AMEC IS-1

The ESWT (extracorporeal shock wave therapy) for musculoskeletal disorders

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Abstract

Shock waves are three-dimensional pressure pules of microsecond duration with a peak pressure of 35-120 MPa. Technological advancements of medical shockwaves made over recent years have broadened the spectrum of its clinical application from being just purely a destructive force, into a treatment modality that engenders a myriad of genesis effects associated with tissue regeneration.

Currently used focused shock wave systems differ in their design and depend on whether the shock waves are generated by electrohydraulic, electromagnetic or piezoelectric mechanisms. Observation of its biochemical and biocellular responses have noted progenesis effects such as angiogenesis, osteogenesis, and tendogenesis.

ESWT has been successfully applied to the treatment of tendinopathy of the shoulder, ellow, patella, Achilles, and the calcaneus, and also union of the long bone. Recently, ESWT utility was expanded to the cardiology, andrology, diabetiec neuropathy, uterine fibrosis, etc. to improve the life quality while reducing the burden of healthcare.

AMEC IS-2

Accelerating Muscular Enzyme Recovery and Pain Mitigation of Elite Athletes Using Hyperbaric Oxygen Therapy

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Abstract

Background: Accelerating the muscular fatigue recovery of athletes and mitigating the pain are the goals that have received considerable attentions from the elite athletes and specialists in sports medicine worldwide. In recent years, numerous studies have been discussing about the feasibility of using hyperbaric oxygen therapy (HBOT) in treating musculoskeletal injuries and improving exercise-induced fatigue.

OBJECTIVE: The purpose of the present study was to evaluate the effects of HBOT on the catabolic muscular enzymes (CMEs), muscle pain intensity, and pain interference of elite baseball players.

RESEARCH DESIGN AND METHODS: A prospective double-blind, randomized control trial was conducted with the approval by the institutional review board of our institute. 41 participants were recruited between June 2014 and December 2015 and were divided into a study group and control group with 20 and 21 participants, respectively. All the participants received either HBOT or placebo sessions twice in a week using a hyperbaric chamber. For the study group, the chamber was pressurized to 2.5 atmospheric absolute (ATA) while breathing pure oxygen. For the control group, the chamber was pressurized to 1.3 ATA while breathing normal air. The duration of each session was 100 min, and ten sessions were completed in five weeks for each participant. The

outcome evaluations consisted of subjective brief pain inventory (BPI) and objective serum CMEs, including blood urine nitrogen (BUN), creatine phosphokinase (CPK), lactate (LT), glutamic-oaa transaminase (GOT), and myoglobin (MB). Data were collected before the treatment (T1), during the treatment (end of fifth HBOT; T2), after the treatment (end of tenth HBOT; T3), and follow-up (two weeks after the tenth HBOT; T4).

RESULTS: In the study group, average reduction of CPK, GOT, and MB were 30.7%, 12.6%, and 37.2% from T1 to T4, respectively. These enzymes of the two groups achieved significant differences at T3 ($p<.001$). Although there were no significant differences of BUN and LT in two groups, the serum level is relatively stable in study group. In terms of pain intensity and pain interference, the study group showed significant improvement at T3. In contrast, the control group showed no significant improvement in CMEs and BPI.

CONCLUSIONS: HBOT facilitates the recovery of the catabolic muscular enzymes and alleviates exercise-induced muscular pain in elite baseball players. We concluded that HBOT is an alternative modality to accelerate the recovery from exercise-induced muscle pain and fatigue.

AMEC IS-3

Analysis of Throwing Motion

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Abstract

Throwing motion needs sufficient physical strength of the shoulder and efficient coordination of the trunk and lower extremity movement. To prevent the occurrence of throwing injury, the biomechanical analysis of throwing motion it is absolutely necessary.

In order to investigate quantitative understanding and evaluate each individual throwing motion being complex, the Graphical User Interface - based kinematic and kinetic analysis System (Nobuhara Hospital, Japan) was developed. 448 pitchers were measured their actions with various performance levels using a Motion Capture System. The resultant joint forces and moments in the wrist, elbow and shoulder were estimated using the inverse dynamics technique.

Results: Consequently, a horizontal adduction of 5.5 [deg] and an abduction of 87.8 [deg] caused the minimum resultant force of the shoulder in terms of anterior/posterior and superior/inferior forces at ball release (BR). Horizontal abduction position increased resultant force at BR. Maximum Horizontal Abduction angle in cocking phase affected horizontal abduction/adduction angle at BR

The results were computed by our system promise to vastly simplify the quantitative evaluation of throwing injury. Throwing motion is performed by the kinetic chain reaction. The throwing injury is induced by a disorganized motion of other regions, joints or the spinal column in a large number of cases. Conservative medical treatment is performed for the purpose of a modification of a kinetic chain reaction. We perform the operation on the case which does not have an effect of conservative treatment and has irreversible change of structure tissues.

To prevent the occurrence of throwing injury, the biomechanical analysis of throwing motion it is absolutely necessary. Our system promises to vastly simplify the quantitative evaluation of throwing injury.

AMEC IS-4

How is biomechanical knowledge useful for understanding shoulder disorders?

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Abstract

Shoulder has a wide range of motion. Contact point between the glenoid and the humeral head, tension of soft tissue, and alignment of muscles connecting the bones drastically change in its range of motion. Mechanism stabilizing shoulder joint is influenced by arm positioning. Assessment of joint stability should always take arm positioning into consideration. In fact, there is a subtle instability which can only be detected when the arm is elevated. The glenoid dysplasia might be a cause for its instability. These findings can be detected only by 3D computer generated images except in some typical cases.

Generally, joint stability is judged by location of the humeral head center in the glenoid. More intricate approach is necessary for some disorders. Analysis of contact area and other glenohumeral relation can clarify instability which cannot be detected through investigating location of joint center. The studies using those parameters showed that the joint is inherently unstable with the arm externally rotated at 90 degrees of elevation, and that joint positioning would be more apt to be affected from the cocking to the acceleration phase during throwing activity. We think such instability might lead to throwing disorders.

AMEC IS-5

MRI-based 3D-shape model improves diagnosis of rotator cuff tear

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Masahiko Komai [1], Yoshiaki Kanatani [1], Kotaro Hashimoto [1],
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Abstract

MRI based 3D-shape model of soft tissue has already applied in various clinical fields. In orthopedics, its clinical application would be strongly contributed to improving diagnostic accuracy of rotator cuff tear. The purpose of this study was to compare shape and size of torn tendon of rotator cuff in reconstructed 3D-shape model to that in intraoperative findings, and to investigate the influence of employing 3D-shape model on accuracy of diagnosis for rotator cuff tear. MRI scan was carried out for 30 patients with rotator cuff tear before surgery. 3D-shape models of rotator cuff tendon and torn tendon were acquired using a standard image processing software. Four shoulder surgeons, such as 2 residents and 2 specialists, reviewed preoperative shoulder 2D-MRIs and 3D-shape model of rotator cuff tear for assessing shape and size. As a result, the accuracy for evaluating shape of torn tendon using 2D-MRIs in a group of residents was significantly lower than a group of specialists. But, there was no significant difference in the accuracy for assessing shape of torn tendon using 3D-shape model of rotator cuff tear among 4 shoulder surgeons. The findings in this study suggest that 3D-shape model could improve diagnosis of rotator cuff tear.

AMEC IS-6

Estimation of shoulder muscle-force during arm abduction in the simulated rotator cuff repair.

Hiroshi Tanaka[1], PhD, Toyohiko Hayashi[2], PhD, Hiroaki Inui[1], MD, PhD, Tomoyuki Muto[1], MD, PhD, Hiroki Ninomiya[1], MD, and Katsuya Nobuhara[1], MD, PhD

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Abstract

Rotator cuff repair is usually performed by reattaching the torn tendon edge to the anatomical insertion site. It is clinically important to know how shoulder muscle force production changes when the reattachment site of the supraspinatus, which is involved in almost all rotator cuff tears, is shifted medially to the original insertion site. The aim of our study was to estimate shoulder muscle-force production varying with the supraspinatus muscle fiber insertion site utilizing a MR/CT image-based musculoskeletal model.

To reproduce the arm abduction in the scapular plane, the shoulder and the elbow of a healthy volunteer were scanned by CT and an open-MR system (the neutral position with CT and five positions of arm abduction in the scapular plane with an open-MR system). Eight shoulder muscles were represented plural straight lines on the surface of 3D anatomic model. Subsequently, three patterns of the supraspinatus insertion sites were determined as follows: anatomical (AI) insertion site, 5mm and 10mm medially-shifted insertion sites (5MS, 10MS). Finally each shoulder muscle -force production of every muscle line was estimated to minimize the summation of each unit muscle force production using an optimization algorithm.

Supraspinatus muscle-force productions in 5MS and 10MS decreased (range: 2.2 to 71.7%) during arm abduction in comparison with that in AI. Moreover, mostly muscle force productions of the infraspinatus, subscapularis, and deltoid anterior portion increased during arm abduction. Additionally, the muscle-force production patterns of the deltoid middle portion were associated with the muscle-force production patterns of the supraspinatus.

Our findings described that the compensatory action and the deltoid middle portion-supraspinatus force couple were performed to be varied with the supraspinatus muscle fiber insertion site. Any deviation of <5 mm form the anatomical insertion site possible improve clinical outcomes after rotator cuff repair.

AMEC Keynote

Advanced CT and MR Imaging for Improving Diagnosis and Treatment Quality

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Abstract

Fast imaging techniques of CT and MRI can provide high temporal and spatial resolution images which can improve the detection, characterization and staging of disease. They also enable us to perform not only 3D imaging that reveals morphologic 3D information of organ but also 4D imaging that shows organ movement and flow direction.

We can have functional imaging of brain and liver, etc. by using sequential scanning after an injection of extra cellular (such as perfusion CT) or tissue specific contrast medium (Gd-EOB-DTPA). These are very helpful for pretreatment planning and treatment effect evaluation.

Dual energy CT (DECT) imaging has the ability to make not only material density images but also monochromatic images. Optimal KeV monochromatic CT image can improve lesion contrast. DECT with multiple material decomposition (MMD) technique now can estimate amount of fat deposition and fibrosis quantitatively.

Multimodality fusion imaging using the complementary imaging examinations, such as US, MDCT and MRI, is very useful for pretreatment planning, adequate treatment and precise evaluation of treatment effect.

I would like to introduce recent progress multimodality and multidimensional imaging for improving diagnosis and treatment quality

AMEC Luncheon Seminar

Utilization of Image Analysis in Joint Surgery

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Abstract

Accurate analyses of images obtained from radiological, MRI, and endoscopic examinations are critical for an orthopedic surgeon to conduct a good surgery. In this talk, I will show several examples for utilization of image analysis in joint surgery.

Arthroscopic surgeries for knee ligament and meniscus injuries are one of the most frequently performed procedures. Preoperative surgical planning based on MRI images, surgical procedure guided by arthroscopic images, and postoperative evaluation of surgical accuracy represent sequential processes of surgical management.

Number of total joint (hip and knee) replacement procedures performed each year is more than 100,000. In this surgery, accurate placement of the implant (prosthesis) in reference to the bone is critical to achieve satisfactory long-term outcome. Use of computer assisted surgery (surgical navigation) can improve accuracy and consistency of prosthetic implantation. In the postoperative evaluation, analysis of implant positioning based on three-dimensional (3D) CT image analysis and 3D joint motion analysis using 2D/3D image registration method provide valuable information regarding the surgical performance.

Osteotomy (correction of angular bony deformity by making bony cut, deformity correction, and bony fixation) is another major procedure in joint surgery. Accurate correction of the deformity with restoration of normal bony geometry should be attained at surgery. Therefore, surgical planning based on preoperative radiological image, intraoperative confirmation of deformity correction, and postoperative evaluation of surgical accuracy are the important sequence to achieve the goal of surgery.

AMEC SS1-1

The Application to Maritime Society of Patch-type Device

Koji Murai

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Abstract

In the maritime society, especially, we sometime find the news of marine collision accidents. Regarding the education and training of ship handling for safe navigation, it consists of lecture, exercise, ship handling simulator (simulator), and training ship.

The some kinds of simulator is making the big impact for the effective education and training tools, and the simulator is used to get the overall skill for the ship handling at sea; however, now we should be confirmed the methodology of how to use, how to assess as a better utilizing the simulator. It deeply depends on the instructor of simulator training. The interesting points are to develop a methodology of effective education and training using ship handling simulator; to assess elements on simulator-based education and training, to develop a new assessment methodology utilizing physiological index.

Physiological indices, heart rate variability (R-R interval), salivary amylase/nitric acid, and facial (nasal) temperature, are sufficient to evaluate the mental workload of a ship bridge teammate: a captain, a duty officer, a helmsman and a pilot. The safe navigation keeps with bridge team work, it is not only a duty officer; moreover, the sensor technology is developing day after days, and it is able to measure various kind human data without stress.

In this conference, I introduce the applications to maritime society of patch-type device: 1) evaluation of - simulator-based education and training, 2) - teamwork, 3) - performance of sea pilot, 4) - performance of port coordinator who is operator of coastal radio station.

AMEC SS1-2

Development of a capacitive force sensor for artificial joint

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Abstract

Soft tissue tension is thought to have a great effect on the clinical performance of total joint replacement; such as shoulder, hip, knee, or ankle. However, there have been no reports quantifying these soft tissue tensions intraoperatively. For the shoulder, reverse total shoulder arthroplasty has been used in Japan since 2014. So the purpose of this study is to develop an instrument which tells us soft tissue tension intraoperatively. Surgeons would be able to utilize the measured values when assessing stability of the joint intraoperatively. We are developing the instrument using capacitive one-dimensional force sensors to measure the soft tissue tension for reverse shoulder arthroplasty. A capacitive one-dimensional force sensor can be made less than 1mm in thickness. And an electric circuit which measures its amount of capacitances also could be made pretty small. That's because we use capacitive force sensors for measuring the soft tissue tension. The whole instruments have to be sufficiently small enough such that its outer geometry could be same to an existing prosthesis. While a capacitive force sensor is good in its dimensions, however, it is very sensitive to noise. We try to improve signal noise ratio having whole dimensions small enough. Now, we have designed a 5mm diameter capacitive one-dimensional force sensor to operate in the 0-150N force range.

This direction hopefully would be one of the promising ways for good clinical outcomes of joint replacement.

AMEC SS1-3

Design of Ultra-low Power Processer for Human Sensing

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Abstract

The declining birthrate, the aging society and lifestyle diseases such as heart disease and diabetes related to changes in the social environment have raised interest in safety, welfare and health care problems. In order to live healthily from these social problems, it is very important to observe our daily activity and physical condition continuously which we call "human sensing" with no assistance of others and to detect serious diseases at an early stage. It is also necessary that the system should be compact, long-term usable and sold at lower price for many people to make daily measurements without discomfort. We have been developing a small and low power MEMS (Micro Electromechanical Systems) devices and integrated circuits. And we aim to develop low power consumption devices, sensors and power generation devices from MEMS technologies for this system. In this study, we would discuss mainly the integrated circuit part which has an important role to control the whole system. Human sensing device aims to acquire five data that including ECG (Electrocardiogram), acceleration, atmospheric pressure, temperature, and humidity. However, ECG and acceleration can change quickly so that it requires higher sampling rate although other sensors are not required. The higher sampling rate increases power consumption because of a higher operation frequency. We have developed a special circuit that extracts valuable data such as the heart rate from the ECG, the maximum and minimum values of acceleration, and the number of steps from the acceleration with low power consumption. Moreover, we are designing analog front-end circuit and digital circuits such as MPU (Micro Processing Unit) and memory in one chip by using CMOS technology. These works enable long-term operation and miniaturization of the human monitoring system.

AMEC SS1-4

Fabrication of ZnO/HfO$_2$/ZnO nanowire capacitors by MOCVD

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Seiji Nakashima[1,2]**

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Abstract

Nonvolatile ferroelectric random access memory (FeRAM) is a promising candidate for internet of things (IOT) because of extremely low power consumption. However, its high integration has not been achieved yet owing to a difficulty in downscaling of the memory cell including one transistor and one capacitor. One of the solutions to realize the very small capacitors is the employment of multi-shell nanowires (NWs) including ferroelectrics. We have already established fabrication process of ferroelectric NWs/nanotubes by metal organic chemical vapor deposition (MOCVD) using conductive ZnO NWs as a template. Hence, we have proposed the introduction of ZnO/HfO$_2$/ZnO NW capacitors into FeRAM memory cells using HfO$_2$ as a ferroelectric. In this study, we focus on the crystallization of HfO$_2$ layers on ZnO NW.

ZnO NWs used as a template for NW capacitors were grown on Pt-covered SiO$_2$/Si substrate by MOCVD using Zn(C$_2$H$_5$)$_2$ and O$_2$ as a precursor and oxidizing gas, respectively. HfO$_2$ was also deposited on ZnO NWs templates at 200°C using Hf(O-t-C$_4$H$_9$)$_4$ and O$_2$ as a precursor by MOCVD. Subsequently, crystallization of HfO$_2$ layer was induced by rapid thermal annealing (RTA) at 600~1200°C for 5min in N$_2$ before top electrode deposition.

The diameter and aspect ratio of ZnO NW used as template were 200nm and 55, respectively. HfO$_2$ thin film with a thickness of 20nm was uniformly deposited on ZnO NWs by MOCVD. Ferroelectric orthorhombic phase was obtained by RTA below 900°C while paraelectric monoclinic phase was appeared by RTA at 1000 and 1200°C.

AMEC SS2-1

Modeling of Nano-Bio Interfaces based on Atomic Scale Simulations

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Abstract

In recent years, great interest has been paid to nano-biotechnology. Various researches such as design of next generation devices and safer implants have been actively carried out. In this field, it is important to understand interactions between biomolecules and solid surfaces. To understand the interactions, experimental observation and analytical method are mainly used, and there are not many studies using theoretical and computational methods. From the viewpoint of complementing the experimental results, computational simulations that can quantitatively analyze microscopic information such as atomic arrangement and interaction such as electrostatic attraction or hydrogen bonding should be also useful. The most widely used computational method is molecular dynamics (MD) with classical force field (FF). By using MD, it is possible to perform statistical analysis incorporating the dynamic fluctuation of the target. On the other hand, quantum mechanical (QM) calculations with higher accuracy than the classical FF is also being applied. However, applicable methods and systems are limited because of its high computational cost.

One promising QM approach for large-scale and complex molecular systems is the fragment molecular orbital (FMO) method [1, 2]. By using the FMO method, there is a possibility to analyze the interaction between the surfaces and the biomolecules. In this presentation, I will introduce applications of the atomic scale simulation in nano-biotechnology, mainly on interaction analysis between the hydroxyapatite surface and a designed peptides motif by using the classical MD and the FMO method [3].

[1] K. Kitaura et al., *Chem. Phys. Lett*. 313 (1999)701.

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AMEC SS2-2

Manipulation of individual cells based on dielectrophoresis using a microdisk electrode with a microcavity

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Abstract

The handling of individual cells is important for investigating characteristics of cells. Dielectrophoresis (DEP) by the microelectrode have been applied to manipulate single target cells as a micro−tweezer [1−2]. A target cell was trapped by positive DEP (p-DEP) and released by negative DEP (n-DEP). However, the DEP force must be continuously applied during a cell transfer, because the trapped cells were released from the electrode tip by turning off the voltage. The cell damage should arise by exposing the cell to the strong electric field formed at the tip for a long period. In this presentation, we have applied DEP manipulation by a microdisk electrode with the microcavity for manipulating individual cells to pick up, transfer and relocate cells at the desired position.

Pt microelectrode tip (20 μm diameter) with the microcavity (10 μm depth) was positioned near the target cell on the indium-tin oxide (ITO) substrate. AC voltage (10 V_{pp}, 10 MHz) was then applied to pick up the cell by p-DEP. The trapped cell was transferred to the desired position. To release cells, repulsive force of n-DEP (2.0 V_{pp}, 1.0 kHz) was employed.

The target cell was moved toward the electrode tip and captured in the microcavity fabricated on the top of tip by p-DEP. The average velocity directly before the cell was trapped reached at ca. 600 μm s^{-1}. The velocity increased with increasing the applied voltage due to the increase of the electric
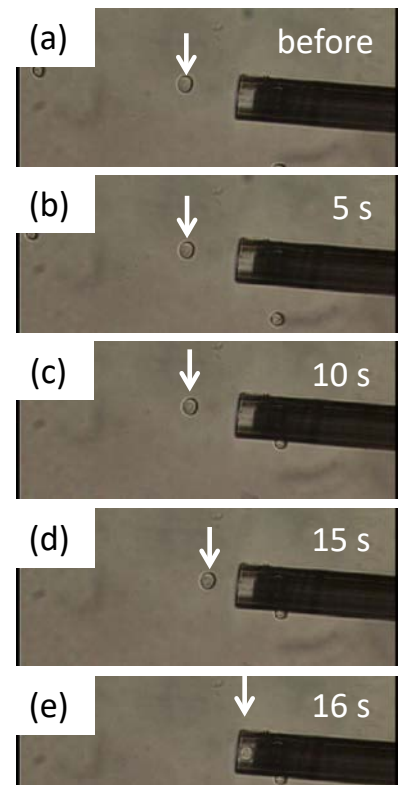

Figure 1. Images for capturing a cell in the cavity (a) before and (b) 5, (c) 10, (d) 15, and (e) 16 s after applying the voltage.

field around the tip electrode. The trapped cell released gradually and positioned at the point of the tip after the frequency were applied for n-DEP.

The patterning with cells was performed by the capture and release of individual cells with p- and n-DEP. The trapped cell has been remained in the microcavity during the transfer to the desired position. The trapped cell was then released from the microcavity by n-DEP. The procedure of capture, transfer and release of the cell was repeated for other cells, resulting in the pattern "T" was formed with 12 cells. The present system is promising for applications to the restoration of the patterned cells formed by other methods and co-culture of the different types of cells by regulating the distance between the cells.

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AMEC SS2-3

The Gold Nanotag for On-dose Authentication to Prevent Fake Drugs

JTakao Fukuoka[*,**], **Yuichi Utsumi**[*], **and Akinobu Yamaguchi**[*]

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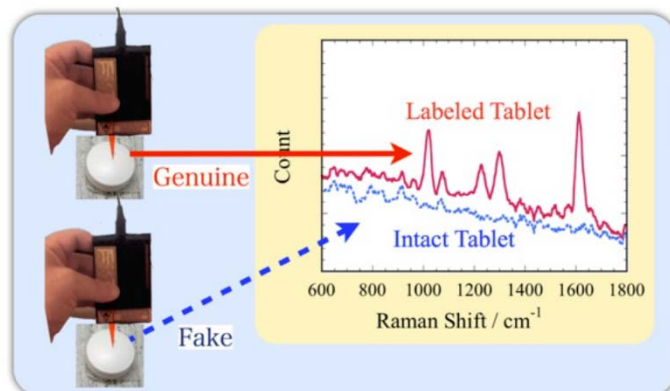[**]*Archilys, Kyoto, JAPAN*

Abstract

T Fake drugs threatens medical supply chain frightfully over 124 countries in the world. Even in Japan, although nobody expected counterfeits violate the maintained distribution of this country, fake harvoni for hepatitis C sold at an authorized pharmacy shocked officials in Ministry of Health, Labor and Welfare. Anti-counterfeit to prevent fake drugs requires rapid-authenticating, costless, and more than anythings, high-security technology.

Recent advances in nanotechnology accelerate developments of nanotag identifiers. Thinking of rapidness and high security in authentication, surface enhanced Raman scattering (SERS) produced from well-designed noble metal nanostructure is promised to apply new authentication method. We have developed SERS active nanostructures by self-assembling of gold nanoparticles (AuNP) with Raman active reporting molecules. A few nanogram amounts of the AuNP assembles were directly deposited onto commercial tablet Mucodyne. For on-dose authentication outside of a laboratory, 80 g weight and smart-phone driven palm-top Raman detector was used.

Shelf-life in SERS activity of the AuNP self-assemble liquid stocked at room temperature was over six months. The nanotag labeled Mucodyne tablet showed special SERS signal derived from the reporting molecule, and 0.2 s irradiation of 785 nm (5 mW) laser was enough to produce distinguishable SERS spectra from intact tablet.

Excellent longevity of SERS signal over three years on the labeled tablets was confirmed. By just 0.2 second laser irradiation with a palmtop Raman spectrometer, rapid on-dose authentication was successfully achieved.

AMEC SS3-1

Towards knowledge discovery from heterogeneous time-series medical databases

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Abstract

According to the JAHIS reports in 2016 [1], more than 72% of Japanese large hospitals (>= 400 beds) use EHRs (electronic health records). Now it becomes possible to exchange medical data electronically between hospitals based on the standards such as SS-MIX (standardized structured medical information exchange) and HL-7 (health level seven). For example in Shimane prefecture, an NPO is providing a communication service named MameNet, in which healthcare providers can securely exchange electronic patient data (with patient consent) via a datacenter. These standards also facilitate gathering of healthcare data from many hospitals for big data analysis.

Records in EHRs are by nature time series and usually heterogeneous; some of them, such as the results of laboratory exams and body measurements, are numeric or categorical, whereas others such as clinical observations and patient summaries are mainly narratives. By collecting these data in a standardized and structured manner and then by applying machine learning techniques, one might be able to find interesting knowledge on the transition of patient status, effects of interventions, and their relations to outcomes. However, knowledge discovery from such heterogeneous, longitudinal data is still a challenging problem; especially under interventions [2].

In this talk, we briefly review current time-series medical data mining techniques and discuss problems towards knowledge discovery from heterogeneous, time-series medical databases.

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[2] Jensen PB, Jensen LJ, Brunak S.: Mining electronic health records: towards better research applications and clinical care. Nat Rev Genet. 13(6):395-405 (2012).

AMEC SS3-2

Investigation on Swallowing Disorder in Biometric Data Measurement

Naomi Yagi

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Kyoto University, JAPAN

Abstract

Dysphagia or impaired swallowing function causes significant morbidity and mortality, and is diverse and common especially in the elderly. Dysphagia might cause aspiration pneumonia and various health problems whose severity range from trivial to lethal conditions, which often compromise the quality of life for patients. Even if the symptoms are mild, it is needed for medical attention because dysphagia could be a multidimensional problem with frequent occurrences and an early sign of serious underlying conditions. Therefore, the swallowing healthcare management is important. Dysphagia occurs during the oral and pharyngeal stage in the swallowing process regardless of age. Many medical experts in this field strongly stated that there is a necessity of healthcare study relating to swallowing disorder. In general, the evaluation of swallowing function is provided by video fluoroscopy or video endoscopy, which are currently international standards. However, those methods are invasive and restrictive examination. Therefore, the development of non-invasive/-restrictive evaluation method is one of the significant needs in dysphagia research. In my talk, I introduce some results of evaluation and investigation using the biometric measurement data of air flow, swallowing sound, and displacement by attaching two types of sensors. In addition, we discuss about the possibility of wearable sensors in the field of healthcare monitoring system.

AMEC SS3-3

Stenosis Detection in Fallopian Tubal Model Using Ultrasonic Measurement

Aoi Emura and Naotake Kamiura

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Abstract

Recently, infertility has been considered to be an urgent problem. One of the causes of female infertility is tubal infertility. As an examination for tubal infertility, hysterosalpingography is often used. It requires a contrast medium injected from the ostium uteri, and infertility doctors observe whether the medium smoothly flows by radiating X-rays. In other words, it is a non-invasive examination that imposes pain and/or bleeding on subjects.

A method of detecting whether there is stenosis in models of fallopian tubes with no medium injection is presented, assuming that silicone tubes are phantoms of fallopian tubes. A lump of the polyester threads is considered to be a stenosis, and inserted in each tube. The method processes the portion of the reflected wave observed by the ultrasonic device. The portion corresponds to the inside of the tube. It is divided into several short-time intervals each of which the length is equal. The method obtains the maximum amplitude value and the minimum amplitude value in each interval. It next generates the frequency distribution associated with the difference between the maximum amplitude value and the minimum amplitude value in each interval. In the distribution, the axis of ordinate and that of abscissa are for the number of differences and for the regularly divided amplitude, respectively. The method employs a ten-dimensional vector with the numbers of differences as element values to specify the portion to be processed, and distinguishes potions with lumps from those without lumps using support vector machines. Experimental results reveal that the method achieves high accuracy in detecting stenosises. This work was supported in part by Terumo Foundation for Life Sciences and Arts.

AMEC SS4-1

A study on flow
between parallel disks for cooling

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Abstract

The size of the motor depends on the required electrical and mechanical characteristics, temperature rise limit. As torque increases, heat generation increases. In order to solve this problem, it is necessary to cool the motor with high efficiency. Air cooling methods are often used for many methods of cooling. In this cooling method, cooling is performed using air. Therefore, complicated equipment is unnecessary．So, the structure of the motor can be simplified. There is also an advantage that the product can be produced at low cost. However, as the number of iron cores inside the motor increases, sometimes motor breaks out. Furthermore, when miniaturization and weight reduction are intended, the power loss density increases and the temperature rise limit of insulation becomes a problem. Because the experiment is expensive, it is important to observe the cooling state of the iron plate by highly accurate simulation. Under these circumstances, we have developed a solid-fluid heat coupling simulation method in this research. By applying this method, it is possible to find the optimum operating state of the motor.

In the conventional calculation method, the temperature of the fluid / solid interface is calculated by using the thermal conductivity calculated by the harmonic mean of each. However, when this calculation method is used, many lattice points are required in order to obtain the temperature of the interface with high accuracy. Also, it is impossible to calculate the discontinuity of temperature at the interface. Therefore, in this study, we calculate the thermal conductivity in each phase by using the thermal conductivity of each fluid and solid, and calculate the temperature of the interface by simultaneous heat flux condition between fluid solids. By using this calculation method, there is an advantage that it is possible to accurately obtain the temperature of the interface even with a small number of grids. Also, even in the heat transfer phenomena of solids and fluids having any shape, it is possible to calculate the strict interface temperature based on the heat conduction ratio. Using this calculation method, we report numerical simulation results by inserting a plurality of plates inside a concentric double cylinder to form a gap.

AMEC SS4-2

Study on Particle Focusing in Microchannel with Orifice-Shape Obstacle

Hirofumi Sugami, Hiroshige Kumamaru and Naohisa Takagaki

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Abstract

In recent years, flow cytometers are used in the medical and research fields. This flow cytometer is an apparatus for observing cells such as humans and analyzing the size and nature of cells. In order to detect the cells, it is necessary to align the cells in a row in the sample solution flow, and now the cells are focused mainly by enclosing the sample solution flow with flows not containing cells called sheath flow. In this method, however, problems such as size increase of the apparatus due to complication of the structure and accurate flow rate control of the sheath flow are pointed out. Therefore, in this research, we aim to focus fine particles by using obstacles in the flow channel, proposed by Park et al., instead of using sheath flow.

In this numerical analysis, ANSYS CFX which is a commercially available thermal fluid analysis software is used. The Euler method and the Lagrangian method (particle tracking method), are used to calculate two-phase flow. The flow channel, with an overall length of 1500 μm, a width of 200 μm and a height of 50 μm, has orifices at three places. For analysis conditions, a sample solution, mixture of water (98%) and polystyrene particles (2%), enters the inlet at a flow velocity of 0.5 m / s. The diameter of the particles is 10 μm and the outlet pressure is atmospheric pressure. In this calculation, it was confirmed that the particles were focused in the central part of the flow channel at each step the solution passed through the orifice. Calculation results on the particle convergence rate and the pressure loss by the Euler method were almost the same as the corresponding results by the Lagrangian method. In addition, the trajectory of particles was visualized by the Lagrangian method. In the future, we will conduct experiments in order to confirm the present calculation results.

AMEC SS4-3

Two numerical simulations of liquid motion driven by wind shear or syringe pump

Atsushi Shinoda[1], Naohisa Takagaki[1], Hiroshige Kumamaru[1], Ryoichi Kurose[2]

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[2] *Kyoto University, Nishikyo-ku, Kyoto 615-8540, JAPAN*

Abstract

Liquid column breaking, called atomization, is of great interest in both geophysics and engineering. Particularly, the atomization occurs on the ocean surface, on fuel injection in engines, on ink injection in printers, and, perhaps, on spilt chemical in future needleless-syringe. Although there are many studies for the atomization, the atomization mechanism is not fully understood, because of complicated interfacial movement and deformation, accompanied with bubble entrainment. We, therefore, used a direct numerical simulation with Level-Set/VOF method as the interface tracking method. The method is coupling method of Level-Set method, which captures an interface shape smoothly, and VOF method with high-precision mass conservation of liquid. The calculation of wind waves was performed using the program code 'FK^3' developed in Kyoto University. The computational domain is set to be 140 mm, 20 mm, and 40 mm in streamwise, spanwise, and vertical directions, respectively. The upper half of the computational domain is set to be air, and lower one is set to be water. The initial constant air flow is set to be 5 m/s, and the water is initially set to be 1 m/s. The results show that we can reproduce the chop breaking, a kind of atomization on a liquid column breaking.

Furthermore, we performed another numerical simulation using ANSYS FLUENT as a preliminary calculation for atomization of a water jet by syringe pumping. The computational domain is set to be 70 mm in total length, 60 mm in total length of the syringe barrel, and the syringe diameter is 20 mm. The length of needle is 10 mm and needle diameter is 2 mm. The piston wall is set to be a mobile wall by dynamic mesh function. The piston wall was moved 40 mm to needle direction with the frequency of 0.1 Hz. The PISO method is used for the unsteady flow. We calculated the flow rate spilt from the edge of the nozzle. The results show that the frequency of spilt flow rate agreed with 0.1Hz, which is the frequency of the mobile wall of the piston.

AMEC SS4-4

Microfluidic Manipulation Based on Thermoplasmonic Marangoni Effect

Kyoko Namura and Motofumi Suzuki

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Abstract

There is a growing need to develop fluid and particle manipulation techniques in microfluidic channels, which are essential for the development of Micro-Total Analysis Systems and Lab on a Chip Devices. The key issue is how to apply forces to the liquid packed in the tiny microfluidic channels. One of the most promising forces for the microfluidic manipulation is "Marangoni force," which is induced by surface tension gradient on a gas-liquid surface under temperature gradient. Here, we present microfluidic manipulation techniques based on the Marangoni effect controlled by thermoplasmonic effect of gold nanoisland films. Gold nanoparticles absorb light efficiently at their resonant frequency and convert it to heat within several picoseconds. Therefore, a focused light spot on the gold nanoisland film acts as a localized and mobile point-heat-source at a micrometer scale. This heat source allows us to generate a microbubble in water and to give a steep temperature gradient on the bubble surface, which results in the generation of the Marangoni flow. By tuning the laser spot position against the microbubble, the flow pattern shows significant change and realizes particle sorting by their size or particle focusing. Recently, we revealed that a further enhancement of the strength of the Marangoni flow is achieved by the degassing process of the working fluid. When the dissolved gases are removed from the water, a water vapor microbubble with a diameter of 10 μm is generated by the thermoplasmonic heating. This microbubble involves extremely rapid Marangoni flow, whose speed exceeds 1 m/s at around the microbubble. This rapid Marangoni flow generation is attributed to the small bubble size, over which the temperature is graded, and the superheat at the bubble surface in contact with the gold nanoisland film.

AMEC SS5-1

Human Fricatives

Kazunori Nozaki

Osaka University Dental Hospital, Dental Informatics

Abstract

There are still many mysteries as to why humans can talk. Especially in birds there is something that can reproduce human's pronunciation. For monkeys as well, it is possible to perform human pronunciation functionally in terms of airway configuration. However, these animals do not have language features. In recent years, research and development of AI which gained a deep impression on deep learning and big data is prevalent. After learning sound, AI can recognize and utter a conversation. Monkeys can see things by eye, recognize them, and eat for food if it is food. AI can cause the robot to take similar actions. Given the mechanism of speech recognition, it is identified as a word unit, a phrase or a sentence by identification of sound, coding of maximum likelihood, and probabilistic syllable estimation using existing databases such as triphones. It can be thought that birds or monkeys can do this sound again through the articulation mechanism. However, it is impossible to freely extract words and phrases from learned sentences, create sentences with new meanings, and pronounce them. Here, I think that the boundary of presence or absence of language is the presence or absence of this function. I'm studying to predict the factors that language has in human beings from the dental field.

In the dental field, various information such as the shape of teeth and jaws are accumulated historically and over time. Recent studies have shown that vowels can be pronounced like humans, not humans. However, it is my expectation that consonants, especially fricatives, that adjust the advanced sound with the tongue will probably be difficult. Even children, it is difficult to pronounce fricatives until about 6 years old. I have been conducting research using aerodynamic acoustic techniques to understand why it is difficult to acquire fricative sounds, so I will tell you about things that have been understood so far.

AMEC SS5-3

Recent Advance in Hyperspectral Sensors and Applications

Chao-Cheng Wu[1], Juei-Chao Chen[2]

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[2]*Department of Statistics and Information Science, Fu Jen University, Taipei, Taiwan*

Abstract

T Fake drugs threatens medical supply chain frightfully over 124 countries in the world. Even in Japan, although nobody expected counterfeits violate the maintained distribution of this country, fake harvoni for hepatitis C sold at an authorized pharmacy shocked officials in Ministry of Health, Labor and Welfare. Anti-counterfeit to prevent fake drugs requires rapid-authenticating, costless, and more than anythings, high-security technology.

Recent advances in nanotechnology accelerate developments of nanotag identifiers. Thinking of rapidness and high security in authentication, surface enhanced Raman scattering (SERS) produced from well-designed noble metal nanostructure is promised to apply new authentication method. We have developed SERS active nanostructures by self-assembling of gold nanoparticles (AuNP) with Raman active reporting molecules. A few nanogram amounts of the AuNP assembles were directly deposited onto commercial tablet Mucodyne. For on-dose authentication outside of a laboratory, 80 g weight and smart-phone driven palm-top Raman detector was used.

Shelf-life in SERS activity of the AuNP self-assemble liquid stocked at room temperature was over six months. The nanotag labeled Mucodyne tablet showed special SERS signal derived from the reporting molecule, and 0.2 s irradiation of 785 nm (5 mW) laser was enough to produce distinguishable SERS spectra from intact tablet.

Excellent longevity of SERS signal over three years on the labeled tablets was confirmed. By just 0.2 second laser irradiation with a palmtop Raman spectrometer, rapid on-dose authentication was successfully achieved.

AMEC SS5-4

A Neural Network-based Odor Recognition System

Teijiro Isokawa, Yusuke Sakai, and Nobuyuki Matsui

Graduate School of Engineering,
University of Hyogo, JAPAN

Abstract

Recognition and identification of odor or smell in the air have many potential applications, such as evaluation of foods, estimations for environmental conditions, and so on. Gas Chromatograph is one of the most precise analyzers for the odor recognitions, but they are not portable and tend to take much time to analyze the odors in the air. Thus, it is desirable to develop portable odor recognizer with high recognition abilities.

This paper presents an odor recognition system, which primarily aims at discriminating diacetyl odor that is a cause of unpleasant smell from middle-aged men. The proposed system has four types of MOS-type gas sensors as sensory component in a sealed acyl box as a sensory components. For recognizing the sensory outputs, Learning Vector Quantization (LVQ), which is a neural network with supervised learning algorithm, is adopted. The LVQ in the proposed system accepts temporal changes of signals output from four sensors, and makes the feature map from these high dimensional sensory signals in a supervised manner.

We conduct the recognition experiments by changing the duration of moving-average and the durations for sensory outputs. We use diacetyl, brewed-ethanol, isopropyl ether, and butyl acetate as target materials of odor recognition. Five-fold cross validation method is used for evaluating the recognition accuracy. From the experimental results, 96.5% of recognition accuracy on test data sets can be achieved by using 20 seconds of sensory signals and 5 seconds of moving-averaged.

ICIEV 17

ICIEV & ISCMHT 2017

2017 6th International Conference on Informatics, Electronics and Vision
&
2017 7th International Symposium in Computational Medical and Health Technology (ICIEV-ISCMHT)

1-3 September, 2017, Himeji, Hyogo, Japan
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&
2017 7th International Symposium in Computational Medical and Health Technology
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Welcome Message from General Chairs

Welcome to the *2017 6th International Conference on Informatics, Electronics & Vision* and *2017 7th International Symposium in Computational Medical and Health Technology* (ICIEV-ISCMHT), during 1~3 September, 2017 at the University of Hyogo, Japan.

We are really grateful for the enormous efforts from the core committee members, reviewers and volunteers – who worked extremely hard to organize the conference. Among them, we would like to mention especially: Syoji Kobashi, Manabu Nii, Masakazu Morimoto, Naomi Yagi and others for their gigantic commitment. The young volunteers and staffs have worked really hard before and during the conference. We would like to thank Belayet Hossain especially among others. We are grateful to IEEE Computer Society for being with the ICIEV conference series for consecutive five years, among others. We highly thank the University of Hyogo and the Advanced Medical Engineering Center (AMEC) for hosting and supporting the conference. The conference has a good number of technical co-sponsors. This list of academic affiliations justifies the value and maturity of the conference. We sincerely thank all the partners of this event.

We especially thank all the speakers, authors, session chairs and participants to support the conference. We sincerely hope that you will enjoy the conference and the wonderful Himeji city during the conference days and after. Japan has many excellent places visit, and we believe that you will enjoy your time, especially who will travel from overseas.

Though this conference and networking, we look forward to have more collaboration to develop knowledge for the betterment of the humanity.

We hope to have your cordial advice and supports in future ICIEV conferences.

Best regards,

General Chairs
Md. Atiqur Rahman Ahad, SMIEEE, University of Dhaka, Bangladesh
Yutaka Hata, FIEEE, University of Hyogo, Japan

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August 20, 2017

Message

I am very happy that similar to the first five ICIEV conferences, the 6th *International Conference on Informatics, Electronics & Vision* (ICIEV 2017) is going to be held jointly with 7th *International Symposium in Computational Medical and Health Technology* (ISCMHT 2017), during 1 - 3 September, 2017. I feel proud that the University of Dhaka was a regular partner of this conference from the beginning. And this year, I am very happy to that the 6th ICIEV is going to be held in Japan for the 2nd time. Japan is a very friendly-country of Bangladesh.

The previous ICIEV conferences were very successful at the University of Dhaka, Bangladesh and in Japan. I wish that the ICIEV-ISCMHT will be a vibrant and successful as well. Being a core part of this conference from the beginning, I myself feel very much enthusiastic about this conference and I hope that through mutual collaborations, we all will get benefit academically. I sincerely thank the top-class committee of the ICIEV, especially Md. Atiqur Rahman Ahad, for his tremendous and sustained efforts to hold this conference at regular interval. I know that Syoji Kobashi, University of Hyogo has taken the lead to hold this conference in Japan and his team have worked very hard to make it a leading conference. I sincerely thank the University of Hyogo and the Advanced Medical Engineering Center (AMEC) for hosting the conference.

I thank all the participants for their contributions in making the conference a grand success. I hope that this conference will promote collaborations among researchers in Informatics, Electronics, Computer Vision, Medical Health and Technology, and create partnerships between universities and industries.

We always value the friendship of Japan and I wish the conference all success.

(Prof. Dr. A A M S Arefin Siddique)
Vice-Chancellor

Welcome Message for "AMEC International Symposium on Medical and Health Technology (ISMHT)"

Dear colleagues and participants,

It is my great pleasure to write about the "sixth AMEC International Symposium on Medical and Health Technology (ISMHT)" that will be held from September 1st to 3rd, 2017, in Himeji and jointly organized with "6th International Conference on Informatics, Electronics & Vision (ICIEV)". ISMHT is an annual international symposium organized by Advanced Medical Engineering Center (AMEC), University of Hyogo, and professors, Juei-Chao Chen, (Fu Jen Catholic University), Chao-Cheng Wu (National Taipei University of Technology) from Taiwan. Previously, it was entitled as "International Symposium on Himeji Initiative in Computational Medical and Health Technology", and were held in Japan (2012), Taiwan (2013), Taiwan (2014), Japan (2015), and Taiwan (2016). However, "Himeji Initiative in Computational Medical and Health Technology (HiMED)" was one of research centers in the University of Hyogo that formed the current AMEC, and the other research centers were "Research Center for Nano-Micro Structure Science and Engineering", and "Molecular Nanotechnology Research Center". These three research centers were integrated into AMEC in 2016, and then the symposium name was changed to "AMEC International Symposium on Medical and Health Technology (ISMHT)".

The program of ISMHT2017 includes organized sessions with invited talks, invited sessions, luncheon seminar, and plenary talk. The plenary talk will be given by a distinguished researcher, Takamichi Murakami (Kindai University, Faculty of Medicine). Each of five research divisions of AMEC is responsible for an organized session and invited talks related to the topics of research divisions. The invited talks will be given by, Shoji Hirano (Shimane University), Naomi Yagi (Hyogo College of Medicine), Koichiro Kato (Mizuho Information and Research Institute, Inc.), Koji Murai (Kobe University), Kyoko Namura (Kyoto University), Kazunori Nozaki (Osaka University Dental Hospital), and Chao-Cheng Wu (National Taipei University of Technology). Invited sessions will focus on medical topics, "Return to Sports" and " Diagnosis & Biomechanics of the Shoulder". In addition, a luncheon seminar will be given by Shinichi Yoshiya (Hyogo College of Medicine). This symposium is a very unique and fruitful symposium where medical doctors, co-medicals, and engineers all will gather together, and discuss state-of-the-art technology in interdisciplinary area of medical and engineering research fields.

On behalf of AMEC, I would like to acknowledge the chairs, organizers, local organizing committee members, and many others who have contributed. I would also like to acknowledge Dr. Md. Atiqur Rahman Ahad (University of Dhaka), General Chair of ICIEV2017, who has offered an opportunity to jointly organize this symposium with ICIEV. Finally, thank you very much to all speakers and attendees for making possible this great event. Without you all, ISHMT 2017 would be infeasible.

Syoji Kobashi
Symposium Chair of ISHMT 2017
Director of Advanced Medical Engineering Center
University of Hyogo

Message from Program Chairs

The ICIEV & ISCMHT provide vibrant opportunities for researchers, industry practitioners and students to share their research experiences, research results, ideas, review of various aspects and practical development experiences on Informatics, Electronics, Computer Vision and related fields. And, it also provides a chance for networking and exploring collaborations among researchers and institutions who are working in similar areas of study.

The ICIEV & ISCMHT 2017 has received many papers from around the world. Approximately 70 high quality papers were accepted. These papers make it possible to prepare an exciting and interesting program. We wish to thank our authors for sharing with us their research findings. We would like to take this opportunity to thank our program committee members and reviewers for their great efforts in reviewing the papers and offering valuable advice and comments to the authors.

As in previous years, our program is not only composed of the paper presentations, but also a rich variety of components. Especially, this year we are honored to have Professor Toshio Fukuda, Professor V.R. Singh, Professor Yasushi Yagi, Professor Mohamed-Slim Alouini, and Professor Anton Nijholt, being our keynote speakers.

We are sincerely hoping that all participants will have a rewarding and enjoyable time at this conference.

Program Chairs
Shahera Hossain and Manabu Nii

Program Co-Chairs
Takahiro Takeda and Hiroshi Tanaka

Message from Award Committee chairs

On behalf of the award committee, it is our great pleasure to welcome you to Himeji, Japan for 6th International Conference on Informatics, Electronics & Vision (ICIEV 2017). The committee discussed the selection process for best paper award winners. According to evaluation by peer reviewers and quality evaluation of the paper (originality, diversity, and impact), 4 finalists of best paper award, and 4 finalists of best student paper award had been selected. The winners will be awarded at the ceremony in the banquet. We strongly hope that the awards would promote the success of all the finalists.

Best paper award finalists
Paper ID: 15
Behavior Analysis of RBM for Estimating Latent Factor Vectors from Rating Matrix
Hiroki Shibata*, Tokyo Metropolitan University
Paper ID: 48
Wikipedia Entry Augmentation by Sub-merging Entities Based on Multilingual Ontology
Md. Tasnim Manzur Ankon*, Bangladesh University of Engineering and Technology (BUET); Muhammad Masroor Ali, Bangladesh University of Engineering and Technology (BUET)
Paper ID: 67
Analysis of classification results for the nursing-care text evaluation using convolutional neural networks
Manabu Nii*, University of Hyogo; Yuya Tsuchida, University of Hyogo; Yusuke Kato, University of Hyogo; Atsuko Uchinuno, University of Hyogo; Reiko Sakashita, University of Hyogo
Paper ID: 82
A 100nW 10-bit 400S/s SAR ADC for Ultra Low-Power Bio-Sensing Applications
Hugo França*, EPFL; Milad Ataei, EPFL; Alexis Boegli, EPFL; Pierre-André Farine, EPFL

Best student paper award finalists
Paper ID: 19
Prototype Development of Interactive Tactile Graphics Editor with LaTeX and Participant's Experience in Using the Editor
Yuji Masaki*, Toyama Prefectural University; Prof. Noboru Takagi, Toyama Prefectural University
Paper ID: 27
Coadsorption study of Pb and Sb on Cu (001) by low energy electron diffraction
Md Kabiruzzaman*, Kyushu University, Japan; Rezwan   Ahmed, Kyushu University; Takeshi Nakagawa, Kyushu University; Seigi Mizuno, Kyushu University
Paper ID: 50
Recognition of Overlapped Objects using RGB-D Senso
Mitsuhiro Yukitoh*, University of Hyogo; Takaaki Oka, University of Hyogo; Masakazu Morimoto, University of Hyogo, JAPAN
Paper ID: 111
Glioblastoma Multiforme Tissue Histopathology Images Based Disease Stage Classification with Deep CNN
Asami Yonekura*, Mie University; Hiroharu Kawanaka, Mie University; V. B. Surya Prasath, University of Missouri-Columbia; Bruce J. Aronow, Cincinnati Children's Hospital Medical Center; Prof. Haruhiko Takase Mie U

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Wang Dan
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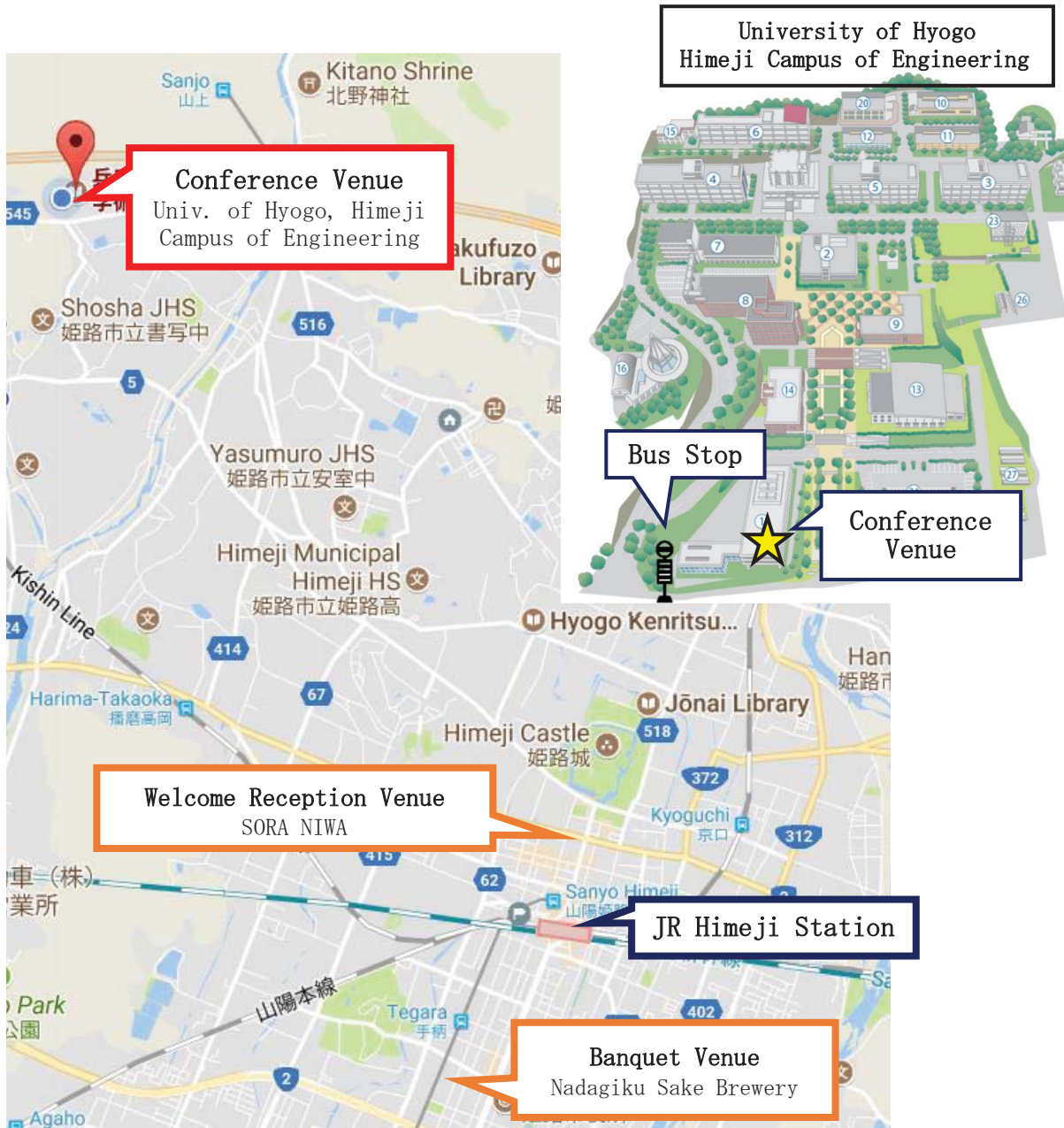*University of California, Berkeley, USA*

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Conference Venue

University of Hyogo Himeji Campus of Engineering

Conference Venue — Univ. of Hyogo, Himeji Campus of Engineering

Bus Stop

Conference Venue

Welcome Reception Venue — SORA NIWA

JR Himeji Station

Banquet Venue — Nadagiku Sake Brewery

Access

Taxi: Ask a driver to go to "Hyogo Kenritsu Daigaku **Shosha** campus".
It takes about 25 min and cost is about 3,000JPY cash from Himeji station.

Public Bus: Ride a bus from Himeji bus terminal #18 (see detail at next page), north side of Himeji station. All bus leaving from #18 will pass University of Hyogo.
The nearest bus stop is "**Kenritsu Dai Kougakubu**" (県立大工学部). It takes about 30min, and the fee is 370JPY (cash only).

Bus Terminal Map and Schedule (9/2 Sat. and 9/3 Sun.)

From Himeji Station	
H	**M in**
7	05 15 35 45
8	05 25 35 40 55
9	10 25 40 45 55
10	10 25 40 55
11	10 25 40 55
12	10 25 40 55
13	10 25 40 55
14	10 25 40 55
15	10 25 40 55
16	10 25 40 55
17	00 10 25 40 55

To Himeji Station	
H	**M in**
10	07 14 27 37 55
11	05 19 37 49
12	07 19 37 50
13	07 19 37 50
14	07 19 35 49
15	07 19 37 50
16	07 19 37 51
17	07 19 35 49
18	07 19 37 49
19	05 17 30
20	04 16 30

Welcome Reception

1ˢᵗ Sep. (Fri.), 630PM-830PM
Venue: SORA NIWA
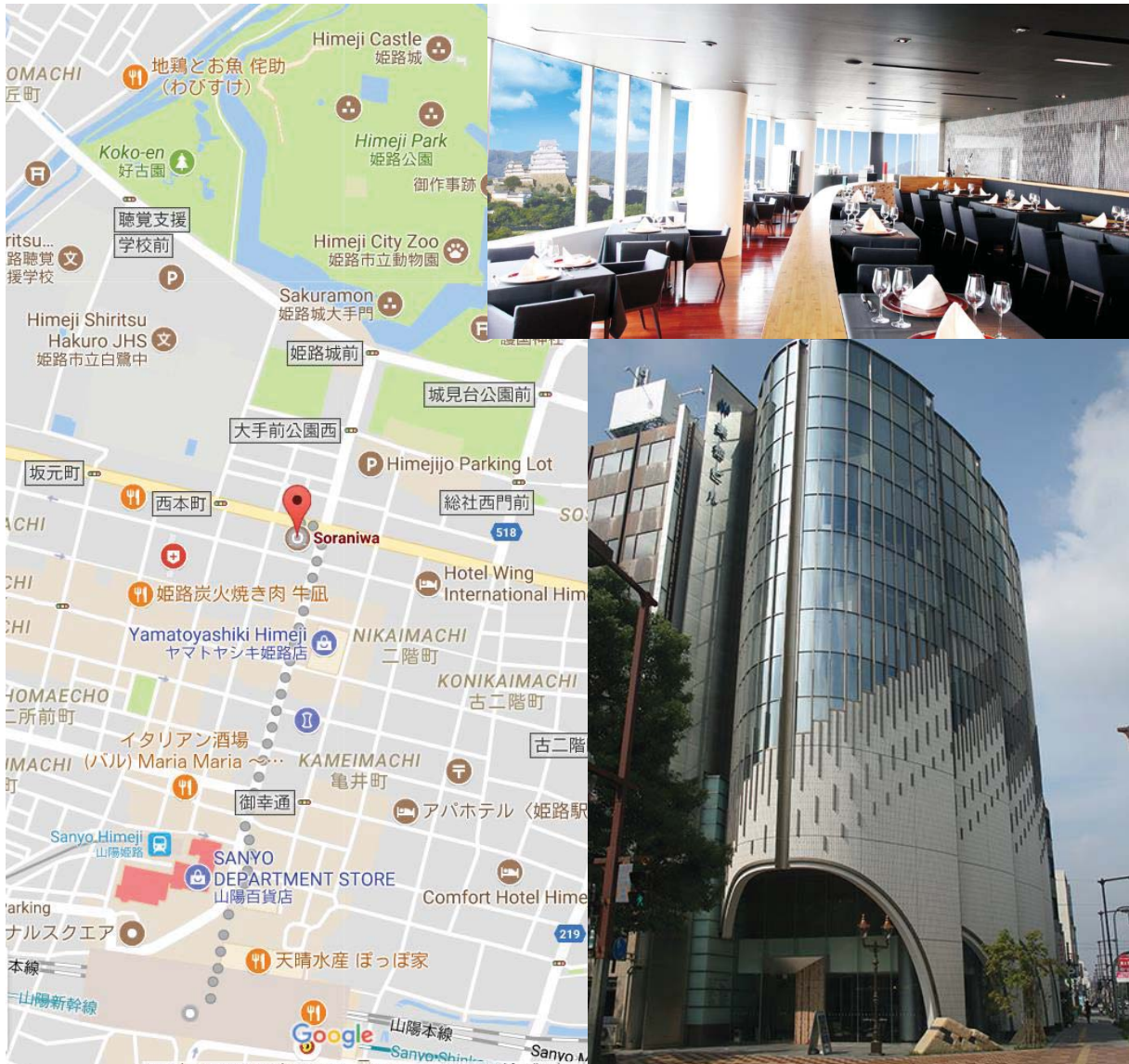
All attendees including student registration are invited. Note that the restaurant is not in the conference venue site. Please visit directly. 7 min walk from Himeji station.

Address: Miki Building 6F, 241, Honmachi, Himeji-shi, Hyogo.
Tel: 078-281-0070
Web-site: http://www.soraniwa-setre.com/

Banquet and Award Ceremony

2nd Sep. (Sat.), 700PM-900PM
Venue: Nadagiku Sake Brewery Co.Ltd.

Banquet ticket is required. Note that the restaurant is not in the conference venue site. Bus transportation from conference site will be served. Please gather in front of the registration desk on 610PM. No guarantee for late person. Or visit there by yourself.
The bus will return to Himeji station (not conference venue) around 930PM.

If you directory go to the banquet venue, you should take a train; "**Sanyo Railway**" (not JR), from *Sanyo-Himeji* (山陽姫路) station to *Tegara* (手柄) station by **local train**. It takes 2min, 150JPY. From the *Tegara* station, it will take 5min on foot.
Otherwise, you can walk to the banquet venue from Himeji station. It is 1.8km long, 25min walk.

Address: 1-121, Tegara Himeji-city, Hyogo.
Tel: 079-285-3111
Web-site: http://www.nadagiku.co.jp/en/access

Welcome reception (Sep 1st)

All attendees including student registration are invited. Note that the restaurant is not in the conference venue site. Please visit directly. 7 min walk from Himeji station.

Venue: SORA NIWA
Address: Miki Building 6F, 241, Honmachi, Himeji-shi, Hyogo, 670-0012
http://www.soraniwa-setre.com/

Banquet and Award Ceremony (Sep 2nd)

Venue: Nadagiku Sake Brewery Co.Ltd.
http://www.nadagiku.co.jp/en/access

Banquet ticket is required. Note that the restaurant is not in the conference venue site. Bus transportation from conference site will be served. Please gather in front of the registration desk on 610PM. No guarantee for late person. Or visit there by yourself. The bus will return to Himeji station (not campus) around 930PM.

Conference venue:

Himeji Engineering Campus, University of Hyogo

Access
Taxi: Ask a driver to go to "Hyogo Kenritsu Daigaku Shosha campus".
It takes about 25 min and cost is about 3,000JPY cash from Himeji station.

Public Bus: Ride a bus from Himeji bus terminal #18, in front of Himeji station. All bus leaving from #18 will pass University of Hyogo. The nearest bus stop is "Kenritsu Dai Mae". It takes about 30min, and the fee is 370JPY (cash only).
Time schedule:
2 Sep., 745, 805, 825, 835, 840, 855, 910, ...
3 Sep., 735, 745, 805, 825, 835, 840, 855, ...

Please visit ICIEV web (http://cennser.org/ICIEV/) for details.

Technical Program Schedule

Friday, 1st Sep, 2017

Venue: SORA NIWA (6F Miki-Building 241 Honmachi Himeji, Hyogo)

http://www.soraniwa-setre.com/

18:30 – 20:30	Welcome Reception

Saturday, 2nd Sep, 2017

Venue: Himeji Campus for Engineering, University of Hyogo (2167, Shosha, Himeji, Hyogo 671-2280)

http://www.u-hyogo.ac.jp/english/access/index.html#No2

	Room 2 (A102)	Room 3 (A202)	Room 4 (A203)	Room 5 (A208)	Room 6 (A206)	Reception
9:20-9:30	Opening (Room1: Main Room – A101)					
9:30-10:30	ICIEV Keynote speech 1 (Main Room – A101) **Toshio Fukuda, Fellow, IEEE, Nagoya University, Japan**					
10:40-12:00	AMEC Special Session 1	ICIEV Session 1-1	ICIEV Session 2-1	ICIEV Session 3-1	ICIEV Session 4-1	
12:00-13:00	Luncheon Seminar (Lunch Room – A401) **Shinichi Yoshiya, MD** **Dept. of Orthopaedic Surgery, Hyogo College of Medicine** **"Utilization of image analysis in joint surgery"**					
13:00-14:00	ICIEV Keynote speech 2 (Room1: Main Room – A101) **V.R. Singh, Life Fellow, IEEE** **National Physical Laboratory, India** **"Advance U-health Care Systems"**					Registration
14:00-15:00	ICIEV Keynote speech 3 (Room1: Main Room – A101) **Yasushi Yagi** **Vice-President, Osaka University, Japan**					
15:00-15:20	Poster Session & Coffee Break					
15:20-16:40	AMEC Special Session 2	ICIEV Session 1-2	ICIEV Session 2-2	ICIEV Session 3-2	ICIEV Session 4-2	
16:40-18:00	AMEC Invited Session	ICIEV Session 1-3	ICIEV Session 2-3	ICIEV Session 3-3	-	
19:00-21:00	Banquet and Award Ceremony					

Sunday, 3rd Sep, 2017

Venue: Himeji Campus for Engineering, University of Hyogo (2167, Shosha, Himeji, Hyogo 671-2280)

http://www.u-hyogo.ac.jp/english/access/index.html#No2

	Room 2 (A102)	Room 3 (A202)	Room 4 (A203)	Room 5 (A208)	Reception
9:30-10:30	ICIEV Keynote speech 4 (Room1: Main Room – A101) **Mohamed-Slim Alouini, Fellow, IEEE King Abdullah University of Science and Technology, KSA**				Registration
10:40-12:00	AMEC Special Session 3	ICIEV Session 1-4	ICIEV Session 2-4	ICIEV Session 3-4	
12:00-13:00	Lunch (Lunch Room – A401)				
13:00-14:00	AMEC Keynote speech (Room1: Main Room – A101) **Takamichi Murakami, Kindai University, Japan "Advanced CT and MR Imaging for Improving Diagnosis and Treatment Quality"**				
14:00-15:00	ICIEV Keynote speech 5 (Room1: Main Room – A101) **Anton Nijholt, University of Twente, The Netherlands**				
15:00-15:20	Poster Session & Coffee Break				
15:20-16:40	AMEC Special Session 4	ICIEV Session 1-5	ICIEV Session 2-5	ICIEV Session 3-5	
16:40-18:00	AMEC Special Session 5	ICIEV Session 1-6	ICIEV Session 2-6	ICIEV Session 3-6	

ICIEV Keynote 1

Medical robots and simulators

Toshio Fukuda

Nagoya University/Meijo University, Japan
Beijing Institute of Technology, China

Abstract

There have been so many robotic surgery systems developed so far, one of which is the Da Vincci Robotic System that is the most successful in the business market. Most robotic surgery systems are remotely controlled devices and systems and so the quality of the surgery heavily depends on the skill of the operators. Thus simulation is so important and necessary that medical doctors can have skillful training to operate those robotic systems and to understand and make the operation with confidence.

To this purpose, there are mainly two simulation methods developed in this field so far, such as virtual reality model based and physical model based methods. There are some comparisons between them, such as advantages and dis-advantages.

We have been developing an endovascular micro surgery system and also an evaluation simulation system, whether the surgery performance is good for human doctor and/or robotics system.

This simulator, Endovascular Evaluator (EVE) is made by the micro technology using the CT data of patients in the brain and other organs. It turned out to be very efficient and useful for evaluating and transferring the skill of medical doctors and also important to develop different catheter devices as well as stents and flow diverters. It can also be used for medical applications to make the aneurysm developing process scientifically clear.

Endovascular Evaluator (EVE)

ICIEV Keynote 2

ADVANCED U-HEALTH CARE SYSTEMS

Prof (Dr) V.R.Singh, Life Fellow- IEEE

Chair, IEEE-IMS/EMBS Delhi

National Physical Laboratory, New Delhi-110012, India

Abstract

As is aware, there is a rapid progress in health care technology, day by day. With the advancement in technology, newer and newer diagnostic and therapeutic systems are being developed, for better health care. Ubiquitous systems are very effective and useful, these days, particularly for maintaining the health, any where, any time, for any one. Wireless sensor networking (WSN) technology is applied easily for u- health care in various harsh environments. Advanced u-health care systems are presented here.

Design and development aspects of advanced sensor systems are discussed for such healthcare applications. Different types of diagnostic and therapeutic devices and sensing systems are described. U-technology is very useful to monitor, in particular, the health of old age patients, living in isolated areas like hills. Medical abnormalities are sensed and transmitted with u-sensors to main city hospital. After proper analysis by the doctor, appropriate advice/precaution is telemetered back to the patient for better critical care and therapeutic treatment, before shifting to a hospital. Examples of some diseases are given here. Strokes are more serious to be dealt with. Cancer nanotechnology and high intensity focal ultrasound system for the treatment of deep seated brain tumours, are given, as case studies.

The advanced u-health care systems are thus very effective and useful for better health care, in a reliable manner, at low cost.

ICIEV Keynote 3

Measurement of Transparent or Translucent objects

Yasushi Yagi

OSAKA University, Japan

Abstract

The studies in our laboratory focus on theory and applications related to computer vision and media processing. Some of the major research projects undertaken in the laboratory involve the creation of novel optical sensing systems including the omni-directional vision system, and the development of algorithms for human sensing, human behavior analysis, gait analysis, geometrical analysis and computational photography.

Especially, we have been studying creation of novel optical sensing systems for more than 25 years. Today, I will introduce several special sensing systems for computer vision.

Measurement of transparent or translucent objects is an important technology with broad potential applications. In the computer vision field, computational photography approaches that combine optical design and computational algorithms to obtain informative images have been actively developed to enhance and restore images. However, it remains difficult to recover invisible information contained within transparent or translucent objects because light penetrates and scatters inside the object, heavily degrading observed images. Second my talk is about our special sensing system using either spatially or temporally modulated light. This optics, for example, can remove scattering lights from observation, by projecting high frequency patterns. I will show several recent researches on the topics.
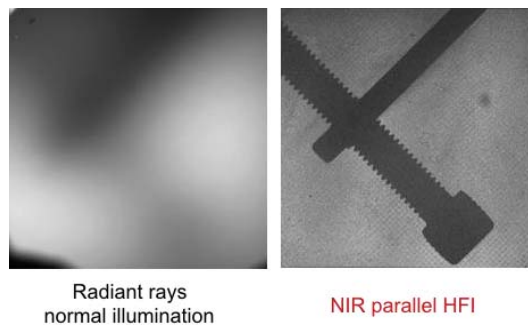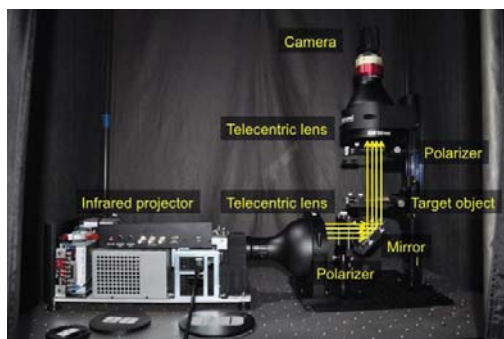
Descattering Transmissive Observation using Parallel High-frequency Illumination

ICIEV Keynote 4

High-speed Underwater Wireless Optical Communication: Potential, Challenges, and Preliminary Results

Mohamed-Slim Alouini

Computer, Electrical, and Mathematical Science and Engineering (CEMSE) Division
King Abdullah University of Science and Technology (KAUST)
Thuwal, Makkah Province, Saudi Arabia

Abstract

Traditional underwater communication systems rely on acoustic modems due their reliability and long range. However their limited data rates, lead to the exploration of alternative techniques. In this talk, we briefly go over the potential offered by underwater wireless optical communication systems. We then summarizes some of the underwater channel challenges going from severe absorption and scattering that need to be surpassed before such kind of systems can be deployed in practice. We finally present some of the on-going research directions in the area of underwater wireless optical communication systems in order to (i) better characterize and model the underwater optical channel and (ii) design, develop, and test experimentally new suitable modulation and coding techniques suitable for this environment.

ICIEV Keynote 5

Playable Cites: A Survey

Anton Nijholt

University of Twente, The Netherlands

Abstract

Digital technology can make cities smart. City managements can make use of in-formation that can be extracted from databases in which data is collected about energy consumption, traffic behavior, waste management, human behavior in public environments and opinions of the general public, for example as they can be collected from social media. But can this digital technology and the data collected from it help to make living in a city more enjoyable? How can digital technology and information provided by digital technology make cities playful, allow citizens to engage in playful and entertaining activities that help to enjoy their daily and sometimes boring activities such as travelling, working, child care, house-keeping? This paper investigates how sensors and actuators in an urban environment can be introduced and used to design playful applications. We observe how ideas about playable cities emerge and develop. Interactive digital installations can provide fun, urban games can provide fun, but the experiences obtained from them can as well provide urban designers, architects, gamification and public media designers with information about public behavior and preferences that can be used in urban design and architecture.

ICIEV Invited Talk 1

Topological Approaches for Simultaneous Localization and Mapping

Naoyuki Kubota

Tokyo Metropolitan University, Japan

Abstract

Recently, various types of robots have developed for the exploration and monitoring in unknown and dynamic environment. Especially, the expectation of robots used in disasters is increasing to prevent the second disaster. Especially, it is very important to extract the environmental information related for remote control and monitoring of mobile robots. Simultaneous localization and mapping (SLAM) is an important methodology to deal with environmental information. Various types of methods for SLAM have been proposed such as Extended Kalman Filter (EKF) SLAM, Graph SLAM, visual SLAM, and cooperative SLAM. In general, there are two main approaches of grid mapping and topological mapping in the study on SLAM. In this talk, we focus on topological mapping methods to extract environmental features from a 3D point cloud. Various types of unsupervised learning methods based on topological mapping have been proposed to deal with environmental features in unknown environments. One of them is Growing Neural Gas (GNG) that can dynamically change the topological structure composed of nodes and edges. The advantage of GNG is in the incremental learning capability of nodes and edges according to target data distribution. We have proposed several different topological mapping methods based on GNG to extract the environmental features from a 3D point cloud until now.

In this talk, we explain the research background of SLAM, the learning algorithm of GNG, and experimental results of GNG for SLAM in various environments. Next, we explain multi-layer GNG to extract hierarchical features in environmental maps as a multi-scale approach, and batch learning algorithm for GNG (GL-GNG) to improve the convergence property. Furthermore, we explain the modified method of GNG-utility (GNG-U), that we called GNG-U2. GNG-U2 can improve the real-time adaptability of extracting topological structure in non-stationary data distribution. Next, show experimental results of SLAM based on GNG-U2 in dynamic environments. Finally, we show several other application examples of topological approaches, and discuss the applicability and future direction of topological approaches in robotics.

ICIEV Invited Talk 2

Information for safe navigation and the concept of collision avoidance

Ruri SHOJI

Tokyo University of Marine Science and Technology, Japan

Abstract

Maritime transport plays an important role in Japan's trade, and marine accidents can cause significant losses to the economy and human life. So "safety" is most importance factor to the ship's navigation. In this paper, it shows what safe navigation is and I will describe the idea of collision avoidance with other ships and autonomous of ship navigation.

1. Introduction

Japan is largely dependent on energy and food resources imported from overseas, and 99.6% (weight basis) of Japan's imports and exports are due to maritime transport. If a maritime accident occurs, it will suffer economically enormous damage. So, in ship operations, ensuring safety is the most important.

2. What is Safe Navigation ?

In order to realize safe navigation, it is necessary to know the information of ship's condition and surrounding conditions, and consideration of the capabilities of the ship. Also, safe navigation means the operation which does not encounter a dangerous thing (obstacle), and dangerous thing mean (1) disturbance such as wind and wave (low pressure), (2) land and shallow etc. and (3) other vessels.

In the case of (1), predict the wind and wave condition that would be encountered during the voyage, consider the ability to respond to the disturbance of the ship (seakeeping and seaworthiness: Performance that can safely navigate against the danger of the dangers such as weather, wave condition etc.), estimate the ship's performance (speed, engine output, ship's motion, etc.) in disturbance at actual sea and the ship select the optimum route. Normally, the technique of Weather Routing is used. In the case of (2), using highly accurate information from nautical charts and related organizations, ship navigates so that the ship's position does not overlap with the dangerous place. In the case of (3), it is necessary to recognize the positional relationship between other ships and the other ship's behavior (encounter situation) and control to avoid collision with other ships.

Here, I will explain the necessary information and the idea of collision avoidance in case (3) .

3. Idea of Collision Avoidance

First, it is necessary to grasp the information on the situation around the ship during navigation. To know the existence of other ships and their behavior, we use information from visual observation, radar, AIS, etc. But it is important to consider that there is a ship that cannot be grasped by any observation. In addition, it is necessary to consider the navigation regulation should be applied.

Also, because ships are large in size, slow moving and may be affected by disturbances in ship maneuvering, we must take into consideration the safety passing distance between two ships. In order to realize above, it is necessary to navigate avoid a place where there is a possibility of collision existing on the course of the other ship, that is, OZT (Obstacle zone by target). OZT method can show the course that ship can easily dealing with a change in the movement of the other ship.

4. For Autonomous Navigation

In the shipping industry, autonomous maritime transport system has begun to be studied from the use of development of communication and information technology, countermeasures against seafarers shortage, etc. and IMO has also begun to consider about the issue of autonomous navigation. In order to promote autonomous and automation, there are still many problems such as monitoring of highly accurate information on ships during navigation, establishment of methods such as automatic avoidance, improvement of laws etc. Also, it is need to take a long time to realize complete unmanned navigation of the ship. However, it is expected that the results of study and research on autonomous will lead to reducing the burden on current seafarers.

ICIEV Invited Talk 3

Strategies for Imbalanced Pattern Classification for Digital Pathology

Gerald Schaefer

Department of Computer Science, Loughborough University, Loughborough, U.K.

Abstract

Pattern classification tasks in digital pathology, which involves the analysis of high resolution digital slides of tissue samples for medical diagnosis, are, like many other medical decision making processes, often imbalanced. This means that there are (many) more training samples of some classes available compared to others, while it is often the minority class(es) that are of medical interest. In this paper, we present strategies for addressing class imbalance in pattern classification problems including the development of cost-sensitive fuzzy classifiers and the derivation of ensemble classification methods, that is classifiers that employ multiple predictors, dedicated for imbalanced classification.

ICIEV Invited Talk 4

Development of a Health Education Model

Stephen Shervais[1] and Thaddeus Shannon[2]

[1]Eastern Washington University, U.S.A.
[2] Western Oregon University, U.S.A.

Abstract

Changing demographics, patterns of funding, and demands of society present policy-makers with a severe challenge when allocating resources to higher education for both general education and for health services education. The full impacts of resource decisions may not be seen until one or more four-year educational cycles have been completed. Policy-makers require tools that will let them easily assess the impacts of a range of possible choices. We present preliminary work on both a Systems Dynamics model and a Markov model designed to do just that.

The Markov model is a simple chain of transition probabilities, designed to validate the Systems Dynamics model over a linear range. The Systems Dynamics model presents a more friendly user interface, and is capable of dealing with recursive and non-linear effects of the system.

This presentation will describe the structure of the Oregon state higher education system, and show how it is captured in the present model. Some preliminary results will be described.

AMEC Keynote

Advanced CT and MR Imaging for Improving Diagnosis and Treatment Quality

Takamichi Murakami, MD.,PhD.

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Kindai University Faculty of Medicine, JAPAN

Abstract

Fast imaging techniques of CT and MRI can provide high temporal and spatial resolution images which can improve the detection, characterization and staging of disease. They also enable us to perform not only 3D imaging that reveals morphologic 3D information of organ but also 4D imaging that shows organ movement and flow direction.

We can have functional imaging of brain and liver, etc. by using sequential scanning after an injection of extra cellular (such as perfusion CT) or tissue specific contrast medium (Gd-EOB-DTPA). These are very helpful for pretreatment planning and treatment effect evaluation.

Dual energy CT (DECT) imaging has the ability to make not only material density images but also monochromatic images. Optimal KeV monochromatic CT image can improve lesion contrast. DECT with multiple material decomposition (MMD) technique now can estimate amount of fat deposition and fibrosis quantitatively.

Multimodality fusion imaging using the complementary imaging examinations, such as US, MDCT and MRI, is very useful for pretreatment planning, adequate treatment and precise evaluation of treatment effect.

I would like to introduce recent progress multimodality and multidimensional imaging for improving diagnosis and treatment quality

AMEC Luncheon Seminar

Utilization of Image Analysis in Joint Surgery

Shinichi Yoshiya, MD

Dept. of Orthopaedic Surgery, Hyogo College of Medicine

Abstract

Accurate analyses of images obtained from radiological, MRI, and endoscopic examinations are critical for an orthopedic surgeon to conduct a good surgery. In this talk, I will show several examples for utilization of image analysis in joint surgery.

Arthroscopic surgeries for knee ligament and meniscus injuries are one of the most frequently performed procedures. Preoperative surgical planning based on MRI images, surgical procedure guided by arthroscopic images, and postoperative evaluation of surgical accuracy represent sequential processes of surgical management.

Number of total joint (hip and knee) replacement procedures performed each year is more than 100,000. In this surgery, accurate placement of the implant (prosthesis) in reference to the bone is critical to achieve satisfactory long-term outcome. Use of computer assisted surgery (surgical navigation) can improve accuracy and consistency of prosthetic implantation. In the postoperative evaluation, analysis of implant positioning based on three-dimensional (3D) CT image analysis and 3D joint motion analysis using 2D/3D image registration method provide valuable information regarding the surgical performance.

Osteotomy (correction of angular bony deformity by making bony cut, deformity correction, and bony fixation) is another major procedure in joint surgery. Accurate correction of the deformity with restoration of normal bony geometry should be attained at surgery. Therefore, surgical planning based on preoperative radiological image, intraoperative confirmation of deformity correction, and postoperative evaluation of surgical accuracy are the important sequence to achieve the goal of surgery.

AMEC IS-1

The ESWT (extracorporeal shock wave therapy) for musculoskeletal disorders

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1Kaohsiung Chang Gung Memorial Hospital, Department of Orthopaedic Surgery, Kaohsiung, Taiwan
2 Kaohsiung Chang Gung Memorial Hospital, Center for Shockwave Medicine and Tissue Engineering, Kaohsiung, Taiwan
3 Xiamen Chang Gung Hospital, Fujian, China, Xiamen, China

Abstract

Shock waves are three-dimensional pressure pules of microsecond duration with a peak pressure of 35-120 MPa. Technological advancements of medical shockwaves made over recent years have broadened the spectrum of its clinical application from being just purely a destructive force, into a treatment modality that engenders a myriad of genesis effects associated with tissue regeneration.

Currently used focused shock wave systems differ in their design and depend on whether the shock waves are generated by electrohydraulic, electromagnetic or piezoelectric mechanisms. Observation of its biochemical and biocellular responses have noted progenesis effects such as angiogenesis, osteogenesis, and tendogenesis.

ESWT has been successfully applied to the treatment of tendinopathy of the shoulder, ellow, patella, Achilles, and the calcaneus, and also union of the long bone. Recently, ESWT utility was expanded to the cardiology, andrology, diabetiec neuropathy, uterine fibrosis, etc. to improve the life quality while reducing the burden of healthcare.

AMEC IS-2

Accelerating Muscular Enzyme Recovery and Pain Mitigation of Elite Athletes Using Hyperbaric Oxygen Therapy

Wen-Yi Chou[1], MD; Jih-Yang Ko[1,2], MD

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Chang Gung University College of Medicine, Kaohsiung, Taiwan

Abstract

Background: Accelerating the muscular fatigue recovery of athletes and mitigating the pain are the goals that have received considerable attentions from the elite athletes and specialists in sports medicine worldwide. In recent years, numerous studies have been discussing about the feasibility of using hyperbaric oxygen therapy (HBOT) in treating musculoskeletal injuries and improving exercise-induced fatigue.

OBJECTIVE: The purpose of the present study was to evaluate the effects of HBOT on the catabolic muscular enzymes (CMEs), muscle pain intensity, and pain interference of elite baseball players.

RESEARCH DESIGN AND METHODS: A prospective double-blind, randomized control trial was conducted with the approval by the institutional review board of our institute. 41 participants were recruited between June 2014 and December 2015 and were divided into a study group and control group with 20 and 21 participants, respectively. All the participants received either HBOT or placebo sessions twice in a week using a hyperbaric chamber. For the study group, the chamber was pressurized to 2.5 atmospheric absolute (ATA) while breathing pure oxygen. For the control group, the chamber was pressurized to 1.3 ATA while breathing normal air. The duration of each session was 100 min, and ten sessions were completed in five weeks for each participant. The

outcome evaluations consisted of subjective brief pain inventory (BPI) and objective serum CMEs, including blood urine nitrogen (BUN), creatine phosphokinase (CPK), lactate (LT), glutamic-oaa transaminase (GOT), and myoglobin (MB). Data were collected before the treatment (T1), during the treatment (end of fifth HBOT; T2), after the treatment (end of tenth HBOT; T3), and follow-up (two weeks after the tenth HBOT; T4).

RESULTS: In the study group, average reduction of CPK, GOT, and MB were 30.7%, 12.6%, and 37.2% from T1 to T4, respectively. These enzymes of the two groups achieved significant differences at T3 ($p<.001$). Although there were no significant differences of BUN and LT in two groups, the serum level is relatively stable in study group. In terms of pain intensity and pain interference, the study group showed significant improvement at T3. In contrast, the control group showed no significant improvement in CMEs and BPI.

CONCLUSIONS: HBOT facilitates the recovery of the catabolic muscular enzymes and alleviates exercise-induced muscular pain in elite baseball players. We concluded that HBOT is an alternative modality to accelerate the recovery from exercise-induced muscle pain and fatigue.

AMEC IS-3

Analysis of Throwing Motion

Hiroki Ninomiya, Hiroshi Tanaka, Hiroaki Inui, Masahiko Komai, Katsuya Nobuhara

Nobuhara Hospital and Institute of Biomechanics, Tasuno, JAPAN

Abstract

Throwing motion needs sufficient physical strength of the shoulder and efficient coordination of the trunk and lower extremity movement. To prevent the occurrence of throwing injury, the biomechanical analysis of throwing motion it is absolutely necessary.

In order to investigate quantitative understanding and evaluate each individual throwing motion being complex, the Graphical User Interface - based kinematic and kinetic analysis System (Nobuhara Hospital, Japan) was developed. 448 pitchers were measured their actions with various performance levels using a Motion Capture System. The resultant joint forces and moments in the wrist, elbow and shoulder were estimated using the inverse dynamics technique.

Results: Consequently, a horizontal adduction of 5.5 [deg] and an abduction of 87.8 [deg] caused the minimum resultant force of the shoulder in terms of anterior/posterior and superior/inferior forces at ball release (BR). Horizontal abduction position increased resultant force at BR. Maximum Horizontal Abduction angle in cocking phase affected horizontal abduction/adduction angle at BR

The results were computed by our system promise to vastly simplify the quantitative evaluation of throwing injury. Throwing motion is performed by the kinetic chain reaction. The throwing injury is induced by a disorganized motion of other regions, joints or the spinal column in a large number of cases. Conservative medical treatment is performed for the purpose of a modification of a kinetic chain reaction. We perform the operation on the case which does not have an effect of conservative treatment and has irreversible change of structure tissues.

To prevent the occurrence of throwing injury, the biomechanical analysis of throwing motion it is absolutely necessary. Our system promises to vastly simplify the quantitative evaluation of throwing injury.

AMEC IS-4

How is biomechanical knowledge useful for understanding shoulder disorders?

Hiroaki Inui, Muto Tomoyuki, Hiroki Ninomiya, and Katsuya Nobuhara

Nobuhara Hospital & Institute of Biomechanics, Hyogo, JAPAN

Abstract

Shoulder has a wide range of motion. Contact point between the glenoid and the humeral head, tension of soft tissue, and alignment of muscles connecting the bones drastically change in its range of motion. Mechanism stabilizing shoulder joint is influenced by arm positioning. Assessment of joint stability should always take arm positioning into consideration. In fact, there is a subtle instability which can only be detected when the arm is elevated. The glenoid dysplasia might be a cause for its instability. These findings can be detected only by 3D computer generated images except in some typical cases.

Generally, joint stability is judged by location of the humeral head center in the glenoid. More intricate approach is necessary for some disorders. Analysis of contact area and other glenohumeral relation can clarify instability which cannot be detected through investigating location of joint center. The studies using those parameters showed that the joint is inherently unstable with the arm externally rotated at 90 degrees of elevation, and that joint positioning would be more apt to be affected from the cocking to the acceleration phase during throwing activity. We think such instability might lead to throwing disorders.

AMEC IS-5

MRI-based 3D-shape model improves diagnosis of rotator cuff tear

**Tomoyuki Muto [1], Hiroaki Inui [1], Hiroshi Tanaka [1]
Kazuki Ishiro [2], Kento Morita [2], Hiroki Ninomiya [1],
Masahiko Komai [1], Yoshiaki Kanatani [1], Kotaro Hashimoto [1],
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Abstract

MRI based 3D-shape model of soft tissue has already applied in various clinical fields. In orthopedics, its clinical application would be strongly contributed to improving diagnostic accuracy of rotator cuff tear. The purpose of this study was to compare shape and size of torn tendon of rotator cuff in reconstructed 3D-shape model to that in intraoperative findings, and to investigate the influence of employing 3D-shape model on accuracy of diagnosis for rotator cuff tear. MRI scan was carried out for 30 patients with rotator cuff tear before surgery. 3D-shape models of rotator cuff tendon and torn tendon were acquired using a standard image processing software. Four shoulder surgeons, such as 2 residents and 2 specialists, reviewed preoperative shoulder 2D-MRIs and 3D-shape model of rotator cuff tear for assessing shape and size. As a result, the accuracy for evaluating shape of torn tendon using 2D-MRIs in a group of residents was significantly lower than a group of specialists. But, there was no significant difference in the accuracy for assessing shape of torn tendon using 3D-shape model of rotator cuff tear among 4 shoulder surgeons. The findings in this study suggest that 3D-shape model could improve diagnosis of rotator cuff tear.

AMEC IS-6

Estimation of shoulder muscle-force during arm abduction in the simulated rotator cuff repair

Hiroshi Tanaka[1], PhD, Toyohiko Hayashi[2], PhD, Hiroaki Inui[1], MD, PhD, Tomoyuki Muto[1], MD, PhD, Hiroki Ninomiya[1], MD, and Katsuya Nobuhara[1], MD, PhD

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Abstract

Rotator cuff repair is usually performed by reattaching the torn tendon edge to the anatomical insertion site. It is clinically important to know how shoulder muscle force production changes when the reattachment site of the supraspinatus, which is involved in almost all rotator cuff tears, is shifted medially to the original insertion site. The aim of our study was to estimate shoulder muscle-force production varying with the supraspinatus muscle fiber insertion site utilizing a MR/CT image-based musculoskeletal model.

To reproduce the arm abduction in the scapular plane, the shoulder and the elbow of a healthy volunteer were scanned by CT and an open-MR system (the neutral position with CT and five positions of arm abduction in the scapular plane with an open-MR system). Eight shoulder muscles were represented plural straight lines on the surface of 3D anatomic model. Subsequently, three patterns of the supraspinatus insertion sites were determined as follows: anatomical (AI) insertion site, 5mm and 10mm medially-shifted insertion sites (5MS, 10MS). Finally each shoulder muscle -force production of every muscle line was estimated to minimize the summation of each unit muscle force production using an optimization algorithm.

Supraspinatus muscle-force productions in 5MS and 10MS decreased (range: 2.2 to 71.7%) during arm abduction in comparison with that in AI. Moreover, mostly muscle force productions of the infraspinatus, subscapularis, and deltoid anterior portion increased during arm abduction. Additionally, the muscle-force production patterns of the deltoid middle portion were associated with the muscle-force production patterns of the supraspinatus.

Our findings described that the compensatory action and the deltoid middle portion-supraspinatus force couple were performed to be varied with the supraspinatus muscle fiber insertion site. Any deviation of <5 mm form the anatomical insertion site possible improve clinical outcomes after rotator cuff repair.

AMEC SS1-1

The Application to Maritime Society of Patch-type Device

Koji Murai

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Abstract

In the maritime society, especially, we sometime find the news of marine collision accidents. Regarding the education and training of ship handling for safe navigation, it consists of lecture, exercise, ship handling simulator (simulator), and training ship.

The some kinds of simulator is making the big impact for the effective education and training tools, and the simulator is used to get the overall skill for the ship handling at sea; however, now we should be confirmed the methodology of how to use, how to assess as a better utilizing the simulator. It deeply depends on the instructor of simulator training. The interesting points are to develop a methodology of effective education and training using ship handling simulator; to assess elements on simulator-based education and training, to develop a new assessment methodology utilizing physiological index.

Physiological indices, heart rate variability (R-R interval), salivary amylase/nitric acid, and facial (nasal) temperature, are sufficient to evaluate the mental workload of a ship bridge teammate: a captain, a duty officer, a helmsman and a pilot. The safe navigation keeps with bridge team work, it is not only a duty officer; moreover, the sensor technology is developing day after days, and it is able to measure various kind human data without stress.

In this conference, I introduce the applications to maritime society of patch-type device: 1) evaluation of - simulator-based education and training, 2) - teamwork, 3) - performance of sea pilot, 4) - performance of port coordinator who is operator of coastal radio station.

AMEC SS1-2

Development of a capacitive force sensor for artificial joint

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Abstract

Soft tissue tension is thought to have a great effect on the clinical performance of total joint replacement; such as shoulder, hip, knee, or ankle. However, there have been no reports quantifying these soft tissue tensions intraoperatively. For the shoulder, reverse total shoulder arthroplasty has been used in Japan since 2014. So the purpose of this study is to develop an instrument which tells us soft tissue tension intraoperatively. Surgeons would be able to utilize the measured values when assessing stability of the joint intraoperatively. We are developing the instrument using capacitive one-dimensional force sensors to measure the soft tissue tension for reverse shoulder arthroplasty. A capacitive one-dimensional force sensor can be made less than 1mm in thickness. And an electric circuit which measures its amount of capacitances also could be made pretty small. That's because we use capacitive force sensors for measuring the soft tissue tension. The whole instruments have to be sufficiently small enough such that its outer geometry could be same to an existing prosthesis. While a capacitive force sensor is good in its dimensions, however, it is very sensitive to noise. We try to improve signal noise ratio having whole dimensions small enough. Now, we have designed a 5mm diameter capacitive one-dimensional force sensor to operate in the 0-150N force range.

This direction hopefully would be one of the promising ways for good clinical outcomes of joint replacement.

AMEC SS1-3

Design of Ultra-low Power Processer for Human Sensing

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University of Hyogo, JAPAN

Abstract

The declining birthrate, the aging society and lifestyle diseases such as heart disease and diabetes related to changes in the social environment have raised interest in safety, welfare and health care problems. In order to live healthily from these social problems, it is very important to observe our daily activity and physical condition continuously which we call "human sensing" with no assistance of others and to detect serious diseases at an early stage. It is also necessary that the system should be compact, long-term usable and sold at lower price for many people to make daily measurements without discomfort. We have been developing a small and low power MEMS (Micro Electromechanical Systems) devices and integrated circuits. And we aim to develop low power consumption devices, sensors and power generation devices from MEMS technologies for this system. In this study, we would discuss mainly the integrated circuit part which has an important role to control the whole system. Human sensing device aims to acquire five data that including ECG (Electrocardiogram), acceleration, atmospheric pressure, temperature, and humidity. However, ECG and acceleration can change quickly so that it requires higher sampling rate although other sensors are not required. The higher sampling rate increases power consumption because of a higher operation frequency. We have developed a special circuit that extracts valuable data such as the heart rate from the ECG, the maximum and minimum values of acceleration, and the number of steps from the acceleration with low power consumption. Moreover, we are designing analog front-end circuit and digital circuits such as MPU (Micro Processing Unit) and memory in one chip by using CMOS technology. These works enable long-term operation and miniaturization of the human monitoring system.

AMEC SS1-4

Fabrication of ZnO/HfO$_2$/ZnO nanowire capacitors by MOCVD

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Abstract

Nonvolatile ferroelectric random access memory (FeRAM) is a promising candidate for internet of things (IOT) because of extremely low power consumption. However, its high integration has not been achieved yet owing to a difficulty in downscaling of the memory cell including one transistor and one capacitor. One of the solutions to realize the very small capacitors is the employment of multi-shell nanowires (NWs) including ferroelectrics. We have already established fabrication process of ferroelectric NWs/nanotubes by metal organic chemical vapor deposition (MOCVD) using conductive ZnO NWs as a template. Hence, we have proposed the introduction of ZnO/HfO$_2$/ZnO NW capacitors into FeRAM memory cells using HfO$_2$ as a ferroelectric. In this study, we focus on the crystallization of HfO$_2$ layers on ZnO NW.

ZnO NWs used as a template for NW capacitors were grown on Pt-covered SiO$_2$/Si substrate by MOCVD using Zn(C$_2$H$_5$)$_2$ and O$_2$ as a precursor and oxidizing gas, respectively. HfO$_2$ was also deposited on ZnO NWs templates at 200°C using Hf(O-t-C$_4$H$_9$)$_4$ and O$_2$ as a precursor by MOCVD. Subsequently, crystallization of HfO$_2$ layer was induced by rapid thermal annealing (RTA) at 600~1200°C for 5min in N$_2$ before top electrode deposition.

The diameter and aspect ratio of ZnO NW used as template were 200nm and 55, respectively. HfO$_2$ thin film with a thickness of 20nm was uniformly deposited on ZnO NWs by MOCVD. Ferroelectric orthorhombic phase was obtained by RTA below 900°C while paraelectric monoclinic phase was appeared by RTA at 1000 and 1200°C.

AMEC SS2-1

Modeling of Nano-Bio Interfaces based on Atomic Scale Simulations

Koichiro Kato

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Abstract

In recent years, great interest has been paid to nano-biotechnology. Various researches such as design of next generation devices and safer implants have been actively carried out. In this field, it is important to understand interactions between biomolecules and solid surfaces. To understand the interactions, experimental observation and analytical method are mainly used, and there are not many studies using theoretical and computational methods. From the viewpoint of complementing the experimental results, computational simulations that can quantitatively analyze microscopic information such as atomic arrangement and interaction such as electrostatic attraction or hydrogen bonding should be also useful. The most widely used computational method is molecular dynamics (MD) with classical force field (FF). By using MD, it is possible to perform statistical analysis incorporating the dynamic fluctuation of the target. On the other hand, quantum mechanical (QM) calculations with higher accuracy than the classical FF is also being applied. However, applicable methods and systems are limited because of its high computational cost.

One promising QM approach for large-scale and complex molecular systems is the fragment molecular orbital (FMO) method [1, 2]. By using the FMO method, there is a possibility to analyze the interaction between the surfaces and the biomolecules. In this presentation, I will introduce applications of the atomic scale simulation in nano-biotechnology, mainly on interaction analysis between the hydroxyapatite surface and a designed peptides motif by using the classical MD and the FMO method [3].

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AMEC SS2-2

Manipulation of individual cells based on dielectrophoresis using a microdisk electrode with a microcavity

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University of Hyogo, JAPAN

Abstract

The handling of individual cells is important for investigating characteristics of cells. Dielectrophoresis (DEP) by the microelectrode have been applied to manipulate single target cells as a micro−tweezer [1−2]. A target cell was trapped by positive DEP (p-DEP) and released by negative DEP (n-DEP). However, the DEP force must be continuously applied during a cell transfer, because the trapped cells were released from the electrode tip by turning off the voltage. The cell damage should arise by exposing the cell to the strong electric field formed at the tip for a long period. In this presentation, we have applied DEP manipulation by a microdisk electrode with the microcavity for manipulating individual cells to pick up, transfer and relocate cells at the desired position.

Pt microelectrode tip (20 μm diameter) with the microcavity (10 μm depth) was positioned near the target cell on the indium-tin oxide (ITO) substrate. AC voltage (10 V_{pp}, 10 MHz) was then applied to pick up the cell by p-DEP. The trapped cell was transferred to the desired position. To release cells, repulsive force of n-DEP (2.0 V_{pp}, 1.0 kHz) was employed.

The target cell was moved toward the electrode tip and captured in the microcavity fabricated on the top of tip by p-DEP. The average velocity directly before the cell was trapped reached at ca. 600 μm s^{-1}. The velocity increased with increasing the applied voltage due to the increase of the electric
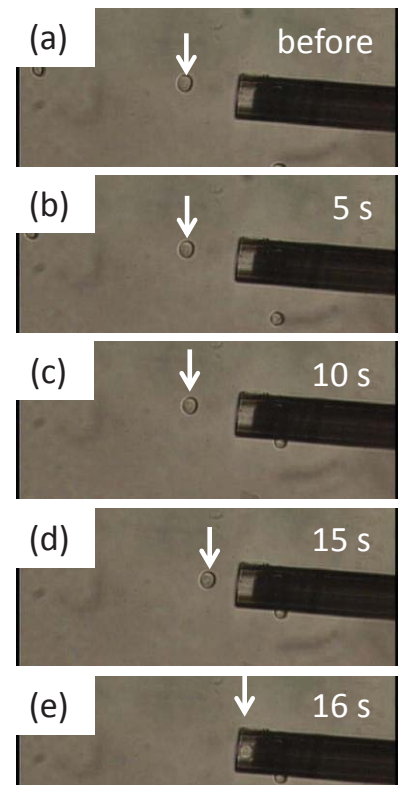

Figure 1. Images for capturing a cell in the cavity (a) before and (b) 5, (c) 10, (d) 15, and (e) 16 s after applying the voltage.

field around the tip electrode. The trapped cell released gradually and positioned at the point of the tip after the frequency were applied for n-DEP.

The patterning with cells was performed by the capture and release of individual cells with p- and n-DEP. The trapped cell has been remained in the microcavity during the transfer to the desired position. The trapped cell was then released from the microcavity by n-DEP. The procedure of capture, transfer and release of the cell was repeated for other cells, resulting in the pattern "T" was formed with 12 cells. The present system is promising for applications to the restoration of the patterned cells formed by other methods and co-culture of the different types of cells by regulating the distance between the cells.

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AMEC SS2-3

The Gold Nanotag for On-dose Authentication to Prevent Fake Drugs

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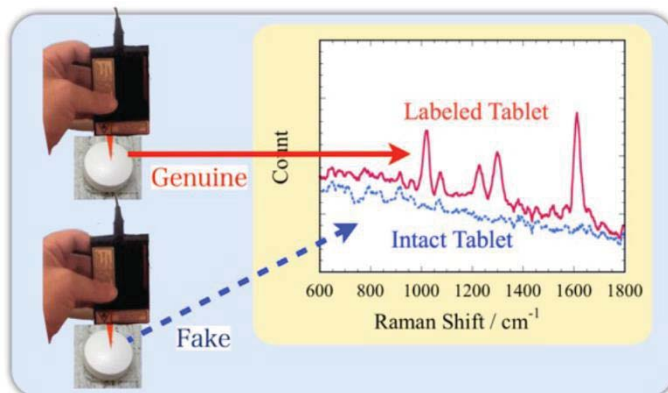[**]*Archilys, Kyoto, JAPAN*

Abstract

T Fake drugs threatens medical supply chain frightfully over 124 countries in the world. Even in Japan, although nobody expected counterfeits violate the maintained distribution of this country, fake harvoni for hepatitis C sold at an authorized pharmacy shocked officials in Ministry of Health, Labor and Welfare. Anti-counterfeit to prevent fake drugs requires rapid-authenticating, costless, and more than anythings, high-security technology.

Recent advances in nanotechnology accelerate developments of nanotag identifiers. Thinking of rapidness and high security in authentication, surface enhanced Raman scattering (SERS) produced from well-designed noble metal nanostructure is promised to apply new authentication method. We have developed SERS active nanostructures by self-assembling of gold nanoparticles (AuNP) with Raman active reporting molecules. A few nanogram amounts of the AuNP assembles were directly deposited onto commercial tablet Mucodyne. For on-dose authentication outside of a laboratory, 80 g weight and smart-phone driven palm-top Raman detector was used.

Shelf-life in SERS activity of the AuNP self-assemble liquid stocked at room temperature was over six months. The nanotag labeled Mucodyne tablet showed special SERS signal derived from the reporting molecule, and 0.2 s irradiation of 785 nm (5 mW) laser was enough to produce distinguishable SERS spectra from intact tablet.

Excellent longevity of SERS signal over three years on the labeled tablets was confirmed. By just 0.2 second laser irradiation with a palmtop Raman spectrometer, rapid on-dose authentication was successfully achieved.

AMEC SS3-1

Towards knowledge discovery from heterogeneous time-series medical databases

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Abstract

According to the JAHIS reports in 2016 [1], more than 72% of Japanese large hospitals (>= 400 beds) use EHRs (electronic health records). Now it becomes possible to exchange medical data electronically between hospitals based on the standards such as SS-MIX (standardized structured medical information exchange) and HL-7 (health level seven). For example in Shimane prefecture, an NPO is providing a communication service named MameNet, in which healthcare providers can securely exchange electronic patient data (with patient consent) via a datacenter. These standards also facilitate gathering of healthcare data from many hospitals for big data analysis.

Records in EHRs are by nature time series and usually heterogeneous; some of them, such as the results of laboratory exams and body measurements, are numeric or categorical, whereas others such as clinical observations and patient summaries are mainly narratives. By collecting these data in a standardized and structured manner and then by applying machine learning techniques, one might be able to find interesting knowledge on the transition of patient status, effects of interventions, and their relations to outcomes. However, knowledge discovery from such heterogeneous, longitudinal data is still a challenging problem; especially under interventions [2].

In this talk, we briefly review current time-series medical data mining techniques and discuss problems towards knowledge discovery from heterogeneous, time-series medical databases.

[1] https://www.jahis.jp/action/id=57?contents_type=23 (in Japanese)

[2] Jensen PB, Jensen LJ, Brunak S.: Mining electronic health records: towards better research applications and clinical care. Nat Rev Genet. 13(6):395-405 (2012).

AMEC SS3-2

Investigation on Swallowing Disorder in Biometric Data Measurement

Naomi Yagi

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Kyoto University, JAPAN

Abstract

Dysphagia or impaired swallowing function causes significant morbidity and mortality, and is diverse and common especially in the elderly. Dysphagia might cause aspiration pneumonia and various health problems whose severity range from trivial to lethal conditions, which often compromise the quality of life for patients. Even if the symptoms are mild, it is needed for medical attention because dysphagia could be a multidimensional problem with frequent occurrences and an early sign of serious underlying conditions. Therefore, the swallowing healthcare management is important. Dysphagia occurs during the oral and pharyngeal stage in the swallowing process regardless of age. Many medical experts in this field strongly stated that there is a necessity of healthcare study relating to swallowing disorder. In general, the evaluation of swallowing function is provided by video fluoroscopy or video endoscopy, which are currently international standards. However, those methods are invasive and restrictive examination. Therefore, the development of non-invasive/-restrictive evaluation method is one of the significant needs in dysphagia research. In my talk, I introduce some results of evaluation and investigation using the biometric measurement data of air flow, swallowing sound, and displacement by attaching two types of sensors. In addition, we discuss about the possibility of wearable sensors in the field of healthcare monitoring system.

AMEC SS3-3

Stenosis Detection in Fallopian Tubal Model Using Ultrasonic Measurement

Aoi Emura and Naotake Kamiura

Graduate School of Engineering, University of Hyogo, JAPAN

Abstract

Recently, infertility has been considered to be an urgent problem. One of the causes of female infertility is tubal infertility. As an examination for tubal infertility, hysterosalpingography is often used. It requires a contrast medium injected from the ostium uteri, and infertility doctors observe whether the medium smoothly flows by radiating X-rays. In other words, it is a non-invasive examination that imposes pain and/or bleeding on subjects.

A method of detecting whether there is stenosis in models of fallopian tubes with no medium injection is presented, assuming that silicone tubes are phantoms of fallopian tubes. A lump of the polyester threads is considered to be a stenosis, and inserted in each tube. The method processes the portion of the reflected wave observed by the ultrasonic device. The portion corresponds to the inside of the tube. It is divided into several short-time intervals each of which the length is equal. The method obtains the maximum amplitude value and the minimum amplitude value in each interval. It next generates the frequency distribution associated with the difference between the maximum amplitude value and the minimum amplitude value in each interval. In the distribution, the axis of ordinate and that of abscissa are for the number of differences and for the regularly divided amplitude, respectively. The method employs a ten-dimensional vector with the numbers of differences as element values to specify the portion to be processed, and distinguishes potions with lumps from those without lumps using support vector machines. Experimental results reveal that the method achieves high accuracy in detecting stenosises. This work was supported in part by Terumo Foundation for Life Sciences and Arts.

AMEC SS4-1

A study on flow
between parallel disks for cooling

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Abstract

The size of the motor depends on the required electrical and mechanical characteristics, temperature rise limit. As torque increases, heat generation increases. In order to solve this problem, it is necessary to cool the motor with high efficiency. Air cooling methods are often used for many methods of cooling. In this cooling method, cooling is performed using air. Therefore, complicated equipment is unnecessary．So, the structure of the motor can be simplified. There is also an advantage that the product can be produced at low cost. However, as the number of iron cores inside the motor increases, sometimes motor breaks out. Furthermore, when miniaturization and weight reduction are intended, the power loss density increases and the temperature rise limit of insulation becomes a problem. Because the experiment is expensive, it is important to observe the cooling state of the iron plate by highly accurate simulation. Under these circumstances, we have developed a solid-fluid heat coupling simulation method in this research. By applying this method, it is possible to find the optimum operating state of the motor.

In the conventional calculation method, the temperature of the fluid / solid interface is calculated by using the thermal conductivity calculated by the harmonic mean of each. However, when this calculation method is used, many lattice points are required in order to obtain the temperature of the interface with high accuracy. Also, it is impossible to calculate the discontinuity of temperature at the interface. Therefore, in this study, we calculate the thermal conductivity in each phase by using the thermal conductivity of each fluid and solid, and calculate the temperature of the interface by simultaneous heat flux condition between fluid solids. By using this calculation method, there is an advantage that it is possible to accurately obtain the temperature of the interface even with a small number of grids. Also, even in the heat transfer phenomena of solids and fluids having any shape, it is possible to calculate the strict interface temperature based on the heat conduction ratio. Using this calculation method, we report numerical simulation results by inserting a plurality of plates inside a concentric double cylinder to form a gap.

AMEC SS4-2

Study on Particle Focusing in Microchannel with Orifice-Shape Obstacle

Hirofumi Sugami, Hiroshige Kumamaru and Naohisa Takagaki

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Abstract

In recent years, flow cytometers are used in the medical and research fields. This flow cytometer is an apparatus for observing cells such as humans and analyzing the size and nature of cells. In order to detect the cells, it is necessary to align the cells in a row in the sample solution flow, and now the cells are focused mainly by enclosing the sample solution flow with flows not containing cells called sheath flow. In this method, however, problems such as size increase of the apparatus due to complication of the structure and accurate flow rate control of the sheath flow are pointed out. Therefore, in this research, we aim to focus fine particles by using obstacles in the flow channel, proposed by Park et al., instead of using sheath flow.

In this numerical analysis, ANSYS CFX which is a commercially available thermal fluid analysis software is used. The Euler method and the Lagrangian method (particle tracking method), are used to calculate two-phase flow. The flow channel, with an overall length of 1500 μm, a width of 200 μm and a height of 50 μm, has orifices at three places. For analysis conditions, a sample solution, mixture of water (98%) and polystyrene particles (2%), enters the inlet at a flow velocity of 0.5 m / s. The diameter of the particles is 10 μm and the outlet pressure is atmospheric pressure. In this calculation, it was confirmed that the particles were focused in the central part of the flow channel at each step the solution passed through the orifice. Calculation results on the particle convergence rate and the pressure loss by the Euler method were almost the same as the corresponding results by the Lagrangian method. In addition, the trajectory of particles was visualized by the Lagrangian method. In the future, we will conduct experiments in order to confirm the present calculation results.

AMEC SS4-3

Two numerical simulations of liquid motion driven by wind shear or syringe pump

Atsushi Shinoda[1], Naohisa Takagaki[1], Hiroshige Kumamaru[1], Ryoichi Kurose[2]

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[2] *Kyoto University, Nishikyo-ku, Kyoto 615-8540, JAPAN*

Abstract

Liquid column breaking, called atomization, is of great interest in both geophysics and engineering. Particularly, the atomization occurs on the ocean surface, on fuel injection in engines, on ink injection in printers, and, perhaps, on spilt chemical in future needleless-syringe. Although there are many studies for the atomization, the atomization mechanism is not fully understood, because of complicated interfacial movement and deformation, accompanied with bubble entrainment. We, therefore, used a direct numerical simulation with Level-Set/VOF method as the interface tracking method. The method is coupling method of Level-Set method, which captures an interface shape smoothly, and VOF method with high-precision mass conservation of liquid. The calculation of wind waves was performed using the program code 'FK^3' developed in Kyoto University. The computational domain is set to be 140 mm, 20 mm, and 40 mm in streamwise, spanwise, and vertical directions, respectively. The upper half of the computational domain is set to be air, and lower one is set to be water. The initial constant air flow is set to be 5 m/s, and the water is initially set to be 1 m/s. The results show that we can reproduce the chop breaking, a kind of atomization on a liquid column breaking.

Furthermore, we performed another numerical simulation using ANSYS FLUENT as a preliminary calculation for atomization of a water jet by syringe pumping. The computational domain is set to be 70 mm in total length, 60 mm in total length of the syringe barrel, and the syringe diameter is 20 mm. The length of needle is 10 mm and needle diameter is 2 mm. The piston wall is set to be a mobile wall by dynamic mesh function. The piston wall was moved 40 mm to needle direction with the frequency of 0.1 Hz. The PISO method is used for the unsteady flow. We calculated the flow rate spilt from the edge of the nozzle. The results show that the frequency of spilt flow rate agreed with 0.1Hz, which is the frequency of the mobile wall of the piston.

AMEC SS4-4

Microfluidic Manipulation Based on Thermoplasmonic Marangoni Effect

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Abstract

There is a growing need to develop fluid and particle manipulation techniques in microfluidic channels, which are essential for the development of Micro-Total Analysis Systems and Lab on a Chip Devices. The key issue is how to apply forces to the liquid packed in the tiny microfluidic channels. One of the most promising forces for the microfluidic manipulation is "Marangoni force," which is induced by surface tension gradient on a gas-liquid surface under temperature gradient. Here, we present microfluidic manipulation techniques based on the Marangoni effect controlled by thermoplasmonic effect of gold nanoisland films. Gold nanoparticles absorb light efficiently at their resonant frequency and convert it to heat within several picoseconds. Therefore, a focused light spot on the gold nanoisland film acts as a localized and mobile point-heat-source at a micrometer scale. This heat source allows us to generate a microbubble in water and to give a steep temperature gradient on the bubble surface, which results in the generation of the Marangoni flow. By tuning the laser spot position against the microbubble, the flow pattern shows significant change and realizes particle sorting by their size or particle focusing. Recently, we revealed that a further enhancement of the strength of the Marangoni flow is achieved by the degassing process of the working fluid. When the dissolved gases are removed from the water, a water vapor microbubble with a diameter of 10 μm is generated by the thermoplasmonic heating. This microbubble involves extremely rapid Marangoni flow, whose speed exceeds 1 m/s at around the microbubble. This rapid Marangoni flow generation is attributed to the small bubble size, over which the temperature is graded, and the superheat at the bubble surface in contact with the gold nanoisland film.

AMEC SS5-1

Human Fricatives

Kazunori Nozaki

Osaka University Dental Hospital, Dental Informatics

Abstract

There are still many mysteries as to why humans can talk. Especially in birds there is something that can reproduce human's pronunciation. For monkeys as well, it is possible to perform human pronunciation functionally in terms of airway configuration. However, these animals do not have language features. In recent years, research and development of AI which gained a deep impression on deep learning and big data is prevalent. After learning sound, AI can recognize and utter a conversation. Monkeys can see things by eye, recognize them, and eat for food if it is food. AI can cause the robot to take similar actions. Given the mechanism of speech recognition, it is identified as a word unit, a phrase or a sentence by identification of sound, coding of maximum likelihood, and probabilistic syllable estimation using existing databases such as triphones. It can be thought that birds or monkeys can do this sound again through the articulation mechanism. However, it is impossible to freely extract words and phrases from learned sentences, create sentences with new meanings, and pronounce them. Here, I think that the boundary of presence or absence of language is the presence or absence of this function. I'm studying to predict the factors that language has in human beings from the dental field.

In the dental field, various information such as the shape of teeth and jaws are accumulated historically and over time. Recent studies have shown that vowels can be pronounced like humans, not humans. However, it is my expectation that consonants, especially fricatives, that adjust the advanced sound with the tongue will probably be difficult. Even children, it is difficult to pronounce fricatives until about 6 years old. I have been conducting research using aerodynamic acoustic techniques to understand why it is difficult to acquire fricative sounds, so I will tell you about things that have been understood so far.

AMEC SS5-2

Computational Heart Modeling using Human Specimens

Ryo Haraguchi, Ph.D.

*Healthcare Informatics Course, Graduate School of Applied Informatics,
University of Hyogo, JAPAN*

Abstract

We present our computational heart modeling project using human specimens with congenital heart disease [1]. Pathological specimens are useful for medical research and education; however, the number of pathological autopsies tends to decrease worldwide. There are various reasons, such as improvement of diagnostic techniques, lack of pathologists and other factors. Besides, the existing specimens have been damaged due to repeated educational use. We are concerned that precious specimens, including scarce samples with congenital heart disease, will be lost forever. This issue requires our immediate attention. We consider that the digitization of these scarce specimens is one of the effective ways for this issue. Computational heart model constructed this way will improve the accessibility as well as the stability. We would like to contribute to medical education and biomedical research, especially in computer simulation study.

In this presentation, we introduce the achievements of the project and the future prospects.

Reference

[1] R. Haraguchi, T. Matsuyama, Y. Morita, H. Ishibashi-Ueda and H. Seo, ``Cardiac Computational Modeling Project using Human Specimens with Congenital Heart Disease,“ in *Proc. International Forum on Medical Imaging in Asia (IFMIA)*, Jan 2017, pp.217-218.

AMEC SS5-3

Recent Advance in Hyperspectral Sensors and Applications

Chao-Cheng Wu[1], Juei-Chao Chen[2]

[1]*Department of Electrical Engineering, Taipei Tech, Taipei, Taiwan*
[2]*Department of Statistics and Information Science, Fu Jen University, Taipei, Taiwan*

Abstract

T Fake drugs threatens medical supply chain frightfully over 124 countries in the world. Even in Japan, although nobody expected counterfeits violate the maintained distribution of this country, fake harvoni for hepatitis C sold at an authorized pharmacy shocked officials in Ministry of Health, Labor and Welfare. Anti-counterfeit to prevent fake drugs requires rapid-authenticating, costless, and more than anythings, high-security technology.

Recent advances in nanotechnology accelerate developments of nanotag identifiers. Thinking of rapidness and high security in authentication, surface enhanced Raman scattering (SERS) produced from well-designed noble metal nanostructure is promised to apply new authentication method. We have developed SERS active nanostructures by self-assembling of gold nanoparticles (AuNP) with Raman active reporting molecules. A few nanogram amounts of the AuNP assembles were directly deposited onto commercial tablet Mucodyne. For on-dose authentication outside of a laboratory, 80 g weight and smart-phone driven palm-top Raman detector was used.

Shelf-life in SERS activity of the AuNP self-assemble liquid stocked at room temperature was over six months. The nanotag labeled Mucodyne tablet showed special SERS signal derived from the reporting molecule, and 0.2 s irradiation of 785 nm (5 mW) laser was enough to produce distinguishable SERS spectra from intact tablet.

Excellent longevity of SERS signal over three years on the labeled tablets was confirmed. By just 0.2 second laser irradiation with a palmtop Raman spectrometer, rapid on-dose authentication was successfully achieved.

A Neural Network-based Odor Recognition System

Teijiro Isokawa, Yusuke Sakai, and Nobuyuki Matsui

Graduate School of Engineering,
University of Hyogo, JAPAN

Abstract

Recognition and identification of odor or smell in the air have many potential applications, such as evaluation of foods, estimations for environmental conditions, and so on. Gas Chromatograph is one of the most precise analyzers for the odor recognitions, but they are not portable and tend to take much time to analyze the odors in the air. Thus, it is desirable to develop portable odor recognizer with high recognition abilities.

This paper presents an odor recognition system, which primarily aims at discriminating diacetyl odor that is a cause of unpleasant smell from middle-aged men. The proposed system has four types of MOS-type gas sensors as sensory component in a sealed acyl box as a sensory components. For recognizing the sensory outputs, Learning Vector Quantization (LVQ), which is a neural network with supervised learning algorithm, is adopted. The LVQ in the proposed system accepts temporal changes of signals output from four sensors, and makes the feature map from these high dimensional sensory signals in a supervised manner.

We conduct the recognition experiments by changing the duration of moving-average and the durations for sensory outputs. We use diacetyl, brewed-ethanol, isopropyl ether, and butyl acetate as target materials of odor recognition. Five-fold cross validation method is used for evaluating the recognition accuracy. From the experimental results, 96.5% of recognition accuracy on test data sets can be achieved by using 20 seconds of sensory signals and 5 seconds of moving-averaged.

ICIEV2-1 Informatics
September 2 (Saturday), 10:40-12:00, A203
Session chair: Kentarou Kurashige

#48   Wikipedia Entry Augmentation by Sub-merging Entities Based on Multilingual Ontology

Md. Tasnim Manzur Ankon*, Bangladesh University of Engineering and Technology (BUET); Muhammad Masroor Ali, Department of CSE, BUET

The amount of knowledge in the world wide web is increasing with the frequent addition of new features, like adaptation of multiple languages. Immense amount of content makes its utilization quite challenging for intelligent machines. Hence, structured formats or ontologies became significant. Ontologies require efficient extraction techniques, a topic that still needs much work. A way to improve the extraction technique is by concentrating multiple data sources into one single source. This paper introduces a way that can sub-merge knowledge repositories from multiple languages into a richer and easily accessible one. Using the knowledge base from English and French languages, machine-readable properties of individual entities are filtered through intelligent techniques and a precise knowledge source is generated. The results obtained by experimental implementation of the sub-merging technique are also presented in this paper to demonstrate the magnitude of enhancement.

#53   2.20 Tbps Hybrid O-OFDM WDM PON using Direct Detection Technique

Saad Bin Ali Reza*, American International University-Bangladesh; Chowdhury Miftah Mahmood Sagir, American International University-Bangladesh; Shahriar Faridi, American International University-Bangladesh; Mrinmoy Roy, American International University-Bangladesh; Dr. Mohammad Nasir Uddin, American International University-Bangladesh (AIUB)

In this paper, 4-QAM architecture was developed where Optical-OFDM (O-OFDM) technique was used along with the incorporation of WDM, through which up to 40 channels were multiplexed each with 55 Gbps data speed. This paper investigates the system by evaluating the effect on OSNR, Error vector magnitude (EVM) and Power Loss in the network. It has been found from this architecture that sufficient power is received at the receiver side maintaining a low Bit error rate (BER), less than 10-3 according to IEEE standard. Through this endeavor, a PON with unprecedented capacity of 2.2 Tbps was created with a maximum transmission distance of 120km which is a very exceptional and noteworthy result for O-OFDM WDM PON, regarding both capacity and transmission distance.

#17   Action selection using priority for each task -Realization of effective processing by dynamical update of priority-

Takuya Masaki*, Muroran Instiute of Technology; Kurashige Kentarou, Muroran Institute of Technology

In recent years, some research makes the robot treat multi-task.   Importance for each task is used to do decision making and is usually changed according to the situation. We proposed method that does decision making according to a change of importance for each task. In this method, we defined priority as importance for task. The system updated priority per n action, the update frequency is fixed. But there is a risk that the system acts without calculating priority according to a situation because update frequency is fixed. In this paper, we solve a problem by dynamically changing update frequency of priority. To calculate priority according to a situation, we propose a method to decide update frequency for priority by using the process of calculating the priority. We carried out an experiment that set three tasks to the robot applied proposal technique. From experimental results, we confirmed the usefulness of proposal technique.

#59   Bengali Sign Language Recognition Using Dynamic Skin Calibration and Geometric Hashing

Kazi Ehsan Aziz, Shahjalal University of Science and Technology; Ashzabin Wadud*, Shahjalal University of Science and Technology; Alauddin Bhuiyan U Melbourne; Sadia Sultana, Shahjalal University of Science and Technology; Md. Akter Hussain, Shahjalal University of Science and Technology

In this paper, we propose a method for Bengali Sign Language Recognition based on skin segmentation and geometric hashing. The skin area is obtained using a combination of dynamic color-based skin thresholding and mean shift segmentation of the original image. A novel feature extraction algorithm is introduced which tries to identify the hand by placing points at regular intervals along the perimeter of the hand blob. A novel dataset of 1147 images is also prepared for the task of training a hash table map with geometric co-ordinates of the feature points. The method is built to recognize static hand signs of 37 Bengali alphabets. Conducting tests on two sets of 37 signs, with varying the precision of feature points taken on each test, yielded an overall recognition rate of 51.35%.

ICIEV3-1 Imaging & Vision
September 2 (Saturday), 10:40-12:00, A208
Session chair: Mohammad Shamsul Arefin

#100   Medicine Recognition Using Text in Pill Image and Intrinsic Geometric Property

Tanjina Piash Proma, Independent University, Bangladesh; Md. Zakir Hossan, Independent University, Bangladesh; M Ashraful Amin*, Independent University, Bangladesh

People of hazy or blurred vision or the elderly people finds it way too challenging just to identify the pills if they are out of the box or packet. And various pills of various shapes, size, texture, color comes with a diverse set of medicinal components which creates confusion among pills of same color and shape to identify based on a specific texture. Even if they configure the shape of the pill, the texts imprinted on the pill remains unknown to them. In this paper, the splitting processes of a dataset according to the shape, number of colors and the texts embossed on the pills, will be described. The shape information was extracted by calculation eccentricity, extent and narrowness of pill from pill image. Reference values of discriminating parameters are determined using 'RxIMAGE' database. Overall shape discrimination accuracy of the proposed system is 93.75%, number of color determination accuracy is 95.6% and text recognition accuracy is 81.32%.

#26   IPMC Based Data Glove for Object Identification

Srijan Bhattacharya*, RCCIIT

Present research article presents a technique of object identification using data glove developed with Ionic Polymer Metal Composite (IPMC) as sensor.This technique givesanimpression of typeand shape for the object which is grasped using the data glove. The output voltage received from IPMC sensors are observed using Digital Storage Oscilloscope (DSO) andobject is identified with the difference in initial and final output voltage pattern. IPMCs are soft and flexible in nature as a result IPMC sensors used in the data glove comes closest in imitating the finger like motion.IPMC as a sensor is fabricated in the data glove between the intermediate and distal phalanges of the index finger as well as between distal and proximal phalanges. IPMC samples are then subjected to mechanical bending motion of a finger and corresponding voltage developed for actuation is recorded.

#31   Parametric Wiener Filter with Parameters Estimation on Image Power Spectrum Sparsity

Naw Jacklin Nyunt*, Saitama University; Yosuke Sugiura, Saitama University; Tetsuya Shimamura, Signal Proc - Saitama University

This paper presents a method to estimate noise variance from the power spectrum of the observed noisy image and proposes an improved Wiener Filter called parametric Wiener filter. The best performance can be obtained with the best parameters of the parametric Wiener filter. However, in practice, it is impossible to know the best parameters because the best parameters are determined depending on the characteristics of the image. Thus, to obtain the estimated best parameters for the parametric Wiener filter, we propose a method of calculating a power spectrum sparsity of the observed noisy image. For the parametric Wiener filter, an image with a large power spectrum sparsity has larger parameters compared with the image with a small power spectrum sparsity. A parametric Wiener filter with the estimated parameters is used in practice. The experimental results shows that the proposed method provides better performance than that of the conventional method.

#66   Robot-Human Handover Based on Motion Prediction of Human

Wataru Sakata*, Kobe University; Futoshi Kobayashi, Robotics & Mechatronics - Kobe University; Hiroyuki Nakamoto, Kobe University

This paper deals with a robot-human handover with the hand/arm robot. Handing over objects to humans is an important motion for assistant robots. In the robot-human handover, the robot has to predict the human motion and make a motion for hand over without disturbing human's works. Therefore, we propose a handover motion for the hand/arm robot according to the predicted human motion. The robot measures the position of human hand by the RealSense Camera and predicts destination of human hand. Then, the robot moves above the position of the predicted human hand.

ICIEV4-1 Imaging & Vision
September 2 (Saturday), 10:40-12:00, A206
Session chair: Yasuhiko Morimoto

#54   Kinematics of Knee Muscles Influencing by Aging Effects as Parametric Index to OA

Md. Tawhidul Khan*, Saga University; A. Nakagaki, Saga University; S. Ide, Saga University

Osteoarthritis (OA), a severe knee disease, is caused by the damage of articular cartilage at the end of anatomical structures conjugated to knee joint. It disables people of all ages. Its prevalence is predicted to increase as a result of increasing ages. Integrity analysis of knee joint involves detail study of its total analytical parts. Therefore, present paper focused to the aging effects on major lower limb muscles related to knee kinematics. As vastus medialis, vastus lateralis, rectus femoris and medial head of gastrocnemius muscles are major concerned in knee flexor-extensor motions, the kinematic relations of these four lower limb muscles in aging were experimentally compared and documented.

#117   Extremely Simple Fuzzy Classifier for Intelligent Multimodal Media Processing

Atsushi Inoue, Eastern Washington University

Fuzzy classifiers are known to be simple yet efficient and effective in various intelligent media processing. We introduce an extremely simple one that has been deployed in the intelligent multimodal media processing for education assessment. While this paper mainly introduces its computational model such as classification and learning (initial identification and reinforcement), this fuzzy classifier is robust against severe imbalancement of sample data distribution for learning and is consistent between fuzzy sets and probability distributions (as the normalized form of histograms). We presented an intelligent recognition of student engagement in classrooms as its application.

#24   Alignment of 3-D Scanning Data for Polygonal Mesh based on Modified Triangulation

Masud An Nur Islam Fahim, Khulna University of Engineering & Technology; Sakib Mostafa*, Khulna University of Engineering & Technology; Jarin Tasnim, Khulna University of Engineering and Technology; A. B. M. Aowlad Hossain, Khulna University of Engineering & Technology

Alignment of 3-D scanning data is important in holography, gesture based gaming, statuette modelling, tomography and so on. All of this sector are advancing day by day on the basis of computational geometry. One of the most complex open problems in the sector of combinatorial and computational geometry is to deal with convex hull. This type of problem commonly arises in the several cases like meshing, 3D data alignment etc. For generating 3D model first, we have to compute the triangulation step. In this study, a divide and conquer based way of triangulation is presented. Furthermore, detecting the point of interest in the vornoi region as well as discarding of other points is also an important feature of the study. The outcome of the study shows effective reconstruction with legit triangulation, less computation time for determining convex hull and a smoothed polygon through proper edge flipping.

#16   Particle Filter Based Moving Object Tracking with Adaptive Observation Model

A.F.M. Shahab Uddin*, Islamic University

In this research, we've tried to develop a method with background subtraction, distance measurement and color histogram with particle filter, to track any single moving object. In visual moving object tracking, the appearance of both objects and the surrounding scenes may experience enormous variations due to changes in the scale and viewing angles, or partial occlusions. Also the objects and the backgrounds may have confusing color. These challenges may weaken the effectiveness of a dedicated target observation model when based on color feature. Background subtraction helps, to eliminate unnecessary regions, to track even when the target object and the background has similar color and thereby reduces the number of particles as well as the execution time and cost. Moreover we use distance measurement information, to make the tracker successful, when there are several objects with similar color. Experimental results have been presented to show the effectiveness of our proposed system.

ICIEV1-2 Medical Health & Technology
September 2 (Saturday), 15:20-16:40, A202
Session chair: Atsushi Inoue

#80   Design and Implementation of a Low-Cost Automated Blood Flow Control Device Through Smart Phone for Bio-Medical Application

Muhibul Bhuyan*, Southeast University; Md. Sumon Ali, Southeast University

This paper reports on the design and implementation of an automatic and low cost blood flow controlling device based on microcontroller through smart phone. It is able to assist the medical personnel to monitor and control the blood flow rate to the patients using mobile phone. The heart of the controlling part is the microcontroller unit in co-ordination with the flow sensors, stepper motor and Bluetooth module. The flow sensor is attached to the neck of the blood bag to count the actual number of drops of blood per minute. Its output signal is amplified and fed to the microcontroller's input pin to continuously check whether the blood flow rate is equal to the given set-value or not. If any mismatch is detected then the microcontroller rotates the stepper motor to adjust the blood flow rate with the set-value. The designed device is implemented and tested to evaluate its real time performance. From the test data, the average experimental accuracy of the system is found over 99%.

#58   Using ANN back-propagation technique to represent the group of ILD patterns

Balemir URAGUN*, Monash University

This study aims for the clustered data representation from recognized-patterns using the feedforward neural networks (ANN); a group of clustered data can be typified with a group of recognized patterns or called master template. This master template consists of the different numbers of clustered data and to be used by a suitable ANN for the clustered data representation. It is an objective fact that through a standard ANN processes of (a) data-oriented parameter selection, (b) identification of the appropriate number of processing layers with the best performance, learning method and training algorithms, and finally (c) development of the clustered data representation. Initially, a Supervised-Feedforward ANN was selected from the literature, based on applications similar to those in this study. Here, the appropriately optimized ANN architecture was tested with a variety of types of training algorithms, and the most useful training algorithm for this specific application was determined.

#83   Effect of EMG Artifacts on Video Category Classification from EEG

Mohammad Bashar, Independent University, Bangladesh; Rayhan Sardar Tipu, Independent University, Bangladesh; Aunnoy K Mutasim, Independent University, Bangladesh; M Ashraful Amin*, Independent University, Bangladesh

EEG (electroencephalography) signals are highly susceptible to noise. Mixture of artifacts like EOG (electrooculography) and EMG (electromyography) with the EEG signals are inevitable. In this paper, we present our findings of the effects of EMG artifacts on EEG signals to categorize videos. The experiments suggest that for video category classification using EEG, signals with EMG artifacts have more discriminating capacity.

#111   Glioblastoma Multiforme Tissue Histopathology Images Based Disease Stage Classification with Deep CNN

Asami Yonekura*, Mie University; Hiroharu Kawanaka, Mie University; V. B. Surya Prasath, University of Missouri-Columbia; Bruce J. Aronow, Cincinnati Children's Hospital Medical Center; Haruhiko Takase, Mie University

Recently, many feature extraction methods for histopathology images have been reported for automatic quantitative analysis. One of the severe brain tumors is the Glioma and histopathological tissue images can provide unique insights into identifying and grading disease stages. However, the number of tissue samples to be examined is enormous, and is a burden to pathologists because of tedious manual evaluation traditionally required for efficient evaluation. In this study, we consider feature extraction and disease stage classification for brain tumor histopathology images using automatic image analysis methods. In particular, we utilized an automatic feature extraction and labeling for histopathology imagery data given by TCGA and checked the classification accuracy of disease stages in GBM tissue images using deep CNN. Experimental results indicate promise in automatic disease stage classification and high level of accuracy were obtained for tested image data.

ICIEV2-2 Imaging & Vision
September 2 (Saturday), 15:20-16:40, A203
Session chair: Takahiro Takeda, Takenori Obo

[Special Session: CIHSA: Computational Intelligence for Health-care Systems and Applications]

#91 Neuro-Fuzzy Model with Subtractive Clustering Optimization for Arm Gesture Recognition by Angular Representation of Kinect Data

Atif Ahmed, University Malaya; Chu Kiong Loo, University of Malaya; Takenori Obo*, Tokyo Polytechnic University

This paper presents a simple and robust framework based on Neuro-Fuzzy System (NFS) for identification of human arm gestures using skeletal data from Kinect sensor . The proposed framework consists of three phases. The Data collection phase, where Kinect sensor captures joint positions in 3D space. These 3D joint position are transformed into Angular representation to reduce the number of dimensions and limits the distribution of data points. The training phase, where the NFS is trained using the transformed joints data. Third phase is the recognition phase, where proposed framework classifies any given arm gesture as one of the trained gestures, in real time. The presented framework is very robust and can be extended to full-body human gesture recognition with minimal changes. Proposed framework can be used in various Human Computer Interaction (HCI) and Human Robot Interaction (HRI) based applications.

[Special Session: CIHSA: Computational Intelligence for Health-care Systems and Applications]

#98 Fast human skeleton optimization for posture recognition

Wei Quan*, Tokyo Metropolitan university

As the development of artificial intelligence, posture recognition has become one of the most popular research area in the field of image processing. Nevertheless, most methods for posture recognition only concerned about the supervised learning, and they played limited role in some case that has few training samples. Based on this truth, we proposed a human posture optimal method that deals with the human posture by kinematics acknowledgment, and the experiment shows that it performed an ideal result in real case.

[Special Session: CIHSA: Computational Intelligence for Health-care Systems and Applications]

#90 A Writing Pressure Analysis Method for Evaluation of Trail Making Test using Smart Device

Takuya Mabuchi, Tokyo Metropolitan University; Naoyuki Kubota, Tokyo Metropolitan University; Takahiro Takeda*, Daiichi Institute of Technology; Atsushi Manji, Saitama Misato Sougou Rehabilitation Hopitan; Tadamitsu Matsuda, Uekusa Gakuen University

This paper describes a diagnosis support system for Trail Making Test (TMT). The system imitates paper based TMT by using a tablet PC and smart pencil that can take writing pressure. Any line between two symbols is separated to finding phase and moving phase, and time, length and pressure of these phases are corrected to evaluate patient's higher brain dysfunctions level. In experiment, we corrected TMT data form 6 healthy volunteers and 10 patients. Results shows difference between healthy volunteers and patients.

[Special Session: CIHSA: Computational Intelligence for Health-care Systems and Applications]

#81 Motion Analysis for Unilateral Spatial Neglect in Computational System Rehabilitation

Takenori Obo*, Tokyo Polytechnic University ; Kota Adachi, Tokyo Polytechnic University; Naoyuki Kubota, Tokyo Metropolitan University

This paper presents a rehabilitation support system for Unilateral Spatial Neglect (USN). The number of patients of brain damage is increasing. USN is a neuropsychological condition in which a deficit in attention to and awareness of one side of space is observed. This is one of higher brain dysfunction after damage to one hemisphere of the brain is sustained. It is defined by the inability for a person to perceive stimuli on one side of the body or environment that is not due to a lack of sensation. In this paper, we explain the developed rehabilitation support system based on the concept of computational system rehabilitation, and show an experimental example to discuss the applicability.

ICIEV3-2 Imaging & Vision
September 2 (Saturday), 15:20-16:40, A208
Session chair: Teijiro Isokawa

#116   An Improved Algorithm for Skeletonisation of Nailfold Capillaries

Niraj Doshi, Loughborough University; Gerald Schaefer, Loughborough University; Iakov Korovin*, Southern Federal University

Nailfold capillaroscopy (NC) is a routine technique that is used to assess the characteristics and morphology of microblood vessels in the nailfold. NC is of particular importance in diagnosing diseases that lead to morphological changes of capillaries such as scleroderma, Raynaud's phenomenon and other connective tissue diseases. In order to provide a computeraided diagnosis approach to analysing NC images, in this paper, we present a skeletonisation algorithm of captured nailfold capillaries. Our approach first enhances the image using an alpha-trimmed filter, and then performs a binarisation step based on difference of Gaussian filtering and thresholding, followed by iterative thinning to extract the capillary skeletons. We show that the proposed algorithm works well and gives significantly superior performance compared to previous approaches.

#19   Prototype Development of Interactive Tactile Graphics Editor with LaTeX and Participant's Experience in Using the Editor

Yuji Masaki*, Toyama Prefectural University; Noboru Takagi Toyama Prefectural University

Blind people access visual information by touching tactile graphics. Many of the tactile graphics are produced by sighted people, but a few of blind people produce tactile graphics independently. A raised-writer is often use when blind people draw tactile graphics. When a blind person writes line-drawings on the cellophane sheet using the pen, the script swells so that the blind person can feel them. However, once a line has been drawn on a cellophane sheet, it cannot be erased and redrawn. Furthermore, any line-drawings of a raised-writer cannot be utilized as digital images. So, we have developed a tactile graphics editor which enables blind people edit linedrawings independently. In this paper, we introduce a tactile graphics editor which has been improved from our previous version; the editor enables blind users to produce tactile graphics interactively with LaTeX codes. We then show an experience of a blind physics teacher when he used our editor.

#14   Limitations when Improving Security Camera Video

Seiichi Goshi*, Image Proc. - JP

Security is one of the most important things in our daily lives and the security business is a big industry. Security cameras are set in many areas in order to keep us safe. When a crime occurs, we often hear that police analyze the security camera footage. It takes long time and it is often the case that the footage is not helpful in the investigation at all. The reason is very simple. Many of the security camera images do not have sufficient resolution. Currently there are many super resolution (SR) technologies. In detective dramas technicians solve crimes using SR technologies turning blurry images taken with a security camera into sharp high resolution ones with a click of a button. However, in real life it is not so easy. In this paper we discuss the current issues and limitations of the SR technologies.

#25   Pattern Augmentation for Handwritten Digit Classification based on Combination of Pre-trained CNN and SVM

Yoshihiro Shima*, Meisei University; Yumi Nakashima, Meisei University; Michio Yasuda, Meisei University

Neural networks are powerful technology for classification of character patterns and object images. The huge number of training samples is very important for classification accuracy. A new method for handwritten digits recognition is proposed by combining Pre-trained Convolutional Neural Networks (CNN) and Support Vector Machines (SVM). The training samples are augmented by patter distortion. Pre-trained CNN, Alex-Net can be used as pattern feature extractor. Alex-Net is pre-trained for large-scale object image dataset. An SVM is used as trainable classifier. The training 60k samples and distorted patterns on MNIST database are trained by the SVM. The feature vectors of character patterns are passed to the SVM from Alex-Net. Experimental results of test error rate 1.03% without distortion and error rate 0.93% with distortion on the test 10k MNIST database show that proposed method is effective in handwritten digits recognition.

ICIEV4-2 Imaging & Vision
September 2 (Saturday), 15:20-16:40, A206
Session chair: Gerald Schaefer

#42 A Descriptive Conceptual Framework to Measure Distance of Pupil using Pixel value

A.F.M. Saifuddin Saif, American International University - Bangladesh ; Md. Shahadat Hossain*, American International University - Bangladesh; Khandaker Tabin Hasan , American International University - Bangladesh

Bio-metrics information is crucial for everyone. Irish is one of the important features for biometrics. As a result, pupil can be same importance as Irish has. Pupil distance is a new bio-metric feature with optimized weight. We can use edge detection and pixel distance which are very effective features to optimize the weight. In this paper, we have proposed two conceptual frameworks to calculate pupil distance. we assume that it will make a unique distance for everyone. we will use edge detection for the first framework to find out the needed edge on eyes and we have shown the equation to calculate the pupil distance using pixel value. For the second one, we will use pixel distance to calculate the distance of pupils. As we are going to measure the pupil distance using image processing, it will be the unique and safest information for every human being according to our equation.Therefore, we can use it as biometrics information.

#86 IHEMHA: Interactive Healthcare System Design with Emotion Computing and Medical History Analysis

Md. Rifat Ullah, East West University; Md. Ataur Rahman Bhuiyan, East West University; Amit Kumar Das*, East West University

The medical healthcare industry has become the emerging areas of research and realizes the need for an interactive healthcare system. Existing healthcare focusses on logical reasons but ignores the medical history and family health data. In this paper, we propose a healthcare system named Interactive Healthcare with Emotion and Medical History Analysis which pays attention to users biological information with emotional state, medical history, and family health data. We use wearable devices which can monitor and collect users health data. EQ radio technology is developed to recognize the emotional state. Medical history and prescription are obtained from computer synchronization and e-prescription. Family health data are gathered from cloud synchronization of the user. We adopt cloud computing for big data analysis. Some machine learning algorithm is used for data analysis to provide prediction report with other functionalities. Those features will improve the healthcare technology.

ICIEV1-3 Electronics
September 2 (Saturday), 16:40-18:00, A202
Session chair: Md. Tawhidul Khan

#69   Photovoltaic performance analysis of electrophoretically deposited ZnO-based dye-sensitized solar cells developed using variations of mechanical compressions along with post annealing

Nayeem Ansari*, Nagoya Institute of Technology; Kato Shinya, Nagoya Institute of Technology; Naoki Kishi, Nagoya Institute of Technology; Soga Tetsuo, Nagoya Institute of Technology

In this study, short-circuit current density (JSC) and power conversion efficiency were analyzed for dye-sensitized solar cells (DSSCs) which were prepared by electrophoretic deposition (EPD) of zinc oxide (ZnO) nanoparticles on fluorine-doped tin oxide (FTO) glass substrates under mechanical compression and post-annealing. The JSC 12.98 mA/cm2 and power conversion efficiency 3.82% were obtained at 42 MPa mechanical pressure and 400°C post-annealing temperature. In this investigation, photoanodes were annealed at different temperatures to study the effect of the post-annealing temperature on the performance of DSSCs. The performances of the cells were analyzed by i-v, UV-Vis-NIR, and scanning electron microscopy (SEM) image. The photovoltaic performance was found to be improved with the application of mechanical compression and post-annealing temperature compared with the DSSCs without having these post surface treatments.

#27   Coadsorption study of Pb and Sb on Cu(001) by low energy electron diffraction

Md Kabiruzzaman*, Kyushu University, Japan; Rezwan Ahmed, Kyushu University; Takeshi Nakagawa, Kyushu University; Seigi Mizuno, Kyushu University

Room temperature coadsorption of Pb and Sb on Cu(001) has been studied by low energy electron diffraction (LEED). A p(4×4) structure has been obtained by Pb and Sb at coverages of ~0.25 and ~0.125, respectively. This coverage combination is similar to the Pb and Bi study on Cu(001) [1].This phase is confirmed by clear LEED patterns up to 250 eV. Above this energy some points of p(4×4) phase has been disappeared and only c(4×4) points remain. Based on LEED theory, using computer simulation and similarity of the coverage combination with Pb and Bi study, here a surface alloy model has been proposed and determined. The best-fit structure of the model and its consistency with the experimental results has been discussed in detail.

#29   Blue Glasses Increase Your Alertness: Effects of Colored Glasses on Psychomotor Performance

Junichiro Hayano*, Nagoya City University Graduate School of Medical Sciences; Yutaka Yoshida, Nagoya City University Graduate School of Medical Sciences; Emi Yuda, Nagoya City University Graduate School of Medical Sciences

Exposure to blue wavelength light has been reported to increase arousal level. In this study, we examined if wearing blue glasses has similar effects. We performed psychomotor vigilance tests before and after 30-min wearing of blue, green, orange, pink, and clear glasses on different days in 20 normal subjects. The level of vigilance measured as reaction time improved after wearing blue glasses, while no significant effect was observed with the other colored or clear glasses. This study indicates that 30-min wearing of blue glasses improves psychomotor vigilance after that and suggests that rather than the absolute intensity of the blue wavelength light, the relative content is the determinant for increasing arousal level.

#28   Food Texture Evaluation Using Tooth-shaped Sensor and Statistic Model

Hiroyuki Nakamoto*, Kobe University; Ninomae Souda, Kobe University; Daisuke Nishikubo, Kobe University; Futoshi Kobayashi, Kobe University

Food texture is an essential factor in mastication and contributes to our physical and psychological healths. To evaluate the food texture, a food texture sensor and a food texture evaluation method are proposed. The food texture sensor has two sensing elements; magnetic resistance elements and an inductor. The food texture sensor measures time-series force and vibration by the two elements. The feature quantities are extracted from the time-series data and determine the coefficients of the logistic regression model. The response variables of the logistic model are the existence or non-existence of food texture answered in sensory evaluations. The experimental results showed that the logistic regression model has a possibility to evaluate food textures of even unknown foods.

ICIEV2-3 Imaging & Vision
September 2 (Saturday), 16:40-18:00, A203
Session chair: Takahiro Takeda, Takenori Obo

[Special Session: CIHSA: Computational Intelligence for Health-care Systems and Applications]

#84   On Ultrasound Measurement System Estimating Diameters of Fallopian Tube Models

Naotake Kamiura*, U Hyogo; Takayuki YUMOTO, U of Hyogo; Teijiro Isokawa, University of Hyogo; Yutaka Hata, University of Hyogo

In this paper, a method of calculating inner and outer diameters of fallopian tubes is presented, provided that silicone rubber tubes are models for fallopian tubes. It is based on the ultrasound measurement using a single probe of which the nominal frequency is 5 MHz, and assumes that ultrasound waves emanating from the probe are reflected at the top outer surface, surfaces between water and silicone rubber, and bottom outer surface of the tube. It obtains envelope curves associated with the reflected waves, by applying Hilbert transformation to the waves. It next estimates top four maximal values on the envelope curves to acquire time points when the wave reflections occur. The inner and outer diameters of the tubes are easily estimated by substituting the above time points in simple formulas. Experimental results reveal that the proposed method can achieve substantial accuracy in estimating inner and outer diameters of the target tubes.

#18   Cost-Effective Camera Pose Estimation for Basketball Analysis Using Radon Transform

Yuto Idaka, Tokyo Metropolitan University; Koya Yasuda, Tokyo Metropolitan University; Yihsin Ho, Tokyo Metropolitan University; Norio Tagawa*, Tokyo Metropolitan University

We are planing to develop an analyzing system of a basketball game. Hand-held video cameras are assumed to be used, by which multi-viewpoint image sequences are captured. To obtain 3-D trajectories of a ball and players with solving occlusions, a camera pose has to be accurately known. In this study, we propose a method for measuring a camera pose by detecting orthogonal two vanishing points. In the method, the lines on a court are detected with low computing amount by the Radon transform. Our method is verified through real image experiments.

#10   Empirical Bayes Estimation of Tissue Scatterer Distribution from Ultrasonic Echo

Atsumi Ubukata, Tokyo Metropolitan University; jing zhu, Tokyo Metropolitan University; Yihsin Ho, Tokyo Metropolitan University; Norio Tagawa*, Tokyo Metropolitan University

In ultrasonic medical imaging, in addition to the boundaries of organs, blood vessels, etc., speckle patterns generated as interference of echoes from small scatterers in living tissue are often observed. Speckle pattern has information on the tissue properties and can be efficiently used as local position information for measuring tissue motions, for example. On the other hand, these are the main factor for lowering the image resolution. In this study, we aim to improve the resolution of ultrasonic imaging by restoring the scatterer distribution within the tissues from the echo. Statistics calculated from the restored scatterer distribution are expected to contribute to the construction of new indicators for tissue properties diagnosis.

#15   Behavior Analysis of RBM for Estimating Latent Factor Vectors from Rating Matrix

Hiroki Shibata*, Tokyo Metropolitan University; Yasufumi Takama, Tokyo Metropolitan University

this paper analyzes the behavior of Restricted Boltzmann Machine (RBM) when it is applied to estimate latent factor vectors from rating matrix. Recently some RBM models are applied to predict ratings for recommendation systems. However, some papers also pointed out that RBM-based recommender systems could not achieve a clear improvement compared with conventional methods like Singular Value Decomposition (SVD) despite using more advanced and higher-cost statistical model. While the reason of low performance should be revealed by analyzing RBM's behavior, detailed analysis has not yet been investigated. This paper proposes alternative implementation of RBM-based collaborative filtering and analyzes its behavior. Experimental results with artificial datasets shows that it retrieves completely original latent vectors in some cases.

ICIEV3-3 Imaging & Vision
September 2 (Saturday), 16:40-18:00, A208
Session chair: Yasuhiko Morimoto

#50   Recognition of Overlapped Objects using RGB-D Sensor

Mitsuhiro Yukitoh*, University of Hyogo; Masakazu Morimoto, University of Hyogo

To realize a practical object recognition system, we employ RGB-D sensor to treat overlapped objects. In this paper, we focus on recognition of partially overlapped breads. Appearance of upper side breads often deforms its shape in captured images, which degrades recognition accuracy. On the other hand, lower side object is partially hidden by other breads, so we cannot achieve whole appearance in captured images. In the proposed method, in order to improve the recognition accuracy of overlapped objects, we adjust or complement the shape of breads by consulting depth information achieved by depth sensors. Some experimental results show that by adjusting overlapped object shape and by complementing hidden area, we can improve recognition accuracy of overlapping objects.

#33   Gesture Recognition based on Spatiotemporal Histogram of Oriented Gradient Variation

Seiji Kojima*, Mie University; Wataru Ohyama, Mie University; Tetsushi Wakabayashi, Mie University

A fine-grained gesture recognition method based on spatiotemporal representation for cooking activities is proposed. Cooking is one of common housework activity in daily life. Supporting cooking using video-based gesture recognition can contribute to improve our quality of life. A cooking gesture recognition method which employs a spatiotemporal representation for both appearance of a cooker and surrounding kitchen utensils. Our proposed method employs Spatio-Temporal extension of Histogram of Oriented Gradient Variation (ST-HOGV) which can represent not only appearance and temporal change of independent objects but locations of these objects. Performance evaluation experiment using ACE dataset shows that recognition accuracy of 76.4% is obtained and the KSCGR evaluation score achieves 73.5%.While the proposed method does not require any a priori knowledge, the performance is comparative other gesture recognition method with a priori knowledge.

#35   Segmented Face Image Verification for Age-Invariant Face Recognition

Yuta Somada*, Mie University; Wataru Ohyama, Mie University; Tetsushi Wakabayashi, Mie University

Face recognition has several problems to improve its performance. In particular, aging causes facial appearance variation so that it is the most difficult problem to handle. We propose a face recognition method that is robust against aging. The proposed mthod employs segmentation verification of frontal face images that consists of the following three steps. (1) Face image segmentation generates three regional subimages from the input face image. (2) A matching score is calculated using gradient features from a pair consisting of the input image and a registered image for each of the three generated subimages and original (whole face) image. We obtain four matching scores. (3) The verifying classifier evaluates the matching score vector and predicts the a posteriori probability that two matching images belong to the same person. The results of an experimental evaluation with the FGNET datasets clarify the effectiveness of the proposed method for age invariant face recognition.

#124   A Study on Dementia Detection Method with Stroke Data using Anomaly Detection

Koya Kawanishi*, Mie University; Hiroharu Kawanaka, Mie University; Haruhiko Takase, Mie University; Shinji Tsuruoka, Mie University

Increasing the number of elderly persons who have dementia, this is one of the severe social problems in Japan. According to the report published by the Ministry of Health, Labor and Welfare, the number of elderly persons with dementia will be around five million in 2015. This report indicates that early detection and prevention of dementia is essential. From viewpoints of early detection of dementia, the most problem is the limitation of test contents and the difficulty of taking a dementia check test on a daily basis. To solve these problems, the authors focus on drawing test using a tablet terminal to develop a dementia detection system, which can be adapted to various drawing contents including digits, characters, and pictures for increasing of dementia screening opportunity. It is, however, difficult to collect sufficient data to build the system because there are many subtypes of dementia. From this background, this position paper discusses an unsupervised anomaly detection method using healthy data only, and also aim to propose a system that gives the probability of being dementia (or other sicknesses) based on the differences from the data of healthy cases. As the first step of this study, we discuss the possibility of a dementia detection method using Variational Autoencoder.

ICIEV1-4 Electronics
September 3 (Sunday), 10:40-12:00, A202
Session chair: Hiroharu Kawanaka

#36   Detection of Primary User Emulation Attack in Cognitive Radio Environment

Khaled Mohammed Saifuddin*, Khulna University of Engineering and Technology; Kazi Fahid Reza, Khulna University of Engineering and Technology; Masud An Nur Islam Fahim, Khulna University of Engineering & Technology; Sk. Shariful Alam, Khulna University of Engineering and Technolog

Cognitive Radio (CR) is a potential solution for radio spectrum limitation problem. It is a promising technology for the ever-developing wireless networks in order to efficiently utilize the limited spectrum resources. It is also a mean to satisfy the rapidly increasing demand for wireless applications and services. But the security from malicious users is an important issue. In this paper a method is proposed to create and detect a primary user emulation (PUE) attack in cognitive radio networks. CR network comes with the great advantage of opportunistic and efficient use of limited spectrum resources. In CR, primary users should have priority over secondary users. Primary user emulation attacks on cognitive radio networks pose a serious threat to the deployment of this. First the position of the transmitter is to be detected to identify an attacker and then effective countermeasures have to be developed. Here we create a PUE attack by adding two incumbents in the scenario in NetSim.

#82   A 100nW 10-bit 400S/s SAR ADC for Ultra Low-Power Bio-Sensing Applications

Hugo França*, EPFL; Milad Ataei, EPFL; Alexis Boegli, EPFL; Pierre-André Farine, EPFL

This paper presents a successive approximation analog-to-digital converter (SAR ADC), which uses an operating scheme that relaxes significantly the requirements for the sampling switches. The method consists on running the ADC with an eight times faster clock and executing the analog data processing on 1/8th of the available time. During 7/8ths of the conversion period, the ADC is tracking the input signal. This technique highly diminishes the constraints for the on and off resistances of the sampling switches, and is particularly suited for low-speed SAR ADCs, which are used in wearable technology for acquiring bioelectrical signals such as electroencephalograms. We have implemented a 10-bit ADC in a $0.18\,\mu m$ CMOS process, applying this operating method, and achieving an ENOB of 9.6-bit at approximately the Nyquist frequency. It consumes 100nW from a 1.2V supply, and has a figure-of-merit of 320fJ/conv.

ICIEV2-4 Informatics
September 3 (Sunday), 10:40-12:00, A203
Session chair: Takenori Obo

#76   Towards Developing a Learning Tool for Children with Autism

Muhammad Nazrul Islam*, Military Institute of Sceince and Technology (MIST)

Autism or Autism Spectrum Disorder (ASD) characterizes a vast range of developmental disabilities associated with social interaction, communication and behavior. Though basic education is a must for everyone, but teaching autism community through traditional approach is still quite complex. Similarly, ICT based learning software that has been developed for autistic kids are also facing the interaction (e.g., how autistic kids may interact with the learning software or devices) challenges. Therefore, the aim of this paper is to introduce a cost-effective, portable and user-friendly interactive learning tool to provide autistic children with basic academics. The tool consist a pressure sensing keypad to provide an easy and flexible means of interaction for autistic kids. The tool is also evaluated in a laboratory environment to assess its effectiveness and usability.

#107   Developing a Method for Detecting Serial and Parallel Components in Programs

Md. Amdadul Haque, CUET, Chittagong; Rezaul Karim, University of Chittagong (CU); Mohammad Shamsul Arefin*, CUET, Chittagong; Yasuhiko Morimoto, Hiroshima University

In this paper, we propose a system that guides programmers to find serial and parallel components in programs. The system takes C and Java codes those may contain serial and parallel components as inputs and detects serial and parallel components in the programs. Our system first identifies the function blocks by parsing the programs based on regular expression pattern matching. Then the developed system constructs dependency graph. In dependency graphs, blocks are treated as nodes and edges are the interaction between nodes. In this paper, we consider four kinds of dependencies such as flow dependency, ante dependency, output dependency and control dependency. From the dependency graph we compute topological order to find the serial parallel execution sequence of the functions or blocks. We perform several experiments and found that our system can detect serial and parallel components from the programs efficiently.

ICIEV3-4 Imaging & Vision
September 3 (Sunday), 10:40-12:00, A208
Session chair: Takahiro Takeda

#6   Automatic tracking method for multiple honeybees using backward-play movies

Toshifumi Kimura*, University of Hyogo

In recent studies, researchers can easily record the behaviors of animals by digital video cameras. However, it is a laborious and time-consuming manual task for them to extract useful behavioral data from these videos. We already proposed a tracking method for unmarked multiple bees in a flat arena, named "K-Track" algorithm. The algorithm can successfully identify and track nearly 90% of interaction cases of targets. In this study, we proposed an improved method for the algorithm by tracking results using backward movies. If the tracking results differed between the forward and backward, one of them had probably resulted from correct tracking. Therefore, by comparing the forward and backward trajectories of the same interaction, we assumed that there is the potential for an increase in tracking accuracy. In the experiments, K-Track using backward movies successfully tracked four out of five situations that was failed by original K-Track.

#30   Histopathological Breast Image Classification by Convolutional Neural Network

Abdullah Nahid*, Macquarie University; Yinan Kong, Macquarie University

Cancer disease investigation has relied heavily on histopathological image analysis. Different mathematical tools and techniques are available for cancer image analysis to classified the images into the Benign and Malignant classes. However state-of-the-art Convolutional Neural Network techniques have shown a remarkable performance in image processing area specially in the image classification. In this paper we have utilized Convolutional Neural Network techniques for classifying a set of Histopathological images into Benign and Malignant classes, which can save doctors' times and help the doctor to take reliable decision about the cancer.

#57   A Method for Calculating the Resonant Frequency of Meander Line Dipole Antenna by Using Antenna's Geometrical Parameters

Md. Rahman*, Rajshahi University of Engineering & Technology; Ajay Sarkar, Rajshahi University of Engineering and Technology, Bangladesh

This paper presents the method for calculating the resonant frequency of MLD antenna in the UHF frequency range. Two types of meander line antennas have been designed for passive RFID tag antennas. Two methods have been proposed to calculate the resonant frequency of a MLD antenna by calculating its inductance. One proposed by T. Endo and another proposed in this paper and the proposed method contributes 90% as closely as desired. The antenna characteristics mainly depend upon the number of meander line, vertical length, the separation of the twist arms, wire radius, physical length and wire length of the antenna. The capacitance and inductance introduced after squeezing the dipole antenna. The capacitance and inductance of the antenna are also a function of the antenna's dimension. The resonant characteristics have been found by calculating its inductance are compared to the result from simulation software FEKO. The result showed a good agreement with the simulation.

#23   A New Chaos Based Medical Image Encryption Scheme

Sakib Mostafa*, Khulna University of Engineering & Technology; Masud An Nur Islam Fahim, Khulna University of Engineering & Technology; A. B. M. Aowlad Hossain, Khulna University of Engineering & Technology

Image encryption has great importance in transmitting images securely for numerous applications taking the advantages of modern communication networks. Due to the era of modern technology medicine sector has updated in dramatic way such as the concept of telemedicine, more specifically the tele radiology services, has raised a great deal of concerns in the security of medical images transmitted over open networks. In order to meet the necessary challenge, a new chaos based encryption scheme is proposed with emphasis on stronger security with variable control parameter facility in a simplistic way. Thorough experimental tests are carried out and the obtained results have shown satisfactory performance which means proposed scheme provides an effective way for online secure medical image transmission over public networks.

ICIEV1-5 Electronics
September 3 (Sunday), 15:20-16:40, A202
Session chair: Teijiro Isokawa

#85 Graphene Based Circular Patch Terahertz Antenna Using Novel Substrate Materials

Sakibul Azam*, University of Chittagong; Md. Abdul Kaium Khan, University of Chittagong; Towqir Ahmed Shaem, University of Chittagong; Abdullah Zowad Khan, University of Chittagong

Graphene, a staggering material with amazing electrical properties is a unique solution for the implementation of Terahertz antenna. Graphene based patch antennas are gaining interest in the field of communication for its reduced size in micrometer range operating in the THz band. The selection of substrate material acts as a major performance controller as it regulates the resonant properties of the graphene patch antenna. A graphene based circular patch antenna is designed here for operating in the frequency range of 6.8-7.2 THz. We applied polyimide, quartz, silicon dioxide and silicon nitride as substrate materials and evaluated the performance of the patch antenna for individual substrate materials based on return loss, voltage standing wave ratio (VSWR), 3D and 2D radiation pattern with gain as output. The result shows that using polyimide as substrate material results in excellent performance with a gain of 16.7 dB as compared to other substrate materials.

#77 Design And Development of A Wide Band Monopole Blade Antenna for Aircraft Navigation and Communication

Nazmus Saaquib, Military Institute of Science And Technology; Tonmoy Sarker*, Military Institute of Science And Technology; Naimur Rahman, Military Institute of Science And Technology; Ludmila Emdad Khan, Military Institute of Science And Technology; Pran Kanai Saha, BUET

In this work an UHF blade antenna working within range 835 MHz to 962 MHz has been designed and constructed. Parasite element is introduced which shows an improved impedance matching and radiation pattern. The designed antenna is simulated by using the 'CST Microwave Studio' software in ideal environment and also simulated by mounting the antenna onto an aircraft CAD model. The radiation pattern and VSWR of the constructed antenna are measured. The measured results have been compared with that of the simulated results. The comparison shows that the simulated radiation pattern and the measured pattern are almost identical.

#21 An Approach to Forecast Medicine Requirement for a Geographic Area at a Specific Time Period from Historical Medical Data of Bangladesh

Mohaimen- Noor*, American International University- Bangladesh; Kawser Rushee, American Inernational University-Bangladesh; Victor Rozario, American International University-Bangladesh; Faria Nawshin, American International University-Bangladesh; Khandaker Tabin Hasan , American International University - Bangladesh

Our research focuses on predictive capability of medicine productivity for a particular disease at a particular time for a particular place in Bangladesh based on historical medical data of Bangladesh. The prediction model learns from the historical data and from the knowledge it can predict the diseases in terms of a specific time and location. After predicting the diseases, the model finds out the medicines required for that disease along with the required dose. The total required amount is achieved by combining all the amounts of that particular medicine. The outcome of this research will help the Pharmaceutical companies to allocate their budget for different medicines and maintain their supply chain management procedures properly. Such a research can result in the betterment of human kind by ensuring availability of necessary medicines in need.

ICIEV2-5 Informatics
September 3 (Sunday), 15:20-16:40, A203
Session chair: Takahiro Takeda

#44   Addressed Query Gossip Resource Discovery Protocol for Mobile P2P Networks and Its Performance in Diverse Mobility Models

Ohm Sornil*, National Institute of Development Administration

P2P resource discovery protocols perform poorly over mobile ad hoc network mainly due to the frequent network dynamics. Peer-to-Peer search techniques including structured and unstructured can be employed over MANETs. Empirical studies indicate that searching in such resultant networks are not efficient and effective due to peer discovery, connectivity and mobility issues. We propose Addressed Query Gossip Resource Discovery algorithm, a light weight resource discovery designed to suit the mobility requirements of ad hoc networks to optimize the search performance while at the same time minimize the extra usage of mobile and network resources. Mobility models represent the movements of mobile nodes. Such models are used to represent how the location, velocity and acceleration change over time. We conduct performance analyses of the proposed protocol and widely used unstructured search techniques over MANET under 2 realistic mobility models.

#113   Developing a Framework for Recommending TV Shows

Chondrima Chowdhury, Department of CSE, CUET; Mohammad Shamsul Arefin*, CUET, Chittagong; Yasuhiko Morimoto, Hiroshima University

Recommendation systems have been actively researched for the last decade and have gained much attention in both research and industry communities. As a result, nowadays we can find recommendations about news, books, movies, products, locations and so on. However, recommendation techniques for TV shows have not been actively researched despite its importance. Although there are some recommendation systems for TV shows, most of them consider western TV shows and there is no recommendation system that considers TV shows in Bengali and Hindi. However, around 1500 million people around the globe are interested about Bengali and Hindi TV shows. Considering this fact, in this paper, we develop a recommendation system that can recommend Bengali and Hindi TV shows along with English TV shows. We have performed several experiments to show the effectiveness of our framework and found that it can recommend efficient recommendation of TV shows to the users.

ICIEV3-5 Imaging & Vision
September 3 (Sunday), 15:20-16:40, A208
Session chair: Iakov Korovin, Gerald Schaefer

#96 A Reliability Improvement Method for Reconfigurable Information and Oil Production Control systems

Iakov Korovin, Southern Federal University; Eduard Melnik, SRI MCS SFEDU; Anna Klimenko*, SRI MCS SFEDU; Gerald Schaefer, Loughborough University

Fault tolerance, a way to obtain system dependability, is extremely important in domains such as aircraft and spacecraft industries, energy plants, and oil processing and oil producing industries. For information and control systems (ICSs) with performance redundancy, fault-tolerance is provided by a special reconfiguration procedure which relates to the monitoring and control task distribution among the operable computational nodes. At the same time, the reliability function of the ICS depends on the computational node load intensity: as the node load (and temperature) increases, the failure rate also increases. This is the cornerstone of the reliability improvement method we present in this paper: to control and improve the reliability function of the system by the configuration formation process. We describe our approach in detail, present a formal model of the ICS configuration formation problem, and give and discuss experimental results.

#108 A Novel Method for Distribution of Goals among UAVs for Oil Field Monitoring

Igor Kalyaev, Scientific Research Institute of Multiprocessor Computer and Control Systems, Co Ltd; Sergey Kapustyan, Southern Scientific Center of the Russian Academy of Sciences; Donat Ivanov, Southern Scientific Center of the Russian Academy of Science; Iakov Korovin*, Southern Federal University; Leonid Usachev, Southern Federal University; Gerald Schaefer, Loughborough University

In this paper, our aim is to improve the efficiency of unmanned aerial vehicles (UAVs) that are employed in a group for monitoring large territories and search for various objects. The problem is that of distributing a certain set of scan areas between the members of an UAV group so as to minimize the scan time. Our proposed approach allows to solve the problem of distribution of targets (scan areas) between the UAVs through control devices of separate UAVs, combined with communication channels in a computer network, and is applicable for a variety of different classes of tasks in groups of UAVs. Experimental simulation results confirm the efficiency of the proposed approach and show that it is possible to obtain close to optimal variants of the distribution of scan areas between UAVs group from the viewpoint of minimising the total time and safe movement of UAVs to targets

#109 Features of Detection of a Single-Photon Pulse at Synchronisation in Quantum Key Distribution Systems

Anton Pljonkin, Southern federal university; Brij Gupta, National Institute of Technology; Konstantin Rumyantsev, Southern federal university; Iakov Korovin*, Southern Federal University; Gerald Schaefer, Loughborough University

The object of this study is a two-pass fiber-optic quantum key distribution system (QKDS) with phase coding states of photons in synchronisation mode. The quantum key distribution (QKD) system is based on a scheme with automatic compensation of polarisation distortions. We use single-photon avalanche photodiodes (SPAD) as optical radiation detection devices. In this paper, we describe the methodology of the design process to detect a time interval with an optical pulse during synchronisation taking into account the features used in QKDS SPAD. The aim of our work is to evaluate the impact of QKDS changing hardware synchronisation settings on probabilistic and time characteristics of the detection time interval. We describe an algorithm that we have developed to synchronise a QKDS that considers the time to restore the operating state of a photon after registration during synchronisation.

#110 Neural Network Model of Pumping Units in Oil Preparation and Pumping Complex

Iakov Korovin*, Southern Federal University; Maxim Khisamutdinov, Southern Federal University; Anatoly Kalyaev, Southern Federal University; Donat Ivanov, Southern Scientific Center of the Russian Academy of Science; Gerald Schaefer, Loughborough University

Methods of improving the efficacy of oil extraction are highly sought after. One way to achieve such an improvement is to reduce the downtime of equipment and to implement measures to increase oil recovery for the entire life cycle of the well based on analysis of operational data. The work we present in this paper is aimed at improving a model of pumping units of the oil preparation and pumping complex. For this purpose, we employ an approach based on computational intelligence techniques and in particular an approach that is based on recurrent neural networks in combination with convolutional neural networks to address the problem of operative analysis of telemetric data from pumping units and to forecast the state of technological equipment. Our proposed approach provides an attractive model of optimising the parameters of pumping equipment and thus a useful avenue of improving the efficacy of oil extraction.

ICIEV1-6 Medical Health & Technology
September 3 (Sunday), 16:40-18:00, A202
Session chair: Mohammad Shamsul Arefin

#67   Analysis of classification results for the nursing-care text evaluation using convolutional neural networks

Manabu Nii*, University of Hyogo; Yuya Tsuchida, University of Hyogo; Yusuke Kato, University of Hyogo; Atsuko Uchinuno, University of Hyogo; Reiko Sakashita, University of Hyogo

In this paper, a convolutional neural network (CNN) based classification method is proposed. We have studied nursing-care text classification for improving nursing-care quality. In our former works, several types of feature definitions were proposed and examined by some classification models. In this paper, a CNN is used for classification of nursing-care texts and then we analyze the trained CNN for extracting important part for decision of classification. First, each nursing-care text is represented as a concatenated word vectors. Then, every nursing-care text is classified using CNN-based classification methods. Next, we examined the structure of the trained CNN for extracting important parts of the nursing-care texts. From our experimental results, the proposed CNN-based method obtained better performance than our former works. And also the results suggest that the extracted part of each nursing-care text has importance for deciding its quality of nursing.

#123   Automated estimation of mTS score in hand joint X-ray image using machine learning

Atsuki Tashita*, University of Hyogo; Kento Morita, University of Hyogo; Manabu Nii, University of Hyogo; Natsuko Nakagawa, Hyogo Prefectural Kakogawa Medical Center; Syoji Kobashi, University of Hyogo

Rheumatoid arthritis (RA) damages joints, and the destructed and/or deformed joint causes the pain and reduces the joint function. The prognosis can be improved by early treatment, but it requires accurate evaluation of the degree of RA progression to apply appropriate treatment. The modified total sharp (mTS) score in hand or foot X-ray image has been used to quantitatively evaluate the RA progression evaluation. However, the mTS score measurement takes huge labor and it is very time consuming method because a physician should evaluate progression grade for all hand joints, and the evaluation is subjective. This paper proposes an automated finger joint detection and mTS score estimation method using support vector machine. The experiment in 45 RA patients shows that the proposed method succeeded in detecting the finger joint and estimating the mTS score. As the number of learning data increases, the proposed method can estimate the mTS score with higher accuracy.

#68   Tongue movement classification in chewing and swallowing using electromyography

Manabu Nii*, University of Hyogo; Shota Okajima, University of Hyogo; Reiko Sakashita, University of Hyogo; Misao Hamada, Social Welfare Corporation Lavita; Syoji Kobashi, University of Hyogo

Nurses who engaged in elderly care would like to assess their ability of chewing and swallowing because deterioration of the ability of chewing and swallowing will cause pulmonary aspiration. Currently, nurses can not assess the chewing and swallowing ability quantitatively. In this paper, to quantitatively assess the ability of chewing and swallowing, electromyography (EMG) signals around the lower jaw and the neck are obtained by some electrodes when the subject persons vocalize some Japanese pronunciations. Then, the obtained EMG signals are classified by some machine learning methods. k-nearest neighbor methods show better classification results for the obtained EMG signals.

ICIEV2-6 Informatics
September 3 (Sunday), 16:40-18:00, A203
Session chair: Naotake Kamiura

#46   Predicting Stock Movement using Sentiment Analysis of Twitter Feed

Pranjal Chakraborty*, BRAC University; Ummay Sani Pria, BRAC University; Rashad Al Hasan Rony, BRAC University; Mahbub Alam Majumdar, BRAC University

Collecting data from social networking sites is a popular way of opinion mining. These opinions show the sentimental state of a large number of people. In this paper, we have shown how much we can predict stock movement from twitter's tweets sentiment analysis. Our work is done on one year's (2016) data of tweets that contained 'stock market', 'stocktwit', 'AAPL' keywords. 'AAPL' related tweets were used to see if these tweets can predict the company's stock indices whereas 'stock market', 'stocktwit' related tweets for predicting the stock market movement of US. Since we are predicting the stock values, we used Boosted Regression Tree model for this purpose.

#79   Audio Zero Watermarking for MP3 Based on Low Frequency Energy

Kexin Wang*, Xi'an Jiaotong University; Chen Li, Xi'an Jiaotong University; Lihua Tian, Xi'an Jiaotong University

In this paper, a robust zero-watermarking algorithm for MP3 compressed domain is proposed. The algorithm generates zero watermarking according to low frequency energy in MP3 frames. The low frequency energy is calculated using MDCT coefficients during MP3 encoding process. It is proved that low frequency energy has great robustness to many attacks. Besides, since the algorithm is proposed in MP3 compressed domain, the zero watermarking is generated during MP3 encoding process. And the watermarking can be extracted while decoding MP3 audio file without extra extraction process. Therefore, the proposed algorithm is more efficient compared with many traditional algorithms. The results of the experiments show that the proposed algorithm is robust against common attacks, especially MP3 compression and recompression attacks. In addition, the algorithm can avoid the conflict between imperceptibility and robustness for using zero-watermarking technology.

ICIEV3-6 Imaging & Vision
September 3 (Sunday), 16:40-18:00, A208
Session chair: Iakov Korovin, Gerald Schaefer

#114   A Statistical Method for Estimating the Accuracy of Scene Reconstruction using a Collinear Digital Stereo Vision System

Konstantin Rumyantsev, Southern federal university; Sergey Kravtsov, Southern Federal University; Iakov Korovin*, Southern Federal University; Gerald Schaefer, Loughborough University

We present a model and technique for the analysis of measurement capabilities of on-board collinear digital stereo vision systems. For this, we use a technique of determining statistical distributions of measurement errors and report the obtained results. The proposed model can be employed for pre- calculating the characteristics of on-board collinear digital stereo vision systems, while the results can also be used to estimate the accuracy of reconstructed maps. This is especially interesting for the oil industry, where continuous monitoring of the conditions of long pipelines using autonomous robots is necessary. With the help of appropriate stereo vision systems, it is possible to assess the conditions of pipelines, detect critical deformations, fix gust places, etc. to ensure safety in the oil infrastructure.

#115   Application of Neural Networks for Modelling Centrifugal Pumping Units of Booster Pump Stations for a Two-Phase Gas-Liquid Mixture

Iakov Korovin*, Southern Federal University; Anatoly Kalyaev, Southern Federal University; Maxim Khisamutdinov, Southern Federal University; Donat Ivanov, Southern Scientific Center of the Russian Academy of Science; Gerald Schaefer, Loughborough University

In this paper, we investigate operational principles of booster pump stations with the aim of developing a method to calculate the influence of the cross-sectional shape of the channel on the coefficient of hydraulic friction and the effect of the curvature of the fixed channel on the coefficient of hydraulic friction and influence of rotation on the coefficient of hydraulic resistance for cylindrical rectilinear channel and border conditions. In this context, we propose the application of neural networks to build a model of centrifugal pumping units of booster pump stations for a two-phase gas-liquid mixture.

#112   Monitoring Daily Variations of Atmospheric Electric Fields using Data Mining Methods

Anatoly Adzhiev, High-Mountain Geophysical Institute; Lianna Malkandueva, High-Mountain Geophysical Institute; Anton Boldyreff, Southern Federal University; Dmitry Bespalov, High-Mountain Geophysical Institute; Iakov Korovin*, Southern Federal University; Gerald Schaefer, Loughborough University

The atmospheric electric field potential gradient is studied during snowfall, and the intensity of snowflakes electrifying depending on weather conditions is estimated. Applying modern data mining methods and high-mountain monitoring, where the anthropogenic factors on the electric field variations is insignificant, enables the identification of the influence of snowfall and snowstorms on the electric field's daily variations. Numerical data of the electrification process in the atmosphere are obtained, and relationships between electric field values and snowfall intensity, wind speed and temperature are demonstrated. Modern neural network techniques for data mining are applied in this context.

Poster
September 2-3, 15:00-15:40
Session chair: Iakov Korovin, Gerald Schaefer

#22   Determining Specialized Doctors that Need to have in Specific Region of Bangladesh by Making Temporal Relations between Region and Diseases

Faria Nawshin*, American International University-Bangladesh; Victor Rozario, American International University-Bangladesh; Kawser Rushee, American Inernational University-Bangladesh; Mohaimen- Noor, American International University- Bangladesh; Khandaker Tabin Hasan , American International University - Bangladesh

This research in the domain of medical science along with computer science knowledge aiming at reducing death rate of Bangladesh to substantial quantity. Many people die either for not properly diagnosed of diseases or for not having proper treatment which is not expected. Obviously, proper treatment can be given to patients when we allocate doctors of that specific specialization in the nearby locality of patients. This paper serves this purpose and determines how to allocate specialized doctors to definite region and in definite time based on the number of patients suffering mostly from which diseases. The more accurately we predict the future deceases considering temporal relations of regions and diseases the more precisely we determine the specialization of doctors that need to be allocated in the whole country.

#102   A study on the continuous increase of subthreshold MOSFETs in analog circuits

Sanjina Ershad*, Military institute of science and technology

As data storage devices, MOSFETs have been used for a long time. But the data storage mainly involves the digital characteristics and so the analog specially high frequency appliances have been neglected for long and BJT have been the analog designer's choice. With the miniaturization and low power devices on demand, the analog designers have been tiled towards mosfet and more models are being developed in subthreshold regime. As a result, analog characteristics specially transient frequency, maximum oscillation frequency, bandwidth of the voltage gain are of great importance. This study is an effort to understand these analog behaviours in perspective of new models developed at subthreshold regime.

AMEC Special Session 1

September 2 (Saturday), 10:40-12:00,

Session chair: Kazusuke Maenaka

#AMEC SS1-1 "The Application to Maritime Society of the Patch-type Device"

Koji Murai, Graduate School of Maritime Sciences,

Kobe University

#AMEC SS1-2 "Development of a capacitive force sensor for artificial joint"

Yusuke Hirai, Takahiro Manabe, Naoya Nakabayashi, Masaru Higa,

Mechanical Engineering, University of Hyogo

#AMEC SS1-3 "Design of Ultra-low Power Processor for Human Sensing"

Jun Fujiwara, Takahumi Matsuda, Yuki Matsumoto, Kensuke Kanda, Takayuki Fujita, Kazusuke

Maenaka, University of Hyogo

#AMEC SS1-4 "Fabrication of ZnO/HfO2/ZnO nanowire capacitors by MOCVD"

Yohei Takeuchi, Hironori Fujisawa, Masaru Shimizu and Seiji Nakashima,

University of Hyogo

AMEC Luncheon Seminar

September 2 (Saturday), 12:00-13:00

#AMEC Luncheon Seminar "Utilization of image analysis in joint surgery"

Shinichi Yoshiya, MD

Dept. of Orthopaedic Surgery, Hyogo College of Medicine

AMEC Special Session 2

September 2 (Saturday), 15:20-16:40,

Session chair: Koji Sumitomo

#AMEC SS2-1 "Modeling of Nano-Bio Interfaces based on Atomic Scale Simulations"

Koichiro Kato

Mizuho Information and Research Institute, Inc.

#AMEC SS2-2 "Manipulation of individual cells based on dielectrophoresis using a microdisk electrode with a microcavity"

Tomoyuki Yasukawa, Fumio Mizutani,

Graduate School of Material Science, University of Hyogo

#AMEC SS2-3 "The Gold Nanotag for On-dose Authentication to Prevent Fake Drugs"

Takao Fukuoka*,**, Yuichi Utsumi*, and Akinobu Yamaguchi*

*Laboratory of Advanced Science and Technology for Industry, University of Hyogo,

**Archilys

AMEC Invited Session September 2 (Saturday), 16:40-18:00, Session chair: Hiroaki Inui and Hiroshi Tanaka
Part I. "RETURN TO SPORTS"
#AMEC IS-1 "The ESWT (extracorporeal shock wave therapy) for musculoskeletal disorders" Prof. Jih-Yang Ko, Kaohsiung Chang Gung Memorial Hospital, Taiwan
#AMEC IS-2 "Accelerating Muscular Enzyme Recovery and Pain Mitigation of Elite Athletes Using Hyperbaric Oxygen Therapy" Dr. Wen-Yi Chou, Kaohsiung Chang Gung Memorial Hospital, Taiwan
#AMEC IS-3 "Analysis of Throwing Motion" Hiroki Ninomiya, Hiroshi Tanaka, Hiroaki Inui, Masahiko Komai, Katsuya Nobuhara, Nobuhara Hospital and Institute of Biomechanics
Part II. "DIAGNOSIS&BIOMECHANICS OF THE SHOULDER"
#AMEC IS-4 "How is biomechanical knowledge useful for understanding shoulder disorders?" Hiroaki Inui, Muto Tomoyuki, Hiroki Ninomiya, and Katsuya Nobuhara, Nobuhara Hospital and Institute of Biomechanics
#AMEC IS-5 "MRI-based 3D-shape model improves diagnosis of rotator cuff tear" Tomoyuki Muto [1], Hiroaki Inui [1], Hiroshi Tanaka [1], Kazuki Ishiro [2], Kento Morita [2], Hiroki Ninomiya [1], Masahiko Komai [1], Yoshiaki Kanatani [1], Kotaro Hashimoto [1], Syoji Kobashi [2], Katsuya Nobuhara [1], [1]Department of Orthopaedic Surgery, Nobuhara Hospital and Institute of Biomechanics [2]Graduate School of Engineering, University of Hyogo
#AMEC IS-6 "Estimation of shoulder muscle-force during arm abduction in the simulated rotator cuff repair" Hiroshi Tanaka[1], Toyohiko Hayashi[2], Hiroaki Inui[1], Tomoyuki Muto[1], Hiroki Ninomiya[1], and Katsuya Nobuhara[1], [1]Nobuhara Hospital and Institute of Biomechanics, [2]Graduate School of Science and Technology, Niigata University

AMEC Special Session 3 September 3 (Sunday), 10:40-12:00, Session chair: Yutaka Hata
#AMEC SS3-1 "Towards knowledge discovery from heterogeneous time-series medical databases" Shoji Hirano and Shusaku Tsumoto, Department of Medical Informatics, Shimane University, School of Medicine
#AMEC SS3-2 "Investigation on Swallowing Disorder in Biometric Data Measurement" Naomi Yagi[1,2] [1]Hyogo College of Medicine, [2]Kyoto University
#AMEC SS3-3 "Stenosis Detection in Fallopian Tubal Model Using Ultrasonic Measurement" Aoi Emura and Naotake Kamiura, University of Hyogo

AMEC Keynote Session September 3 (Sunday), 13:00-14:00, Session chair: Yutaka Hata
#AMEC Keynote "Advanced CT and MR imaging for improving diagnosis and treatment quality" Takamichi Murakami, MD.,PhD., Department of Radiology, Kindai University Faculty of Medicine

AMEC Special Session 4 September 3 (Sunday), 15:20-16:40, Session chair: Hiroshige Kumamaru
#AMEC SS4-1 "A study on flow between parallel disks for cooling" Takahiro Harumoto, Itsuro Honda, Osamu Kawanami, University of Hyogo
#AMEC SS4-2 "Study on Particle Focusing in Microchannel with Orifice-Shape Obstacle" Hirofumi Sugami, Hiroshige Kumamaru and Naohisa Takagaki, University of Hyogo,
#AMEC SS4-3 "Two numerical simulations of liquid motion driven by wind shear or syringe pump" Atsushi Shinoda*, Naohisa Takagaki*, Hiroshige Kumamaru*, Ryoichi Kurose**, *University of Hyogo, **Kyoto university
#AMEC SS4-4 "Microfluidic Manipulation Based on Thermoplasmonic Marangoni Effect" Kyoko Namura and Motofumi Suzuki, Department of Micro Engineering, Kyoto University

AMEC Special Session 5 September 3 (Sunday), 16:40-18:00, Session chair: Masakazu Morimoto
#AMEC SS5-1 "Human Fricatives" Kazunori Nozaki Osaka University Dental Hospital, Dental Informatics
#AMEC SS5-2 "Computational heart modeling using human specimens" Ryo Haraguchi, Graduate School of Applied Informatics, University of Hyogo
#AMEC SS5-3 "Recent Advance in HYPERSPECTRAL Sensors and Applications" Chao-Cheng Wu[1], Juei-Chao Chen[2] [1]Department of Electrical Engineering, Taipei Tech, Taiwan [2]Department of Statistics and Information Science, Fu Jen University, Taiwan
#AMEC SS5-4 "A Neural Network-based Odor Recognition System" Teijiro Isokawa, Yusuke Sakai, and Nobuyuki Matsui, University of Hyogo

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Review Result	15 Apr. 2018
Final Camera-ready Submission	15 May 2018
Early-bird Registration [must for authors]	15 May 2018

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Pattern Recognition	Biometrics	Sensors & Embedded Systems
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