

Project No:	13.2.1		
Supervisor:	Gan Woon Seng (Assoc Prof)	E-mail address:	ewsgan@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Digital Active Noise Control Headsets		
Summary:	<p>This project researches on the integrated approach in designing a noise reduction headset for the audio and communication systems. Conventional passive headset gives good attenuation of ambient noise in the upper frequency range, while most of these devices fail below 500 Hz. Unlike the feedforward method, the adaptive feedback active noise control technique provides a more accurate noise cancellation since the microphone is placed inside the ear-cup of the headset. Furthermore the system uses single microphone per ear cup, thus produces a more compact, lower power consumption, easy to integrate seamlessly with existing playback system, and cheaper solution to form an integrated feedback active noise control (IFBANC) system</p>		

Project No:	13.2.2		
Supervisor:	Gan Woon Seng (Assoc Prof)	E-mail address:	ewsgan@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Wireless Headsets with Localization Features		
Summary:	<p>This project focuses on adaptive source localization algorithms and novel microphone system design, being able to track a moving speaker in a changing acoustic environment. Different techniques are being tested and modified to suit the inclusion in the wireless headsets setting. The first task is to choose an appropriate algorithm for acoustic source localization, and investigate the disadvantages/advantages of the chosen algorithm and of other algorithms. The second task is to design the smart microphone system and investigate the potential application of new microphone system for wireless headsets.</p>		

Project No:	13.2.3		
Supervisor:	Gan Woon Seng (Assoc Prof)	E-mail address:	ewsgan@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Multi-channel Active Noise Control: New Algorithms and Applications		
Summary:	<p>This project is on the development of new algorithms and methods that will handle some of the current unsolved problem in Active Noise Control. It focuses on the study of new psychoacoustical signal processing algorithms that will potentially improve the performance of the current active noise control systems and extend the current application areas. Multiple sensors and sources configuration will also be studied and analyze to apply this new methods to handle 3D active noise control. Extensive objective and subjective experiments are planned for this PhD project that allow further verification of the newly developed methods and algorithms. Finally, this project will require the student to carry out numerical simulation work and applying signal processing algorithms in improving the current system.</p>		

Project No:	13.2.4		
Supervisor:	Gwee Bah Hwee (Asst Prof)	E-mail address:	ebhgwee@ntu.edu.sg
Candidature:	MEng		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Acoustic Noise Suppression Algorithm and Circuit Design		
Summary:	<p>Signal intelligibility in speech communication is very often affected / deteriorated due to the noises in the ambient environment. It is highly desirable to reduce and suppress these noises in order to enhance the communication. This project aims to investigate new acoustic noise suppression algorithm for low power portable speech communication applications. This algorithm will be based on a hybrid concept of combining conventional digital signal processing and soft-computing techniques and with emphasis on low power consideration. The project is digital signal processing and IC design in nature. In this project, MATLAB program will be to investigate the performance of proposed noise suppression algorithm. The candidate will then design the circuit and implement it using VHDL and HSPICE IC design tools to verify its functionality. Finally, the circuit will be synthesised and the power dissipation of the overall circuit will be simulated using Nanosim power analysis tools.</p>		

Project No:	13.2.5		
Supervisor:	Soon Ing Yann (Assoc Prof)	E-mail address:	elysoon@ntu.edu.sg
Candidature:	MEng		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Frequency Extension of Narrowband Speech using Vector Quantization		
Summary:	<p>Narrowband speech refers to telephone quality speech that is bandlimited to 3.4kHz. The lack of high frequencies results in narrowband speech sounding muffled and less clear. The project intends to extend the narrowband speech to wideband speech through spectral extrapolation using Vector Quantization and excitation generation. Various methods of excitation generation will be implemented and evaluated using both subjective and objective measures. Utterances will be taken from the TIMIT database.</p>		

Project No:	13.2.6		
Supervisor:	Soon Ing Yann (Assoc Prof)	E-mail address:	elysoon@ntu.edu.sg
Candidature:	MEng		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Lead Vocal Suppression		
Summary:	<p>Many commercial CD, VCD and DVD players have vocal mute feature for Karaoke purposes. However most commercial systems obtained the output by subtracting the right channel from the left channel. This simple technique however has many drawbacks and does not work in all cases. Most notably when the voice of the lead singer exhibits a phase shift in the left and right channels or recorded in a non -balance way in the left and right channels, the simple technique fails. The project would like to analyse the common problems encountered and come up with a solution to improve on the vocal suppression algorithm.</p>		

Project No:	13.2.7		
Supervisor:	Soon Ing Yann (Assoc Prof)	E-mail address:	eiysoon@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Speech Signal Processing		
Project Title:	Narrowband Speech Enhancement		
Summary:	<p>It is very common for speech signals to be contaminated by additive background noise. For example, speech in a car can be corrupted by various background noise such as wind noise, road noise, engine noise etc. This project will look into the suppression of background noise using filtering in the transform domain. The transform used will be either Fourier transform or the Discrete Cosine Transform. The objective will be to implement a robust noise suppression algorithm that works for various noise types. The issue of musical tonal residual noise commonly left behind by many filtering algorithms will also be examined and resolve using postprocessing techniques. The project will also examine what should be a good objective measure for measuring the quality of an enhanced speech signal that correlates closely to the subjective Mean Opinion Score (MOS).</p>		

Project No:	13.2.8		
Supervisor:	Yap Kim Hui (Asst Prof)	E-mail address:	ekhyap@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Content based Analysis		
Project Title:	Content-based Multimedia Indexing and Retrieval Systems and Algorithms		
Summary:	<p>The significant growth in the volume of multimedia information in recent years has triggered the development of efficient approaches for accessing the information. The objective of this project is to design and implement a content-based multimedia indexing and retrieval system. The project involves the following modules: feature extraction and selection, dimensionality reduction, similarity measure formulation, and human-computer interaction. The candidate will explore the idea of relevance feedback in order to develop efficient learning algorithms to retrieve the relevant image/video. The desired outcome is to develop and implement a fully functional multimedia indexing and retrieval system with user-friendly interface.</p>		

Project No:	13.2.9		
Supervisor:	Ma Kai Kuang (Assoc Prof)	E-mail address:	ekkma@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Filter Bank Design for Medical Image Processing		
Summary:	<p>Over the past decade, filter banks have gained wide interests in both theory and applications. In this project, we will develop new filter banks for medical image processing. The goal is to construct more powerful filter banks (e.g., oversampled systems, vector-valued systems or multidimensional systems) that can capture the intrinsic geometrical structure of medical images. Both fundamental theory and fast implementation structures would be investigated. The designed filter banks aim to provide versatility, flexibility, adaptivity for compression, enhancement, denoising and feature extraction of medical images. Student who is interested in this image and video coding area should visit my homepage and with further discussion.</p>		

Project No:	13.2.10		
Supervisor:	Ma Kai Kuang (Assoc Prof)	E-mail address:	ekkma@ntu.edu.sg
Candidature:	MEng		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Tumor Segmentation from Magnetic Resonance Imaging for Clinical Diagnosis		
Summary:	<p>It is quite useful to have a computer-assisted software tools to enhance medical doctors/radiologists on performing clinical diagnosis. In this project, we will be investigating how to achieve such tasks by exploiting various techniques, such as signal processing, image processing, pattern recognition, etc. The final deliverable will be a software system/tool with user-friendly GUI to illustrate the efficacy and effectiveness of the developed algorithm. Student who is interested in this image and video coding area should visit my homepage and with further discussion.</p>		

Project No:	13.2.11		
Supervisor:	Ma Kai Kuang (Assoc Prof)	E-mail address:	ekkma@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Human Identification by Kernel Learning		
Summary:	<p>Human identification is very important for security surveillance today, especially in anti-terrorism. However, it is still a challenging work to recognize human accurately based on the face, signature, and gait information. Kernel learning technology is a novel machine learning mechanism for pattern recognition proposed recently. In this project, we will develop automated human identification technology to detect, recognize and identify threats for security surveillance based on kernel learning. This technology will provide critical early-warning support. Student who is interested in this image and video coding area should visit my homepage and with further discussion.</p>		

Project No:	13.2.12		
Supervisor:	Ma Kai Kuang (Assoc Prof)	E-mail address:	ekkma@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Wireless Digital Image and Video Coding		
Summary:	<p>Wireless has been a well-received technology for years. How to improve the compression performance and its related transmission issues are still challenging tasks with many opened issues to tackle. In this project, we will look into further on this direction and build up a demonstration platform to show the performance. We will be investigating several components, including coding performance, error-resilient robustness, and potential post-processing issues and applications. Student who is interested in this image and video coding area should visit my homepage and with further discussion.</p>		

Project No:	13.2.13		
Supervisor:	Yap Kim Hui (Asst Prof)	E-mail address:	ekhyap@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Adaptive Image and Signal Processing using Computational Intelligence		
Summary:	<p>The objective of this project is to develop a class of analytical, modeling, and computational strategies to address adaptive image and signal processing. The candidate will study these principles through applications of single-input single-output (SISO) model, and multiple-input multiple-output (MIMO) model. The applications include adaptive image deconvolution (SISO) and multiuser detection for CDMA systems (MIMO). The project will also focus on blind signal processing, which describes a class of algorithms dealing with systems with incomplete information or poor characterization. Computational intelligence will be employed due to their capability in systematic signal identification, intelligent information integration, and robust optimization.</p>		

Project No:	13.2.14		
Supervisor:	Yap Kim Hui (Asst Prof)	E-mail address:	ekhyap@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Adaptive Blind Image Restoration Systems and Algorithms		
Summary:	<p>The primary objective of blind image restoration is to recover lost information from a degraded image, and so obtain the best estimate to the original image. Its applications include photography deblurring, sonar imaging, remote sensing, medical and microscopic imaging. The main principles of blind image algorithms can be described concisely as: identification of useful <i>a priori</i> information such as the invariant features of input signals, integration of extracted knowledge into the schemes without compromising their flexibility, and development of an appropriate computational technique to optimize the cost function. The candidate will develop algorithms to addresses these requirements for systematic signal identification, intelligent information integration, and efficient optimization.</p>		

Project No:	13.2.15		
Supervisor:	Zhu Ce (Asst Prof)	E-mail address:	eczhu@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Compressed Video over Heterogeneous Network		
Summary:	<p>A video communication system will be simulated to robustly transport compressed video in heterogeneous networks especially in wireless environment. The project will focus on maximizing the decoded video quality using network-adaptive error control techniques and joint source-channel coding. The project will cover video coding, wireless network simulation and Internet traffic modeling. The prospective students are expected to investigate novel techniques for effective and efficient transmission of compressed video. Extensive experiments should be done on a simulated wireless network platform using C/C++ and MATLAB.</p>		

Project No:	13.2.16		
Supervisor:	Zhu Ce (Asst Prof)	E-mail address:	eczhu@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Rate-Distortion Techniques for Video Coding		
Summary:	<p>Recently a significant amount of research efforts have been put in the area of R-D optimized video coding. The rate-distortion efficiency of the prevailing video coding schemes is based on a sophisticated interaction among the hybrid coding tools such as motion estimation/representation, transform, quantization and entropy coding. A key problem in video coding is the operational control of the encoder. Topics to be investigated include rate-distortion optimal motion estimation, rate control, constrained resource allocation techniques. R-D optimized scalable video coding is another focus. Students who are interested in video coding and algorithm development are welcome to undertake this project.</p>		

Project No:	13.2.17		
Supervisor:	Zhu Ce (Asst Prof)	E-mail address:	eczhu@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Image and Video Signal Processing		
Project Title:	Receiver-Driven Scalable Media Communication		
Summary:	<p>The proposed project is to research more powerful technologies and environment for streaming media over wired/wireless networks. A new image/video coding framework, receiver-driven interactive scalable image/video coding & streaming, will be proposed to exploit the most efficient participation of receivers in the encoding process to maximally improve coding performance. It can be expected that the receiver-driven approach to image/video coding and streaming is much more flexible and effective than the existing schemes where the source determines everything which is then transmitted to recipients. A basic working model for such an image/video coding & streaming over wired/wireless networks are expected to be developed.</p>		

Project No:	13.2.18		
Supervisor:	Yang Jun (Asst Prof)	E-mail address:	ejyang@ntu.edu.sg
Candidature:	MEng / PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Audio and Image Signal Processing		
Project Title:	Study of Image Sonification for Blind and Visual Impaired Persons		
Summary:	<p>It is technically possible to convert video into audio while preserving a significant amount of visual information in the resulting sounds. This project aims to synthesis sound according to the texture of images and find relationships or mappings between image and sound data. We attempt to try some different rules of mapping between image and sound, such as mapping between the basic properties of image (color, brightness, x-y positions, etc) and those of sound (amplitude, frequency, etc). This project can be applied to aid blind people, who could learn to mentally reconstruct the visual content carried by these sounds, and might be able to "see" with sound.</p>		

Project No:	13.2.19		
Supervisor:	Yang Jun	E-mail address:	ejyang@ntu.edu.sg
Candidature:	PhD		
Research Programme:	Multimedia Signal Processing		
Research Area:	Signal and Image processing		
Project Title:	Application of Independent Component Analysis in Signal and Image Processing		
Summary:	<p>Independent Component Analysis (ICA) is a statistical and computational technique for revealing hidden factors that underlie sets of random variables, measurements, or signals. The objective of this project is to evaluate existing methods and develop new algorithms for signal and image processing. For blind source separation (BSS), the key point in ICA applications, the frequency-domain ICA is to be combined with time-domain ICA to achieve a superior source-separation performance under real environment such as reverberant conditions. Fast convergence algorithm is to be investigated through optimization in ICA and applied to multichannel blind deconvolution in real environments, feature extraction and encoding of speech signals, and cardiac signals and brain imaging etc.</p>		