between a local variety of Aboriginal English and local Indigenous languages to see whether VOT features are transferred in the contact process, and if VOT patterns from different contact languages are carried over into Aboriginal English as well. Previous work gives reason to hypothesise that obstruents in Australian contact languages, such as Roper River Kriol, exhibit features that are consistent with influence from Indigenous substrate language (Baker et al. 2014). Specifically, voicing contrasts in stops may be realised differently or be absent completely, depending also on the availability of such distinctions in the Indigenous contact languages.

This project aims to test and develop predictions in Baker et al. 2014 for Croker Island Aboriginal English, a contact variety of English spoken on Croker Island. Specifically it will be tested whether speakers of an Indigenous language with a phonological contrast in stop pairs of the same manner and place of articulation (usually a length or fortis – lenis distinction), as e.g. in Kunwinjku, realise the voicing contrast in English different from speakers without such a distinction (if they realise it at all), e.g. as in Iwaidja. Furthermore, it will be tested how participants with different linguistic backgrounds realise the voicing distinction in English fricatives, given that none of the contact languages have fricatives similar to English. Based on the results of Baker et al. 2014, it is hypothesised that speaker background is factor in both cases, and that making a voicing contrast in stops will be more consistently made than in fricatives. The main method to measure the realisation of voicing in Aboriginal English will be determining Voice Onset Time and closure duration (see also Baker et al. 2014). The data for this project will come from an ARC-funded Discovery Project led by the primary supervisor, which investigates grammatical influence of Indigenous languages on Aboriginal English. It will complement the more grammatically-oriented perspective of Discovery Project and give important insights in the fragmented situation of language contact in a multilingual community.

This project will enhance our understanding of how Indigenous languages have shaped English spoken by Indigenous Australians, by uncovering the continuities from the vanishing Indigenous languages and the traces they have left behind. Aboriginal English is used as a feature of identification for Aboriginal people despite being looked down upon by language policymakers and normative policy planners. Linguistically, it will also inform our view of contact linguistics, as it will deepen our
understanding of transfer phenomena in complex language contact in a fine-grained phonetic study.

**Project Aims**

1. measure VOT and closure duration in stops of a sample taken from a corpus of Aboriginal English, Iwaidja and Kunwinjku collected within the Discovery Project “The indigenous grammar of Aboriginal English”
2. compare measurements and patterns to identify matches across languages (and compare against a non-Aboriginal English variety, e.g. from the AusTalk corpus)

**Project Methods**

Measurements will be carried out using adequate software, e.g. Praat. Data will be entered into a database and then statistically compared. The student will be engaged in this process on all levels, i.e. learn to measure VOT/closure duration, data sampling and analysis.

**Opportunities for Skill Development**

It is anticipated that the following skills will be developed in the project. Analytical skills: phonetic analysis, statistical analysis; literature research on contact linguistics for the interpretation, time management and project management skills, independent research and working skills; communication and academic writing.

**Students are required to have the following skills to apply**

At least 2nd year with some phonetic knowledge (e.g. completed unit “Sound of Language”)
Project Title 24: Assessment of a new form of neuromuscular electrical stimulation and miniaturization for wearable implementation

Supervisory team: Dr. Paul Breen; Prof. Lucy Chipchase

Contact information for Supervisor:
Dr Paul Breen, (02) 4736 0507 P.Breen@uws.edu.au

Project Description

Increased cortical excitability has been associated with learning and decreased excitability with impaired learning. Previous work by Prof. Chipchase (Chipchase et al 2011a, 2011b, Schabrun and Chipchase 2012, Schabrun et al 2012) indicates that electrical stimulation causing muscle contraction improves cortical excitability. However, stimulation above this level (i.e. painful stimulation) and below this level (i.e. sensory stimulation) reduces cortical excitability. Thus, an ideal electrical stimulation method to improve both motor strength and control would produce maximal muscular contraction without any painful or sensory perception at the electrode sites.

Coincidently, technology developed by Dr. Breen has the potential to provide exactly this kind of painless motor stimulation (Breen et al 2009). With existing electrical stimulation methods electrical charge builds up across the skin during the stimulation pulse, which is not fully discharged during interpulse intervals. Allowing full discharge during these intervals allows greater charge delivery with reduced pain and greater muscular force output (WO Patent 2,013,069,003). This stimulus paradigm has been used in several successful studies with healthy younger adults (Bîrlea et al 2009, 2014, Breen et al 2012, Corley et al 2012, Broderick et al 2010a, 2010b), patients with orthostatic intolerance (Quinn et al 2011), orthopedic implants (Broderick et al 2010, 2011a, 2011b) and patients with active ulcerations (unpublished).

However, the reduction in pain using this type of stimulation is yet to be fully investigated and documented. Furthermore, the current circuit design does not lend itself to a miniaturized wearable solution, which would be highly advantageous for the practical delivery of this treatment. Substantial advancements have been made in electronic component design since this stimulator circuit was previously built, and as a result this miniaturization for wearable use may now be achieved. This project seeks to address both of these issues.

This work is intended to provide preliminary data for a NHMRC Project grant application in 2015.

Project Aims

The project has two aims:

Aim 1: Investigate of the impact of different neuromuscular electrical stimulus paradigms on perceived pain and muscle contraction force.
Aim 2: Design and build a miniaturized version of the electrical stimulator that is suitable for wearable applications.

**Project Methods**

Aim 1 will utilize a randomized repeated measures design to compare three stimulus paradigms namely, asymmetric biphasic, symmetric biphasic and discharged symmetric biphasic (the paradigm under test). Muscle force generated by the different stimulus paradigms will be measured using a Biodex Computerized Dynamometer. Pain experienced during stimulation will be measured using a visual analog scale. All techniques have proven to be reliable and valid and part of standard physiotherapy practice. However, prior to any muscle testing or exercise program, we will ask participants to complete the Physical Activity Readiness questionnaire to ensure it is safe to do so.

Aim 2 is a primarily involves electronic hardware design and will utilize the waterfall design method. An initial design will have the primary aim of maintaining functionality in the smallest possible single layer footprint. If required, further design iterations will be completed and bench tested. The requirements of the device are small size, low power consumption, capability to generate sufficient slew rate and ultimately the ability to generate the required stimulus paradigms.

**Opportunities for Skill Development**

This is a fantastic opportunity for the selected student. It will give them first hand experience in the development of a medical device, a massive and growing industry. Circuit design skills developed over the course of the program will be of direct relevance to their degree and will demonstrate solid and relevant experience for perspective employers.

The student will gain hands on experience in planning and conducting research. This will be of benefit should they decide to pursue Honours, Masters in Research and/or a PhD.

This multidisciplinary research project requires the student to communicate effectively with others from different backgrounds and with different skillsets. This requires the student to quickly absorb new knowledge/terminology while simultaneously explaining their contribution to non-experts in their field. Individuals with multidisciplinary research experience are few and much sought after. Completion of this project will give the student a great advantage over other graduates.

It is also likely that the student will benefit from being an author on peer reviewed journal publications emanating from this work.

**Students are required to have the following skills to apply**

Electronic circuit design, software design. 2nd or 3rd year student
Project Title 25: Cross-situational learning of minimal pair words

Supervisory team: Dr Paola Escudero; Dr Karen Mulak

Contact information for Supervisor:
Dr Paola Escudero (02) 9772 6493 paola.escudero@uws.edu.au

Project Description

Word learning is a difficult task. When a learner encounters an unknown word, it is not often that the meaning or referent corresponding to the word is explicitly taught. In such cases, the learner is instead presented with an often wide range of possible referents that correspond to the unknown word. However, after multiple experiences with a word, learners can resolve ambiguity in word-referent mappings by tracking the likelihood of candidate referents occurring with presentation of the unknown word. This phenomenon is termed cross-situational word learning (Fazly, Alishahi, & Stevenson, 2010; Fitneva & Christiansen, 2011; Frank, Goodman, & Tenenbaum, 2009; Kachergis, Yu, & Shiffrin, 2012; Vlach & Sandhofer, 2014; Yu & Smith, 2007, 2012; Yurovsky, Yu, & Smith, 2013).

Research has revealed that adult learners can learn words through cross-situational learning (e.g., Vlach & Sandhofer, 2014; Yu & Smith, 2007), and recent work from our lab (Escudero, Mulak & Vlach, in press) has shown that adults can learn even minimal pair words, which are words that differ in only one consonant or vowel sound. Adults learned consonant minimal pairs (e.g., BON and TON) and vowel minimal pairs (DEET and DIT). This supports cross-situational learning as a viable model of real-world word learning, because in the real-world we have to learn words in sufficient phonological detail to be able to tell them apart from other phonologically similar words (e.g., BET vs. DEBT or BEAT).

Following from this experiment, our lab has completed running a study that tests the limits of cross-situational learning and also directly compares cross-situational word learning to explicit word learning by testing adults’ ability to learn minimal pairs in explicit one-to-one word-referent learning trials versus trials that have two to four candidate referents. For this study, the research intern would analyse the eye-tracking and behavioural data collected in this experiment, providing them with an opportunity to become familiarized with both eye-tracking and behavioural methods, and an understanding of how the data between these two methods relate to one another.

In addition, while our previous research (Escudero, Mulak, & Vlach, in press) showed adults can use cross-situational learning to learn consonant and vowel minimal pairs, adults’ performance was comparatively worse for vowel minimal pairs. However, consonant changes between words always occurred at the beginning of words (e.g., BON and TON), whereas vowel changes occurred in the middle of words (DEET and DIT). Thus, we cannot be sure whether adults have more difficulty with vowels, or with changes that do not occur at word onset. For this project, the intern will set up, run, and analyse a behavioural experiment testing adults’ ability to learn minimal pair words in which the consonants occur medially in the word (e.g., ABA, ADA), and vowel changes occur word initially (e.g., OOSHA, ISHA). In particular, the intern will
be responsible for recording and processing stimuli, incorporating stimuli into an E-
Prime behavioural experiment, running participants, and analysing the behavioural
data. Opportunity for oral presentation and/or written publication co-authorship would
be dependent on time and conceptual contribution. This provides a valuable
opportunity to learn the practical and analytical skills crucial to conducting a
behavioural experiment and will prove beneficial for Honours and higher degree
research.

**Project Aims**

1. Directly compare cross-situational word learning to explicit one-to-one
teaching of word-object associations.
2. Test cross-situational learning of minimal pairs with varying degrees of within-
trial ambiguity.
3. Establish whether adults’ relative difficulty in cross-situational learning of word
pairs such as DEET–DIT relative to BON–DON is due to difficulties in
encoding vowel detail or detail of non-initial segments.

**Project Methods**

The cross-situational learning paradigm comprises a learning and test phase, and
will be run on a laptop using E-Prime software. In each trial of the learning phase,
two picture referents appear side-by-side and are named left to right or right to left,
without indication of the order in which the images are named (i.e., participants
cannot figure out which word refers to which image from exposure to a single trial).
During the test phase, participants again see two picture referents on the screen.
They hear four repetitions of the word corresponding to one of the images, and are
asked to indicate via button press whether the word refers to the left or right image.
While the experiment is already set up in our lab, the intern will be responsible for
recording and processing new stimulus words for use in the present study. This will
involve recording our speaker, and cutting and normalizing tokens using Audacity
and/or Praat software, such that they match those used in the previous experiment.
The intern will also incorporate the new stimuli into the E-Prime experiment, and will
be responsible for running participants through the study and processing and
analyzing the collected data.

**Opportunities for Skill Development**

This project will provide the student with a wide breadth of skills necessary for
conducting a research study. Through participation in this project, the intern will
become adept at stimulus planning, recording, and processing, as well as with
running participants in a behavioural task, and analyzing both behavioural and eye-
tracking data. Additionally, this project will familiarize and introduce the student to E-
Prime experimental programming, and if the experiment moves in a timely manner,
there may be scope to develop academic writing and oral presentation skills. In sum,
this project presents the opportunity to master a strong set of research skills that will
compliment future Honours or post-graduate research.
Students are required to have the following skills to apply

This psycholinguistics project would be well suited for a student enrolled in a psychology or linguistics degree (second year or above): Bachelor of Arts (Psychology), Bachelor of Arts (Linguistics), Bachelor of Social Science (Psychology), or Bachelor of Psychology. The intern should also be enthusiastic and detail-oriented, as they will play a major role in stimulus development and data analysis. Knowledge of research design and statistical analyses would be helpful, but not necessary, as that knowledge will be developed as part of the project.
Project Title 26: Social communicative functions of music.

Supervisory team: Assoc Professor Peter Keller; Dr Giacomo Novembre

Contact information for Supervisor:
Assoc Professor Peter Keller (02) 9772 6722  p.keller@uws.edu.au

Project Description

Music is a human communicative art that may have deep biological roots. Long before humans evolved the capacity to sing and dance together in groups, other animals—such as crickets, frogs, and crabs—engaged in synchronous group behaviour. These synchronous displays, produced by males in order to attract migrating females, are termed the 'beacon effect'. Recent research from our laboratory has demonstrated that a similar effect occurs in human musical behaviour. The voices of members of the St Thomas Boys Choir in Germany, one of the world's premier choral ensembles, were recorded with head-worn microphones as they performed a short concert program three times: first with an all-male audience, then with female peers in the audience, and finally with an all-male audience again. The boys in the choir were 12 to 19 years of age, and the female peers were aged 15-16. Acoustic analyses of the recordings revealed that older boys (aged 16-19) increased the energy in a high frequency band (2500-3500 Hz) within the voice's spectrum in the presence of the females. As this frequency band, known as the 'singers' formant', adds brilliance and carrying power to the voice, this finding is consistent with a beacon effect. The current internship project will test how listeners respond to this change in the boys' voices and, specifically, whether listeners are able to detect the presence of female peers from the quality of the voices. Hypotheses will address how the perceived attractiveness of the boys' voices is modulated by the listener's sex and age (adolescents vs. adults). Specifically, it is predicted that females, especially adolescents, will have heightened sensitivity to the enhancement of the singers' formant in the boys' voices. The results will be informative about the communicative functions of music, which is aligned with the research agenda of MARCS.

Project Aims

The aim of this internship project is to investigate listeners' sensitivity to acoustic changes in boys' singing voices that occur in the presence of female peers.

Project Methods

An experiment will be conducted in which short excerpts (10 seconds) of each choir piece from each condition will be played to four groups of listeners: Adolescent females; adolescent males; adult females; adult males. There will be 15-20 listeners in each group. The listeners will be asked to rate each excerpt on several dimensions, including how beautiful or 'attractive' the choir sounds. The student will be responsible for preparing the materials for the experiment (i.e., basic editing of existing audio files), recruiting participants, and collecting and analyzing the ratings data. The supervisors will provide guidance will all aspects of the methods.
Opportunities for Skill Development

1. Data collection
2. Statistics
3. Familiarity with literature relevant for the social origins of music

Students are required to have the following skills to apply

The student will need to be doing a Bachelor of Psychology or BA -Psychological Studies Major to be able to complete project. A strong interest in music is desirable.
Project Title 27: Explaining the native language listening advantage.

Supervisory team: Professor Anne Cutler; Dr Mark Antoniou

Contact information for Supervisor:
Professor Anne Cutler (02) 9772 6684  a.cutler@uws.edu.au

Project Description

Listening to spoken language needs to be highly adaptable. We frequently encounter talkers never previously heard, and have to adjust to speech that is atypical (e.g., foreign accented), or difficult listening conditions (e.g., a poor quality phone conversation). Native speakers are able to cope with such demands very efficiently. However, if listening is language-specific, then it stands to reason that we will listen less efficiently to languages with structure different from that of our native language. This may be an underlying reason for why learning a foreign language proves to be so challenging for some learners. To address this issue, this research project will compare the adaptability of the native language and the second language. Specifically, the project focuses on two languages: English and Mandarin because they differ both in phonetic repertoire and lexical structure. Mandarin-English speaking subjects will be recruited from the subject pool at UWS and will complete two experimental session in which native versus second language adaptability will be assessed.

Project Aims

1. Examine the native-language advantage in listener adaptability
2. Examine listeners’ ability to adapt their second language categories

Project Methods

The methods that will be used in this proposal follow the current best practices in the field of lexical adaptation, which have been pioneered by Prof. Cutler and colleagues. The best method for examining listener-controlled modulation of lexical competition uses eye-tracking and speech clarity manipulation to measure the impact of mismatch on lexical competition. Under such an experimental paradigm, spoken sentences containing critical words are recorded and selected phonemes (but not in the critical words) are replaced by noises similar to those heard on a badly tuned radio. The effect of the noises is to make the listener less confident about the critical words that they are hearing, and reveal the information that listeners attend to as lexical processing unfolds over time.

On each trial, a neutral sentence containing a critical word is heard and four pictures are displayed. For example, “I saw a candle and liked it a lot” may be heard, and pictures of a BALL, HAT, HANDLE and CANDY would be displayed onscreen. From past research, we would expect subjects to look at the pictures of the candy and handle more than the ball and hat because they share the same onset (candle - candy) and offset (candle - handle). In addition, we would expect more looks to candy than handle because more looks go to items beginning like the target than to items ending like it, i.e., the first sound of candle matches candy but mismatches
handle. However, when speech clarity is reduced, for e.g., by adding noise at the onset of other words in the sentence, the beginning-end asymmetry decreases for listeners exposed to such interruptions compared to listeners who hear only clear input, even when there is no noise in the critical words themselves. These findings indicate that native listeners are sensitive to unreliability in the acoustic signal and adapt their lexical processing accordingly. Here, we will investigate if the subjects’ second language differs in its adaptability relative to native language.

**Opportunities for Skill Development**

The student will have the opportunity to be trained in cutting edge experimental techniques by leading researchers in the field of experimental psycholinguistics. The student will be trained in the process of stimulus creation, experimental design, ethical considerations for testing human subjects, subject scheduling and experimental testing, data analysis and interpretation of results, and literature search and manuscript writing. Prof. Cutler will oversee the project to ensure that the aims of the project are met. Dr. Antoniou will supervise the student directly to ensure that all work is completed efficiently and to the highest standard.

**Students are required to have the following skills to apply**

As the research is concerned with spoken language processing, we seek a student who is enrolled in Psychology, Linguistics or a related discipline. Past research experience is desirable. Prof. Cutler and Dr. Antoniou will work closely with the student to develop their expertise in the experimental techniques to be employed, ranging from stimulus development to analysis of data.
Project Title 28: Articulatory constraints on the spontaneous entrainment of speech and manual gesture.

Supervisory team: Dr Gregory Zelic; Dr Jeesun Kim

Contact information for Supervisor:
Dr Gregory Zelic (02) 9772 6813  g.zelic@uws.edu.au

Project Description

Background: It is common to talk and at the same time be moving fingers, hands and arms; such manual gestures contribute to the spoken communication. In a recent experiment, we investigated whether speech and manual gesture interact when what is said and what is gestured are not dedicated to a common communication goal. For this initial experiment, we reduced speech and manual gestures down to their simplest form. Participants had to repeatedly utter a /CV/ syllable (/ba/ or /sa/) while continuously moving their right index finger in flexion and extension. We found that there was spontaneous coordination between speech and finger motion, and interestingly, that such coordination was greater for the /sa/ than for the /ba/ syllables. We proposed that the greater articulatory control required when uttering the /sa/ syllables facilitated the entrainment of the speech (jaw) motion to the finger’s oscillations. This demonstration of an interaction between unconnected speech and manual gesture is important not only for theories of motor control but also for practical situations where people are talking and performing independent manual actions (e.g., driving).

Current Project: We are interested in extending this research by examining whether spontaneous coordination would occur when the speech task is a step closer to that of ‘naturally speaking’. Speaking typically involves more than simply uttering a /CV/ syllable, i.e., it is necessary to combine the speech articulators in different ways, which linguists characterize by the terms place of the articulation in the vocal tract (e.g. bilabial or alveolar) and the manner of articulation (e.g. plosive or fricative). So, in the present project, participants will be instructed to repeatedly utter /CVCV/ syllables while performing a rhythmic motor action. We will manipulate the bi-syllables by varying (1) the congruence of the place of the articulation of the first syllable and the second syllable; and (2) the congruence of the manner of articulation.

Project Aims

The project aims to examine the extent to which spontaneous speech-gesture coordination is affected by different combinations of /CVCV/ syllables.

Project Methods

Task and experimental conditions: the task consists in repeatedly uttering /CVCV/ syllables while performing a rhythmic motor action. Participants will be tested in 3 experimental conditions:
1. The speech task performed alone,
2. The gesture task performed alone,
3. The speech and gesture tasks performed together.
4. Two factors related to the combination of the first /CV/ syllable with the second /CV/ syllable will be manipulated:
5. The congruence of the place of the articulation (same places vs. different places);
6. The congruence of the mode of the articulation (same modes vs. different modes).

The /CVCV/ syllables will be combined from 2 different sets of 4 monosyllables consisting of an alveolar plosive (/ta/ or /da/), an alveolar fricative (/sa/ or /za/), a bilabial plosive (/ba/ or /pa/) and a bilabial fricative (/fa/ or /va/). Therefore a total of 16 different combinations of /CVCV/ syllables will be tested.

Procedure: the manual and speech gestures (jaw and lips motion) will be recorded with the VICON motion capture system. As there is 16 combinations of syllables to test for the speech task, and as we want 2 trials performed per experimental conditions, each participant will perform a total of (16X2)+(1X2)+(16X2) = 66 trials.

Data analyses: the manual and speech gestures will be used i) to determine speech events (that will be the instants of the production of the second syllable), ii) to determine the phase time-series of the gesture oscillatory motion. Finally, the precision of speech-gesture coordination will be indicated by the circular variance of the positions of these speech events in the phase time-series of the gesture oscillatory motion.

The student will be involved to set up each step of the experiment from the set up to the discussion of the results. He/she will be especially trained in using the VICON motion capture system.

Opportunities for Skill Development

This project is well-suited for introducing the student to a laboratory research setting. She/he will learn the basics of behavioural experimentation, perception and production motor research, motion tracking, including specialized skills for analysing motion dynamics. Exposure to a laboratory setting could greatly influence the possibilities that the student considers for future research degrees.

Students are required to have the following skills to apply

There are no pre-requisites but a 3rd year student enrolled in psychology or engineering would be the most suitable. This is because the student will have a first role in recruiting participants, running the experiment and collecting data. She/he will also be involved in some data analysis and the discussion of the results.
**Project Title 29:** Linguistic analysis with Alveo.

**Supervisory team:** Dr Dominique Estival

**Contact information for Supervisor:**
Dr Dominique Estival (02) 9772 6596 d.estival@uws.edu.au

**Project Description**

The Alveo Virtual Laboratory for Human Communication Science, a collaborative project led by UWS, makes it possible for researchers to access a variety of speech and text corpora, such as AusTalk (speech) or AusNC (text and speech), and to analyse these with a range of tools, such as parsers, POS taggers or speech analysers. The proposed project would be an instance of the types of research projects which can be conducted within Alveo. Under the supervision of a MARCS staff member, the student will explore the types of research questions that can be investigated with the tools and corpora available within Alveo, and will choose a suitable research question, e.g. an historical investigation using several text or speech corpora from different time periods, or a phonological comparison across a range of speech data. The student will use the Alveo Virtual Laboratory to set up a workflow to perform the desired analysis with the appropriate tools. The student will then analyse the results and report on the findings. The report may lead to a publication or conference presentation.

**Project Aims**

1. Define a linguistic research project, using the corpora and tools available in Alveo.
2. Create an analysis workflow and perform the analysis for the project.
3. Interpret the results and report the findings.

**Project Methods**

The student will first choose a suitable research question, e.g. an historical investigation using several text or speech corpora from different time periods, or a phonological comparison across a range of speech data. The student will learn how to use Alveo and will set up a workflow to perform the desired analysis with the appropriate tools. The student will then analyse the results and report on the findings.

**Opportunities for Skill Development**

1. Learn to define a linguistic research project.
2. Learn to use a range of computational analysis tools.
3. Become familiar with a variety of speech and text corpora.
4. Learn to create and run an analysis workflow.
5. Learn to interpret analysis results.
6. Learn or improve report writing skills.
Students are required to have the following skills to apply

The student should have taken at least Introduction to Linguistics, and preferably 1 or more additional units in Linguistics or Language Studies.
Project Title 30: Intelligent Interaction in Immersive Environment with Kinect.

Supervisory team: Dr Quang Vinh Nguyen; Prof Simeon Simoff

Contact information for Supervisor:
Dr Quang Vinh Nguyen  (02) 4736 0482   vinh@scm.uws.edu.au

Project Description

Kinect is a motion sensing input device that provides an excellent application development interface (API) for developing interactive voice- and gesture-based applications [1]. Kinect devices have been successfully applied in research and development on possible applications that go beyond the system's intended purpose of playing games, such as in education [2] and medical [3].

Immersive and high resolution workstation has a potential for analysing and manipulating large datasets in the information age. The use of those displays has several advantages compared to ordinary displays, such as presenting a vast amount of detail and context information simultaneously, deploying natural inputs/interactions such as with Kinect device, utilising human visual perception on large amount of information and providing a wow visual experiment on public users.


Project Aims

Although available tracking and gesture recognition algorithms and technologies are moderately acceptable, intelligent interaction with Kinect, particularly in immersive environment, is still limited. This project will design and implement a prototype system that provides intelligence to gesture recognition algorithm. It aims to

1. develop (with possible improvement) a gesture recognition algorithm that provides a robust and effective and interactive system with intelligence
2. integrate human-computer interaction in the immersive environment

Project Methods

This project will be developed on the new ultra high-resolution and multiple-screen system. The immersive platform is enabled by using AMD Eyefinity and HD3D Pro Technologies that supports up to six monitors on enabled graphics card. The system will be built on Windows 64-bits platform and 6 Full large HD LCD 3D screens. The
interaction is enable with the latest Kinect 2 with SDK 2.0. The system will be developed using either C# or JavaScript.

Based on the latest technologies, this project will utilise machine learning method, such as Wu et al’s algorithm [4] for the immersive environment. Based on the histograms of oriented gradient (HOG) and adaboost learning methods, the algorithm is designed to recognize the predefine gesture by tracking the hand trajectory by Kinect.


**Opportunities for Skill Development**

1. Research skills and practice high-end equipment in Human computer interaction in immersive environment.
2. How to use Artificial Intelligence in HCI.
3. Kinect and large high resolution displays.
4. Programming skills with Kinect.

**Students are required to have the following skills to apply**

Strong programming skills with technical and innovative thinking are essential. The project is suitable for computer science student(s) (or comparable).
Project Title 31: Infants' sex-related preferences for real and doll faces vs real and toy mechanical objects: Innate or acquired?

Supervisory team: Dr Paola Escudero; Dr Rachel Robbins

Contact information for Supervisor:
Dr Paola Escudero (02) 9772 6493 paola.escudero@uws.edu.au

Project Description

Previous research has demonstrated that 3- to 10-year-old children exhibit preferences for toys associated with their gender (Pasterski et al., 2005). For instance, 3-year old boys prefer transportation-related toys (e.g. cars) over dolls, whereas girls show a preference for dolls (Connor & Serbin, 1977). Cognitive and learning theories posit that these preferences emerge through modelling and reinforcement, and are driven by a social context that defines gender-appropriate toy preferences. However, biologically-based explanations for these preferences are supported by other studies that reveal sex-related preferences in 6-month-old infants who have had less exposure to gender-based social norms than older children (e.g. Alexander, Wilcox, & Woods, 2009).

The proposed student project is a part of a larger body of research investigating the time-course of the development of sex-related preferences for particular toys. This larger project is a collaboration between researchers at the MARCS Institute (Dr. Paola Escudero), School of Social Sciences and Psychology, UWS (Dr. Rachel Robbins) and the Department of Psychology, University of California (Dr. Scott Johnson). To this date, the key finding from the larger project is that while 4- to 5-month-old infants show a preference for faces (real or doll) over mechanical objects (real or toy), there are no sex-related preferences (Escudero, Robbins, & Johnsons, 2013. This provides support for a socially-driven, and learning-based mechanism for the preferences exhibited by older children. In order to further the research, an investigation into toy preferences in older infants and children is required. Hence, it is proposed that the student would finish the sample of older infants (19-month-olds) that the project has already included as well as testing children (3-5 year-olds) using the experimental protocol applied previously to younger infants. The experiment will be conducted at the MARCS Institute BabyLab and would employ a preference looking-time task concurrently with eye-tracking. Infants and children will be presented with images of female and male faces (real and dolls), and gender-associated mechanical objects (toy and real stoves/cars). The measure of preference will be the looking time to the images. Children will also be presented with the same overt behavioural test presented to adults in Escudero, Robbins & Johnson, 2013.

Project Aims

To investigate older infants’:
Sex-related preferences for mechanical images: real and toy stoves vs. real and toy cars.
Sex-related preferences for faces: real and doll females vs. males.
Older infants’ preferences for images of faces over images of mechanical objects.
**Project Methods**

Nineteen-month-old infants and 3-5 year-old children will be presented with images from four categories: 1) real female/male faces, 2) female/male dolls, 3) real/toy cars, and 4) real/toy stoves. Each trial will consist of an adjacent presentation of two images from two different categories. An attention-getter will be presented prior to each trial in order to draw the infant’s gaze to the presentation screen. Infants will sit on their caregiver’s lap and children will sit on a chair. The chair will be located in front of a table with a computer screen and a Tobii eye-tracker, which will record the infant and children’s eye movements. For the children, their caregiver will be observing the experiment or will stay in the room with the child. From the same adjacent room, the student will control the experiment, initiating each trial once the child’s gaze was fixated on the attention-getter. An experimental session consists of 48 trials, lasting 5 mins in total.

**Opportunities for Skill Development**

This project will offer the student an opportunity to engage in the research process: understanding the theory underpinning the research, exploring and defining the research question, conducting an experiment, organizing and analyzing data, and writing up a paper. The student will also develop knowledge in the field of developmental psychology, and principles of infant testing and eye tracking.

The student will be trained in the MARCS Babylab participant booking system. They will become familiar with the software used to develop the experiment (e.g. E-Prime) and the testing hardware (i.e. Tobii eye-tracker). The student will be extensively trained in the protocol of experimentation with infant participants and will develop valuable and sought-after skills in the set-up and running of an infant and child eye-tracking experiment. They will develop skills in the processing of data extraction and data organization using Microsoft Excel and will gain experience using SPSS for data analysis. In addition, expertise in presenting the research in written and oral form will be developed.

Importantly, the student will have exposure to the MARCS Institute research environment, providing insight into the broad scope of psychological research. They will have the experience of working within a team and will develop important interpersonal and team-based skills.

**Students are required to have the following skills to apply**

It is a requirement that students will be enrolled in Bachelor of Arts (Psychology), Bachelor of Social Science (Psychology), or Bachelor of Psychology. The student will need to complete a NSW Working with Children check. They will also need to provide a vaccination record card with evidence of their current vaccination status. If these vaccinations do not meet the requirement set by the MARCS BabyLab, the student will need to acquire the necessary vaccinations.
Project Title 32: Bodies swinging together during joint musical performance.

Supervisory team: Assoc Professor Peter Keller; Dr Giacomo Novembre

Contact information for Supervisor: Assoc Professor Peter Keller (02) 9772 6722 p.keller@uws.edu.au

Project Description

Joint action - i.e. the ability to coordinate our actions with the actions of others- is a fundamental human ability that requires special forms of cognitive representations. In music, this ability is particularly crucial, as groups of musicians need to align their actions in time in order to produce synchronous performances. Recent research suggests that, in order to accomplish this task, musicians might co-represent the actions produced by their ensemble members by internally simulating these actions. For this purpose, we recently videotaped pairs of pianists performing duets (without seeing each other) across conditions during which the pianists had or had not practiced each other actions. We hypothesized that action familiarity (i.e. having practiced the actions produced by the pianist partner) would lead to higher co-representation. To test this hypothesis, we plan to assess whether action familiarity leads to more spontaneous movement (head or body sway). Furthermore, we want to establish whether the spontaneous movement produced by the two musicians is synchronized. This research has the potential to shed light upon the cognitive mechanisms that regulate group behaviour and social cohesion during shared joint action activities.

Project Aims

The aim of this internship project is to investigate how musicians’ ancillary movements (e.g. head or body sway) tend to synchronize during joint musical performance.

Project Methods

This project will aim at analysing a set of recordings of pairs of pianists performing in ensemble across conditions during which the pianists had or had not practiced each others' parts before the performance. It is hypothesized that action familiarity will lead to an internal action simulation at the partner's performance, which might be reflected in higher inter-personal synchronization of body sway or head motion between performers. The student will be responsible for quantifying the degree of movement from the videos using dedicated software provided by the supervisors, and (statistically) comparing them across conditions. The supervisors will provide guidance will all aspects of the methods.

Opportunities for Skill Development

1. Video analysis
2. Statistics
3. Familiarity with literature relevant for action simulation and joint action
Students are required to have the following skills to apply

The student will need to be doing a Bachelor of Psychology or BA -Psychological Studies Major to be able to complete project. A strong interest in music is desirable.
Project Title 33: Asymmetries in sound perception: Exploring the processes underlying listeners’ perception of speaker, and accent variability.

Supervisory team: Dr Paola Escudero; Dr Josephine Terry

Contact information for Supervisor:
Dr Paola Escudero  (02) 9772 6493  Paola.Escudero@uws.edu.au

Project Description

Despite differences in the acoustic properties of speech across individuals, listeners have an extraordinary ability to understand each other in conversation. For instance, men and women can sound very different from one another, as can speakers with different accents. However, these different speakers are quite adept at comprehending each other. This project explores the possible mechanisms underpinning this phenomenon by investigating between-speaker, between-gender, and between-accent speech perception. It is proposed that listeners use the relative differences in the acoustic properties of two varying speech signals (e.g. between-speaker) to perceive similarity, rather than difference – a process referred to as speech normalization. Infant research has demonstrated that 7.5 month olds can normalize across speakers, highlighting the possibility that the process of ignoring variability is innate. However, it is not yet clear as to whether between-speaker/gender and between-accent variability are driven by the same underlying mechanism. It is also unclear as to whether accent normalization is innate, or acquired via extensive exposure to cross-accent variability. Both behavioural and electrophysiological (i.e. electroencephalography, EEG) measures can be employed to investigate these issues. While a behavioural task (e.g. vowel categorization) can measure the perception of speech sounds (i.e. Dutch vowels) that vary across speaker and accent, electrophysiological measures can highlight the timeframe at which normalization occurs. Using these methods with both infant and adult participants can also address the question of whether normalization of speaker and accent variability is innate or acquired. This student project offers an opportunity for the interested student to choose the method and population that best matches their interests. Subsequently, the student project will involve using either a behavioural or electrophysiological method with an adult or infant population.

Project Aims

1. Demonstrate the capacity of adult or infant listeners to normalize speech across speaker, gender and accent
2. Investigate whether normalization across speaker, gender, and accent is innate or acquired via exposure to speaker/accent variability
3. The EEG study aims to investigate the time-course of normalization of speaker and accent variability: Does it occur at a pre-attentive stage of processing, or at a later post-lexical stage?
Project Methods

**Behavioural method:** For adult testing, a Go/No-Go task will be used. This is a computer-based task during which participants are trained to categorise two vowels spoken by a Dutch speaker. In a test phase, a proportion (20%) of vowels are spoken by a different speaker (same or different gender), or are spoken by speaker with a different accent (same or different gender). Accuracy at categorizing these vowels is a measure of whether or not the speech signal is normalized. A variant of the Go/No-Go task will be employed with infants. In this head-turning procedure, infants are trained to look at areas of a screen associated with particular vowels. In a test phase, looks to these screen locations in response to the same vowels spoken by new speakers with the same or different accents, is an indication of speech normalization. If the student chooses either of these tasks, they will be responsible – under supervision - for setting up the testing session and conducting the experiment.

**EEG method:** EEG measures event-related potentials that are evoked in response to deviant stimuli. Using an odd-ball task, participants will listen to a series of vowels spoken by the one speaker (standards). Infrequently, the vowels will be spoken by a new speaker (same of different gender) or a speaker with a different accent (same or different gender) (deviants). Brainwaves elicited in response to the standards and deviants will be compared. Similarities and differences in these brainwaves indicate the presence or absence of normalization, respectively. This method can be applied to both adult and infant populations. If the student chooses this method, they will be trained in the setting up of the EEG equipment. They will work alongside a research assistant when preparing the participant for testing, and will be responsible for the running of the program used to present the stimuli.

Opportunities for Skill Development

This project will offer the student an opportunity to engage in the research process: understanding the theory underpinning the research, exploring and defining the research question, conducting an experiment, organizing and analyzing data, writing up a paper. The student will also develop knowledge in the field of linguistics and gain an understanding of how to apply psychology research principles and practices to the field.

Specifically, the student will become familiar with the software used to develop an experiment (e.g. E-Prime, Praat, Tobii) and will be extensively trained in the protocol of experimentation with either adult or infant participants. If the student chooses the neurophysiological method, they will develop valuable and sought-after skills in the set-up and running of EEG. They will develop skills in the process of data extraction and data organization using Microsoft Excel and will gain experience using SPSS for data analysis. In addition, skills in presenting the research in written and oral form will be developed.

Importantly, the student will have exposure to the MARCS Institute research environment, providing insight into the broad scope of psychological research. They will have the experience of working within a team and will develop important interpersonal and team-based skills.
Students are required to have the following skills to apply

It is a requirement that students will be enrolled in the second or third year of Bachelor of Arts (Psychology), Bachelor of Social Science (Psychology), Bachelor of Psychology, Bachelor of Arts (Linguistics). If choosing to conduct infant research, the student will need to complete a NSW Working with Children check. They will also need to provide a vaccination record card with evidence of their current vaccination status. If these vaccinations do not meet the requirement set by the MARCS BabyLab, the student will need to acquire the necessary vaccinations.
Project Title 34: Integration of a new analysis tool in the Alveo Virtual Laboratory

Supervisory team: Dr Dominique Estival

Contact information for Supervisor:
Dr Dominique Estival (02) 9772 6596 d.estival@uws.edu.au

Project Description

The Alveo Virtual Laboratory for Human Communication Science, a collaborative project led by UWS, makes it possible for researchers to access a variety of speech and text corpora, such as AusTalk (audio-visual speech), AusNC (text and speech), PARADISEC (speech, music and text) and to analyse these with a range of tools, such as parsers, POS taggers or speech analysers. A number of these tools are made available through the well-established Galaxy Workflow Engine via the Alveo API; others are available on a Virtual machine in the NeCTAR Research Cloud. The proposed project would be an instance of the extensions to Alveo planned for Phase II of the project. Under the supervision of a MARCS staff member, the student will choose one of the tools proposed for inclusion in Alveo and determine the best way to integrate it with the existing platform. For instance, the PCT tool, written in Python, could be integrated into Galaxy using the Alveo API. Examples of other tools of interest include text mining tools such as ‘Voyant Tools’ or TAPoRware’, the music analysis tool ‘NuancesWithMidi’, or the XLE text grammars.

Project Aims

1. Design and implement the appropriate method(s) of integrating one or more tool into the Alveo Virtual Laboratory.
2. Demonstrate the use of the tool(s) within the Alveo workflow.
3. Document the project and produce a final report.

Project Methods

The student will first choose one of the tools proposed for inclusion in the Alveo Virtual laboratory. The student will explore the range of appropriate methods of inclusion and determine the best approach for the chosen tool. The student will then design and implement the method of integration; perform testing and debugging; write the appropriate documentation and produce a final project report.

Opportunities for Skill Development

1. Learn to define the scope of a software engineering project.
2. Learn to collect end-user requirements.
3. Become familiar with a variety of speech and text corpora and of computational analysis tools.
4. Learn to assess the relative merits of different solutions for a specific purpose.
5. Improve programming and software development skills.
6. Learn or improve report writing skills.

Students are required to have the following skills to apply
The student should be in their 3rd year and have programming experience, e.g. in Python or Java.
Project Title 35: Teasing apart different contact languages: Patterns of lenition in Aboriginal English.

Supervisory team: Dr Robert Mailhammer; Dr Paola Escudero Neyra

Contact information for Supervisor: Dr Robert Mailhammer (R.Mailhammer@uws.edu.au)

Project Description

This project aims at detecting and ascertaining the influence of Australian Indigenous languages on a local variety of Indigenous English spoken on Croker Island, NT in the area of phonetics/phonology. The goal is to compare patterns of lenition of intervocalic stops between a local variety of Aboriginal English and local Indigenous languages to see whether these features are transferred in the contact process, and if lenition patterns from different contact languages are carried over into Aboriginal English as well. Previous work gives reason to hypothesise that phonetic realisations of sounds in Australian contact languages, such as Roper River Kriol, exhibit features that are consistent with influence from Indigenous substrate language (Baker et al. 2014). For instance, voicing contrasts in stops may be realised differently or be absent completely, depending also on the availability of such distinctions in the Indigenous contact languages.

This project aims to test and develop predictions based on Baker et al. 2014 for Croker Island Aboriginal English, a contact variety of English spoken on Croker Island. Specifically it will be tested whether speakers of an Indigenous language with a productive pattern of intervocalic stop lenition, as e.g. in Iwaidja, Mawng and Amurdak, show similar patterns of lenition in their variety of Aboriginal English, and whether speakers of languages with different patterns, such as Kunwinjku, carry over these patterns of lenition in their variety of English. This will first of all establish whether patterns of lenition are transferred in the contact process and if so, whether the specific patterns are transferred and in what way. The main method to measure the degree of lenition in Aboriginal English will be determining the manner of articulation of intervocalic stops and voicing to see whether stops have become fricatives, approximants or whether they have been deleted altogether.

The data for this project will come from an ARC-funded Discovery Project led by the primary supervisor, which investigates grammatical influence of Indigenous languages on Aboriginal English. It will complement the more grammatically-oriented perspective of Discovery Project and give important insights in the fragmented situation of language contact in a multilingual community.

This project will enhance our understanding of how Indigenous languages have shaped English spoken by Indigenous Australians, by uncovering the continuities from the vanishing Indigenous languages and the traces they have left behind. Aboriginal English is used as a feature of identification for Aboriginal people despite being looked down upon by language policymakers and normative policy planners. Linguistically, it will also inform our view of contact linguistics, as it will deepen our understanding of transfer phenomena in complex language contact in a fine-grained phonetic study.
Project Aims

1. measure manner of articulation, duration and voicing (and hence the degree of lenition) in stops of a sample taken from a corpus of Aboriginal English, Iwaidja and Kunwinjku collected within the Discovery Project “The indigenous grammar of Aboriginal English”

2. compare measurements and patterns to identify matches across languages (and compare against a non-Aboriginal English variety, e.g. from the AusTalk corpus)

Project Methods

Measurements will be carried out using adequate software, e.g. Praat. Data will be entered into a database and then statistically compared. The student will be engaged in this process on all levels, i.e. learn to determine the manner of articulation, duration and voicing, data sampling and analysis.

Opportunities for Skill Development

It is anticipated that the following skills will be developed in the project. Analytical skills: phonetic analysis, statistical analysis; literature research on contact linguistics for the interpretation, time management and project management skills, independent research and working skills; communication and academic writing.

Students are required to have the following skills to apply

At least 2nd year with some phonetic knowledge (e.g. completed unit “Sound of Language”)