Gwangju Institute of
Science and Technology

School of Information and Communications
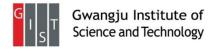
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Order	Date	Title
	Presenter	Abstract
1	2012-11-06	Digital holography for quantitative phase-contrast imaging
	Nitin Rawat	In the paper, they have presented a new application of digital holography for phase-contrast imaging. The technique uses a CCD camera for recording of a digital Fresnel off-axis hologram and a numerical method for hologram reconstruction. The method simultaneously provides an amplitude-contrast image and a quantitative phase-contrast image.
2	2012-11-13	Compressed sensing with off-axis frequency-shifting holography
	Hwanchol Jang	This work reveals an experimental microscopy acquisition scheme successfully combining compressed sensing (CS) and digital holography in off-axis and frequency-shifting conditions. CS is a recent data acquisition theory involving signal reconstruction from randomly undersampled measurements, exploiting the fact that most images present some compact structure and redundancy. We propose a genuine CS-based imaging scheme for sparse gradient images, acquiring a diffraction map of the optical field with holographic microscopy and recovering the signal from as little as 7% of random measurements. We report experimental results demonstrating how CS can lead to an elegant and effective way to reconstruct images, opening the door for new microscopy applications.
3	2012-11-20	An EEG-Based BCI System for 2-D Cursor Control by Combining Mu/Beta Rhythm and P300 Potential
	Younghak Shin	In this paper, they have proposed a 2-D cursor control application for BCI system by combining motorimagery and P300 potential. They use two independent signals for controlling vertical and horizontal movements of a cursor simultaneously. They was assessed six subjects through an online experiment. The six subjects successfully carried out 2-D cursor control with satisfactory accuracies.
4	2012-11-27	Robust Face Recognition via Sparse Representation
	Woongbi Lee	In this paper, sparse signal representation is investigated for recognizing human faces from frontal view with varying expression and illumination, as well as occlusion and disguise. Based on a sparse representation computed by l1-minimization, this face recognition problem is cast as a general classification among multiple linear regression models. Even with severe occlusion and corruption, their algorithms show high performance classification of high dimensional data.

5		2012-12-04	Gaming control using a wearable and wireless EEG-based brain-computer interface device with novel dry foam-based sensors
	SeungChan Lee		In this paper, they introduced a wearable, wireless and portable EEG-based BCI device with dry foam-based EEG sensors. Using this device, they demonstrated the game control application. This game application was controlled by real-time cognitive stage detection algorithm. The result of this study indicate that a portable wireless BCI device is conveniently and effectively control the application and the developed dry sensor also provided a good quality of EEG signals.
6		2012-12-11	Brain-Computer Interface Using a Simplified Functional Near-Infrared Spectroscopy System
	Evgenii Kim		In this paper, principles, experiments and progress in harnessing simplified function near-infrared spectroscopic systems (fNIRS) as non-invasive instrumentation for brain-computer interfaces were described. The system based on detecting haemodynamic responses. Results show that fNIRS can support simple BCI functionality and shows much potential.
7		2013-01-08	Two-dimensional ultrasound detection with unfocused frequency-randomized signals
	Pavel Ni		This paper was published in the Journal of Acoustical Society of America 2007. Until now in best of my knowledge the only one paper about unfocused ultrasound imaging method. Author proposed to use random frequency for each element of transducer to make randomized frequency pattern. In simulation study this approach was effective in detecting small objects when using frequencies in the 0.25-1.25 Mhz range.
8		2013-01-15	Probabilistic Reconstruction in Compressed Sensing : Algorithms, Phase Diagrams, and Threshold Achieving Matrices
	Hyeongho Baek		In this paper, they present the probabilistic approach to reconstruction and discuss its optimality and robustness. And they detail the derivation of the message passing algorithm for reconstruction. Moreover, they further develop the asymptotic analysis of the corresponding phase diagrams with and without measurement noise, for different distribution of signals.

9	2013-01-22	DASHER-An Efficient Writing System for Brain-Computer Interfaces?
	Soogil Woo	In this paper, they introduced DASHER and DASHER as a BCI user interface. DASHER is a user interface for entering text using discrete or continuous gestures, e.g. a mouse, touchscreen, or eye-tracker. DASHER have advantages. The operation of DASHER is simple, and immediately evident to new users. Also, DASHER has a rapid learning rate that is comparable to alternative text entry methods. So, they propose that DASHER would be well-matched to the low bit-rate, noisy output obtained from brain-computer interfaces(BCI), and discuss the issues surrounding the use of DASHER with BCI systems. In conclusion, they think that DASHER will be equally useful to users who retain functioning vision but are limited to communication through a BCI.
10	2013-01-29	Speckle-field digital holographic microscopy
	Nitin Rawat	This paper was published in the Optics express Journal in 2009. In this paper, they introduced the recording of the electric field of speckle which overcomes the drawbacks: poor spatial resolution, weak depth sectioning, and fixed pattern noise due to unwanted diffraction. This technique has great potential in studying biological samples with improved sensitivity, resolution and optical sectioning capability.
11	2013-02-05	Compressive multiple view projection incoherent holography
	Sangjun Park	In this seminar, the principles of the muliple view projection (MVP) holography technique are described. After understanding the principles, the intuition of the paper is shortly given. Finally, the new technique so called compressive multiple view projection (CMVP) holography is presented and the numberical simulations are also demonstrated.
12	2013-02-12	Compressed Sensing of EEG for Wireless Telemonitoring with Low Energy Consumption and Inexpensive Hardware
	Younghak Shin	Compressing EEG for telemonitoring is extremely difficult for current CS algorithms, because EEG is not sparse in the time domain nor sparse in transformed domains. In this study, they proposed to use the framework of block sparse Bayesian learning, which has superior performance to other existing CS algorithms in recovering non-sparse signals. Experimental results showed that it recovered EEG signals with good quality. Thus, it is very promising for wireless telemonitoring based cognitive neuroscience studies and engineering applications.

13		2013-02-19	Compressive sensing in medical ultrasound
	Jin-Taek Seong		In this paper, they review the basic theory of compressive sensing. Then, a review of the existing CS studies in the field of medical ultrasound is given: reconstruction of sparse scattering maps, pre-beamforming channel data, post-beamforming signals and slow time Doppler data.
14		2013-02-26	Enhanced performance by a hybrid NIRS-EEG brain computer interface
	Seungchan Lee		In this paper, they investigate whether near-infrared spectroscopy (NIRS) can be used to enhance the EEG approach. In the experiment, they applied both methods simultaneously in a real-time Sensory Motor Rhythm (SMR)-based BCI paradigm, involving executed movements as well as motor imagery. They tested how the classification of NIRS data can complement ongoing real-time EEG classification. From the results, simultaneous measurements of NIRS and EEG can significantly improve the classification accuracy of motor imagery in over 90% of considered subjects and increases performance by 5% on average (pb0:01).
15		2013-03-19	Frequency Domain Compressive Sampling for Ultrasound Imaging
	Pavel Ni		Conventional Ultrasound imaging systems rely on Shannon-Nyquist theorem. Often US devices use a sampling rate that is at least four times the central frequency. Consequently large amount of data should be processed in real time. Compressive sensing allows to reduce volume of data directly acquiring compressed signal. The purpose of this paper is to show mechanism involved in a successful CS reconstruction.
16		2013-03-26	Brain Computer Interface-Based Smart Living Environmental Auto-Adjustment Control System in UPnP Home Networking.
	Soogil Woo		A brain computer interface-based smart living environmental auto-adjustment control system (BSLEACS) is proposed in this paper. They integrated the BCI technique with universal plug and play (UPnP) home networking for smart house applications. This system has advantages. The advantages of low power consumption and small volume of the above modules are suitable for smart house applications in daily life. BSLEACS provides a novel system prototype for environmental control.

17		2013-04-02	Optical brain monitoring for operator training and mental workload assessment
	Evgenii Kim		In this paper, we provide evidence from two studies that fNIR can be used in ecologically valid environments to assess the: 1)mental workload of operators performing standardized and complex cognitive tasks, and 2) development of expertise during practice of complex cognitive and visuomotor tasks (piloting unmanned air vehicles — UAV). Results indicate that fNIR measures are sensitive to mental task load and practice level, and provide evidence of the fNIR deployment in the field for its ability to monitor hemodynamic changes that are associated with relative cognitive workload changes of operators.
18		2013-04-09	Direct recording of holograms by a CCD target and numerical reconstruction
	Nitin Rawat		In this paper, the principle of recording holograms directly on a CCD target is described. A real image of the object is reconstructed from the digitally sampled hologram by means of numerical methods.
19		2013-04-23	Localisation of cognitive tasks used in EEG-based BCIs
	Younghak Shin		In this paper, to provide candidate electrode sites and neurophysiological reference information for cognitive tasks, six cognitive tasks were tested against the idle state. Cross subject candidate electrode sites were obtained via a wrapper method based upon a sequential forward floating search algorithm. Source localisation results were obtained using sLORETA software
20		2013-04-30	Scanner-Free and Wide-Field Endoscopic Imaging by Using a Signle Multimode Optical Fiber
	Hwanchol Jang		In this letter, a method for eliminating the effect of mode dispersion and therefore realize wide-field endoscopic imaging by using only a single multimode fiber with no scanner attached to the fiber.
21		2013-05-14	A Compressive Sensing and Unmixing Scheme for Hyperspectral Data Processing
	Woongbi Lee		In this paper, a low complexity scheme is proposed for hyperspectral data compression and reconstruction. The data reconstruction minimizes the total variation of the abundance fractions subject to a preprocessed fidelity equation with a significantly reduced size, and other side constraints.

22		2013-05-21	Dry and NOncontact EEG sensors for Mobile Brain-Computer Interfaces
	Seungchan Lee		Dry and noncontact electroencephalographic (EEG) electrodes, which do not require gel or even direct scalp coupling, have been considered as an enabler of practical, real-world, brain–computer interface (BCI) platforms. This study compares wet electrodes to dry and through hair, noncontact electrodes within a steady state visual evoked potential (SSVEP) BCI paradigm. The construction of a dry contact electrode, featuring fingered contact posts and active buffering circuitry is presented. Additionally, the development of a new, noncontact, capacitive electrode that utilizes a custom integrated, high-impedance analog front-end is introduced.
23		2013-05-28	Exemplar-Based Processing for Speech Recognition
	Pavel Ni		Automatic speech recognition has been dominated by technique using hidden Markov models to model time varying aspects of the acoustics. This method allows for a generalization of the observed data as long as the distribution estimated by the model is a reasonable description of the unseen data. In many cases, such a description must be simplified to allow reliable estimates of all free parameters in the model, and as a result, fine details in the model are lost. Exemplar based models have the potential to address this deficiency by building an instance of model based only on the relevant exemplars selected, exploiting sparse coding and compressive sensing technique.
24		2013-06-04	A cell-phone-based brain-computer interface for communication in daily life
	Soogil Woo		In this paper, their study aims to integrate a mobile and wireless electroencephalogram (EEG) system and a signal processing platform based on a cellphone into a wearable and wireless online BCI. They implemented and tested online signal processing methods in both time and frequency domains for detecting steady-state visual evoked potential (SSVEP). They study to demonstrate a portable, cost-effective and miniature cell-phone-based platform.
25		2013-06-25	Supervised Machine Learning: A review of Classification Techniques
	Evgenii Kim		Supervised machine learning is wildly used algorithm in different fields of science. This paper describes a basic idea of various supervised machine learning classification techniques. The author's hope is to guide the researcher in interesting research directions and to give suggestion possible bias combinations that have yet to be explored.

26	2013-07-09	Digital holography for quantitative phase-contrast imaging
	Nitin Rawat	The paper provides simultaneously an amplitude-contrast image and a quantitative phase-contrast image. The technique uses a CCD camera for recording of a Fresnel off-axis hologram and a numerical method for hologram reconstruction.
27	2013-07-16	A new (semantic) reflexive brain–computer interface: In search for a suitable classifier
	Younghak Shin	The goal of the current study is to find a suitable classifier for electroencephalogram (EEG) data derived from a new learning paradigm which aims at communication in paralysis. A reflexive semantic classical (Pavlovian) conditioning paradigm is explored as an alternative to the operant learning paradigms, currently used in most brain–computer interfaces (BCIs).
28	2013-07-23	Conditions for practicing compressive Fresnel Holography
	Sangjun Park	Recently, compressive sensing based on Fresnel wave propagation and sparsity is sued for promoting imaging reconstruction from a hologram. In this talk, we aim to understand the theoretical bounds on the performance of compressive imaging system based on Fresnel wave propagation.
29	2013-07-30	Random-Frequency SAR Imaging Based on Compressed Sensing
	Jin-Taek Seong	In this paper, a random-frequency SAR imaging scheme based on compressed sensing is proposed. If the targets are sparse or compressible, it is sufficient to transmit only a small number of random frequencies to reconstruct the image of the targets. This means that the limitations of the stepped-frequency technique for SAR can be overcome. The available imaging range width can be enlarged significantly, while the range and azimuth resolutions are both maintained
30	2013-08-07	Optimizing the Channel Selection and Classification Accuracy in EEG-Based BCI
	Seung-Chan Lee	Multichannel EEG is generally used in brain–computer interfaces (BCIs). This paper proposes a novel sparse common spatial pattern (SCSP) algorithm for EEG channel selection. The proposed SCSP algorithm is formulated as an optimization problem to select the least number of channels within a constraint of classification accuracy. The proposed SCSP algorithm is evaluated using two motor imagery datasets, one with a moderate number of channels and another with a large number of channels. The proposed SCSP algorithm yielded an average improvement of 10% in classification accuracy compared to the use of three channels (C3, C4, and Cz).

31	2013-08-14	Compressive Sensing in Photoaccustic Tomography
		The data acquisition speed in photoacoustic computed tomography (PACT) is limited by the laser repetition rate and the number of parallel ultrasound detecting channels. Reconstructing an image with fewer measurements can effectively accelerate the data acquisition and reduce the system cost. We adapt compressed sensing (CS) for the reconstruction in PACT. CS-based PACT is implemented as a nonlinear conjugate gradient descent algorithm and tested with both phantom and in vivo experiments.
	Pavel Ni	
32	2013-08-21	Toward Brain-Actuated Humanoid Robot: Asynchronous Direct Control Using an EEG-Based BCI
	Soogil Woo	The brain–computer interface (BCI) technique is a novel control interface to translate human intentions into appropriate motion commands for robotic systems. The aim of this study is to apply an asynchronous direct-control system for humanoid robot navigation using an electroencephalograph (EEG), based active BCI. The experimental procedures consist of offline training, online feedback testing, and real-time control sessions. For the performance test, five healthy subjects controlled a humanoid robot navigation to reach a target goal in an indoor maze by using their EEGs based on real-time images obtained from a camera on the head of the robot. In experimental results, the subjects successfully controlled the robot in the indoor maze.
33	2013-08-28	Temporal classification of multichannel near-infrared spectroscopy signals of motor imagery for developing a brain-computer interface
	Evgenii Kim	in this paper, they describe a study conducted to test the feasibility of using multichannel NIRS in the development of a BCI. They used a continuous wave 20-channel NIRS system over the motor cortex of 5 healthy volunteers to measure oxygenated and deoxygenated hemoglobin changes during left hand and right-hand motor imagery. They applied two different pattern recognition algorithms separately, Support Vector Machines (SVM) and Hidden Markov Model (HMM), to classify the data offline. SVM classified left-hand imagery from right hand imagery with an average accuracy of 73% for all volunteers, while HMM performed better with an average accuracy of 89%. Their results indicate potential application of NIRS in the development of BCIs.

34		2013-09-10	Digital Image information encryption based on compressive sending and double random phase encoding technique
	Nitin Rawat		An image information encryption method based on compressive sensing and double random-phase encoding is proposed. Considering that natural image tends to be compressible in a transform domain, the characterstics of Compressive sensing, dimensional reduction and random projection, are utilized to sample or encrypt a digital image firstly. The double-encrypted information is dispersed and embedded into the host image. At the received terminal, original image information is reconstructed approximately via Orthogonal Matching Pursuit algorithm.
35		2013-09-24	Sparsity driven ultrasound imaging
	Jin-Taek Seong		The framework involves the use of a physics-based forward model of the ultrasound observation process, the formulation of image formation as the solution of an associated optimization problem, and the solution of that problem through efficient numerical algorithms. The sparsity-driven, model-based approach estimates a complex-valued reflectivity field and preserves physical features in the scene while suppressing spurious artifacts. It also provides robust reconstructions in the case of sparse and reduced observation apertures.
36		2013-10-08	An auditory brain–computer interface evoked by natural speech
	Younghak Shin		In this study, they present a novel fully auditory EEG-BCI based on a dichotic listening paradigm using human voice for stimulation. This interface has been evaluated with healthy volunteers, achieving an average information transmission rate of 1.5 bits min−1 in full-length trials and 2.7 bits min−1 using the optimal length of trials, recorded with only one channel and without formal training. This novel technique opens the door to a more natural communication with users unable to use visual BCIs, with promising results in terms of performance, usability, training and cognitive effort.
37		2013-10-15	Temporal classification of multichannel near-infrared spectroscopy signals of motor imagery for developing a brain-computer interface
	Evgenii Kim		In this paper, they describe a study conducted to test the feasibility of using multichannel NIRS in the development of a BCI. They used a continuous wave 20-channel NIRS system over the motor cortex of 5 healthy volunteers to measure oxygenated and deoxygenated hemoglobin changes during left hand and right-hand motor imagery. They applied two different pattern recognition algorithms separately, Support Vector Machines (SVM) and Hidden Markov Model (HMM), to classify the data offline. SVM classified left-hand imagery from right hand imagery with an average accuracy of 73% for all volunteers, while HMM performed better with an average accuracy of 89%. Their results indicate potential application of NIRS in the development of BCIs.

38	2013-10-22	A measurement-domain beamforming approach for ultrasound instrument based on distributed compressed sensing: initial development
	Pavel Nee	In this paper author applied distributed compressed sensing to ultrasound medical imaging and proposed Measurement-domain adaptive beamforming (MABF) to directly reconstruct ultrasound image without reconstructing transducer signals.
39	2013-10-29	A novel BCI based on ERP components sensitive to configural processing of human faces
	Seungchan Lee	This study introduces a novel brain–computer interface (BCI) based on an oddball paradigm using stimuli of facial images with loss of configural face information (e.g., inversion of face). With the proposed novel paradigm, we investigate the effects of ERP components N170, VPP and P300 on target detection for BCI. An eight-class BCI platform is developed to analyze ERPs and evaluate the target detection performance using linear discriminant analysis without complicated feature extraction processing. The online classification accuracy of 88.7% and information transfer rate of 38.7 bits min−1 using stimuli of inverted faces with only single trial.
40	2013-11-05	Securing information by use of digital holography
	Nitin Rawat	An information security method that uses a digital holographic technique is proposed in this paper. An encrypted image is stored as a digital hologram. The decryption key is also stored as a digital hologram. The encrypted image can be electrically decrypted by use of the digital hologram of the key. This security technique provides secure storage and data transmission. Experimental results are presented to demonstrate the proposed method.
41	2013-12-03	A Head-Up Display-Based P300 Brain–Computer Interface for Destination Selection
	Soogil Woo	In this paper, they propose a P300 brain–computer interface (BCI) with visual stimuli presented on a head-up display and we apply this BCI for selecting destinations of a simulated vehicle in a virtual scene. To improve the usability of the selection system, we analyze the effects of the number of electroencephalogram (EEG) rounds on system performance. This paper lays a foundation for developing vehicles that use a BCI to select a desired destination from a list of predefined destinations and then use an autonomous navigation system to reach the desired destination.
42	2013-12-10	Some fundamental properties of speckle
	Hwanchol Jang	A probabilistic modeling for speckle pattern is introduced. Ways to suppress the speckle pattern is also presented.