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Novel higher order signal processing via vibration and acoustical condition monitoring

Novel class of higher order signal processing technique, the nonlinear frequency response functions, based on the higher order spectral analysis, are proposed, developed and investigated for vibration and acoustical condition monitoring of nonlinear systems, structures and materials for cases of the phase coupled interferences. The proposed techniques developed for stationary and non-stationary conditions of testing of nonlinear systems, structures and materials.

The significance of the proposed techniques is that they provide a measure of the structure and material output higher order spectral characteristics in response to the structure/material input higher order spectral characteristics and eliminate the influence of the phase coupled interferences on nonlinearity detection and diagnosis.

The proposed techniques are novel generalisations of the classical frequency response functions for the higher order spectral analysis of nonlinear systems.

Validation of these novel techniques by simulation and experiments in laboratory and in field conditions will also be presented for stationary and non-stationary conditions of nonlinear systems.

It is shown that the proposed techniques provide an essential effectiveness gain for the detection of nonlinearity for nonlinear systems in comparison with the classical higher order spectra for the case of the phase coupled interferences.

Biography

Prof. Len Gelman joined Cranfield University in 2002 as a Senior Research Fellow, creating a team focused on vibro-acoustical condition monitoring of complex systems with an emphasis on their practical deployment. During his time at Cranfield, Len has developed technologies which have been field trialled in applications ranging from aircraft engines, gearboxes, bearings, steam turbines, composite materials and centrifugal compressors. He has managed contributions to EU funded programs, UK DTI programs, EPSRC grants and multiple industrial contracts, including multiple contracts with Rolls-Royce. Len received Rolls-Royce award for innovation in 2011.

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Atomic and Electronic Structures of Complexes of Screw Dislocations and Mg Impurities in GaN

Recent experiments suggest that Mg condensation at threading dislocations induces current leakage, leading to degradation of GaN-based power devices. To investigate this, we perform first-principles total-energy electronic-structure calculations for various Mg and dislocation complexes. We find that threading screw dislocations (TSDs) indeed attract Mg impurities, and that the electronic levels in the energy gap induced by the dislocations are elevated toward the conduction band as the Mg impurity approaches the dislocation line, indicating that the Mg–TSD complex is a donor. These findings provide a picture in which the Mg, being a p-type impurity in GaN, diffuses toward the TSD and then locally forms an n-type region. The appearance of this region along the TSD results in local formation of an n-n junction and leads to an increase in the reverse leakage current.

Biography

Dr. Kenji Shiraishi has completed his PhD from the University of Tokyo, Japan in 1988 and worked for NTT basic research laboratories, Japan from 1988 to 2000. From 2001-2013, he worked for University of Tsukuba. From 2013, he moved to Nagoya University. He is now a professor of Nagoya university. He has published more than 200 papers in reputed journals.

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Thermal necrosis in bone drilling: Simulation, optimization and reduction

Bone drilling is a typical operation in the myriad of surgeries in the orthopedics, oral and maxillofacial, neurological, and otolaryngology. Friction and shear deformation energy during the drilling surgery generates extreme heat in the drilling hole, which increases the bone temperature. Thermal osteonecrosis loosens fracture fixations and permanent disability to the patients when it involves nerve injuries. Drilling parameters and drill bit geometries have been identified as two main factors that can be manipulated to reduce the bone temperature. Therefore, this lecture aims at reducing the thermal damage in bone drilling by using optimal drilling parameters (ODP) and improved drill bit geometries (IDG). In order to determine the ODP and IDG, approaches including numerical, experimental, and statistical were adopted. Human cortical bone and surgical drill bit models were developed using commercially available finite element method software, DEFORM-3D. From the sum of weightage results, the ranges for drilling parameters and drill bit geometries for optimization study were selected. Then, the response surface methodology (RSM) and multi-objective optimization studies were performed to determine the ODP and IDG. The proposed ODP can significantly reduce the thermal damage compared with the recommendations from the previous studies (maximum bone temperature elevation. Furthermore, the IDG can reduce thermal damage more than the existing surgical drill bit. Next, new ODP and IDG were recommended to reduce significant thermal damage. This research extends our knowledge of thermal osteonecrosis prevention and will serve as a base for future studies in the automation of bone drilling surgery.

Biography

Prof Yusoff has completed his PhD from University of Sheffield, UK, appointed as visiting/guest professor at universities in Japan, Turkey and Indonesia and as research fellow in several national and international companies. He serves as the deputy dean of Institute of Post Graduate Studies, Univrsiti Malaysia Pahang, Malaysia and received a Professional Engineer from Board of Engineers Malaysia and Chartered Engineer from I-MechE, UK. He has graduated 5 PhD students and 10 master students and actively supervised 6 PhD student which is published more than 25 papers in reputed journals and served as examiner/advisor for technical institutions and universities.

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Stereolithographic Additive Manufacturing of Metal and Ceramic Solid Geometries as Structural Components

In stereolithographic additive manufacturing, cross sectional patterns were created through photo polymerization by UV laser drawing on spread resin paste including ceramic and metal nanoparticles, and solid components were sterically printed by layer lamination. The lithography system has been developed obtain bulky components with functional geometries. An automatic collimeter was newly equipped with the laser scanner to adjust beam diameter. Fine or coarse beams could realize high resolution or wide area drawings, respectively. As the row material of the 3D printing, nanometer sized ceramic and metal particles were dispersed in to acrylic liquid resins at 60 % in volume fraction. These materials were mixed and deformed to obtained thixotropic slurry. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 50 μm in variable diameter and scanned on the spread resin surface. Irradiation power was changed automatically for enough solidification depth for layer bonding. The composite precursors including nanoparticles were dewaxed and sintered in the air atmosphere. In the recent investigation, through the computer aided smart manufacturing, design and evaluation (Smart MADE), solid geometries composed of zirconia ceramic and titanium alloy were fabricated as structural components, and these mechanical properties were evaluated.

Biography

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics” for environmental improvements of “Geotechnology”, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

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The Purpose of Temperature of Fever in Covid -19

When the disease made by virus becomes a threat to life or organs blood circulation decreases, Temperature of fever will emerge to increase prevailing blood circulation. And it acts as a protective covering of the body to sustain life. When blood flow decreases to the brain, the patient becomes fainted-delirious. If we try to decreases the temperature of fever, the blood circulation will further be reduced. Blood circulation never increases without temperature increase. Delirious can never be cured without an increase in blood circulation.

The temperature of fever is not a surplus temperature or it is not to be eliminated from the body. During fever, our body temperature increases like a brooding hen`s increased body temperature.

The actual treatment to fever is to increase blood circulation. Two ways to increase blood circulation. 1. Never allow body temperature to lose 2. Apply heat from outside to the body. When the temperature produced by the body due to fever and heat which we applied on the body combines together, the blood circulation increases.

Then the body will stop to produce heat to increase blood circulation. And the body will get extra heat from outside without any usage of energy.

How can we prove that the temperature of fever in Covid -19 is to increase blood circulation?

If we ask any type of question-related to fever by assuming that the temperature of fever is to increase blood circulation we will get a clear answer. If avoid or evade from this definition we will never get a proper answer to even a single question If we do any type of treatment by assuming that the temperature of fever is to increase blood circulation, the body will accept, at the same time body will resist whatever treatment to decrease blood circulation. If we measure the heat energy used for which activities in fever, we will know the purpose of the temperature of fever. No further evidence is required to prove the temperature of fever in Covid -19 is to increase blood circulation.

Keywords: Blood circulation, Surplus temperature, Protective covering, energy

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Poly(Sugar Acids): Phenolic Derivative of Polysaccharide Poly(2,3-Glyceric Acid Ether) from Medicinal Plants of Boraginaceae Family with Therapeutic Efficacy

The main chemical constituent of high molecular (>1000 kDa) preparations from *Symphytum asperum, S.caucasicum, S.officinale, S.grandiflorum, Anchusa italica, Cynoglossum officinale* and *Borago officinalis* (Boraginaceae) according to data of liquid-state ^{1}H, ^{13}C NMR, 2D $^{1}H/^{13}C$ HSQC, 2D DOSY and solid-state ^{13}C NMR spectra was found to be poly[oxy-1-carboxy-2-(3,4-dihydroxyphenyl)ethylene] or poly[3-(3,4-dihydroxyphenyl)glyceric acid] (PDPGA). The polyoxyethylene chain is the backbone of this polymer molecule. The repeating unit of PDPGA is 3-(3,4-dihydroxyphenyl)glyceric acid residue. PDPGA as 3,4-dihydroxyphenyl derivative of poly(2,3-glyceric acid ether) relates to a new class of an acidic polysaccharides poly(sugar acids) as well. Its basic monomeric moiety glyceric acid is oxidative form of aldotriose glyceraldehyde. Every repeating structural unit of PDPGA contains three reactive functional groups, two phenolic hydroxyl groups in *ortho*-position and one carboxyl group. The structural unit of synthetic polymers poly(glyceric acid carbonate) and poly(glycerol carbonate) contain only one reactive carboxyl and one reactive $–CH_2OH$ groups, respectively. Hyaluronidase (Hyal-1) degrades high molecular mass of Hyaluronic acid into smaller fragments which have pro-inflammatory effects. PDPGA possesses the ability to inhibit the enzymatic activity of Hyal-1 completely. Consequently PDPGA exhibited anti-inflammatory effect. PDPGA exerted anticancer activity *in vitro* and *in vivo* against androgen-dependent and –independent human prostate cancer (PCA) cells via targeting androgen receptor, cell cycle arrest and induced apoptotic death by activating caspases, without any toxicity towards non-neoplastic human prostate epithelial cells, together with a strong dose-dependent decrease in prostate specific antigen levels by 87%. Thus, PDPGA was identified as a potent agent against PCA without any toxicity.

Biography

Dr. Vakhtang Barbakadze has his expertise in isolation and structure elucidation of biologically active plant polysaccharides and polyethers. In 1978 and 1999 he has completed his Ph.D and D.Sci., respectively. He is the Head of Department of Plant Biopolymers at the Tbilisi State Medical University Institute of Pharmacochemistry. In 1996 and 2002 he has been a visiting scientist at Utrecht University (The Netherlands) by University Scholarship and The Netherlands organization for scientific research (NWO) Scholarship Scientific Program, respectively. He has published more than 100 papers in reputed journals. In 2004 he was Georgian State Prize Winner in Science and Technology.

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The Effect of Amount of Graphene for the study of Barrier properties of Epoxy-Graphene nano composites

The vapor barrier film of epoxy graphene nanocomposites of 0.75 and1.5wt% was synthesized by dispersion method this dispersion of graphene mainly attributes to the excellent water barrier property. when epoxy combined with graphene nanoparticles show significantly increased toughness and dampness capacity of epoxy system this is mainly due to free volume reduction respect to the pristine polymer The nanocomposites derived from graphene show excellent electrical ,thermal and mechanical properties. The excellent electron transport ,high surface area and mechanical properties of graphene epoxy nanocomposites has potential applications in food packaging, anticorrosive coating The synthesized the barrier film of epoxy graphene composites were characterized by differential scanning calorimetric techniques (DSC) The barrier properties were investigated by using electrochemical impedance spectroscopy (EIS)

Key words: Epoxy nanocomposites , barrier properties graphene nanoparticles

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Laser Lithographic Sintering on Ceramic Additive Manufacturing

Ultraviolet laser lithography was newly developed as a direct forming process of fine ceramic components with micro geometric patterns. As an additive manufacturing technique, two dimensional cross sections were created through dewaxing and sintering by UV laser drawing on spread resin paste including ceramic nanoparticles, and three dimensional composite models were sterically printed by layer laminations and interlayer joining. Alumina or titania particles of 300 nm in average diameter were dispersed in to photo sensitive liquid resins at 50 % in volume fraction. The resin paste was spread on a glass substrate at 50 μm in layer thickness by a mechanically moved knife edge. An ultraviolet laser beam of 355 nm in wavelength was adjusted at 10 μm in diameter and scanned on the surface. Irradiation power was increased to 1 W for enough solidification depth. The half wavelength of the incident ultraviolet ray should be comparable with the nanoparticles gaps in the resin paste, and electromagnetic field can be resonated and concentrated through Anderson localization. After the layer lamination, the alumina or titania structures with about 99 % in volume fraction were successfully processed to create thermoacoustic or electromagnetic devices for supersonic or terahertz waves modulations.

Biography

Soshu Kirihara is a doctor of engineering and a professor of Joining and Welding Research Institute (JWRI), Osaka University, Japan. In his main investigation “Materials Tectonics” for environmental improvements of “Geotechnology”, multi-dimensional structures were successfully fabricated to modulate energy and materials flows effectively. Ceramic and metal components were fabricated directly by smart additive manufacturing, design and evaluation (Smart MADE) using high power ultraviolet laser lithography. Original stereolithography systems were developed, and new start-up company “SK-Fine” was established through academic-industrial collaboration.

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Prediction of Bone Remodeling and Adaptation in Pelvis-Femur Model with Hip Arthroplasties

Prediction of bone remodeling behavior is a challenging factor in encouraging the long term stability of hip arthroplasties. The presence of femoral components has modified the biomechanical environment of bone and altering the bone growth process. Issues of bone loss and gait instability on both limbs are associated with the remodeling process. In this study, finite element analysis with adaptive bone remodeling algorithm have been used to predict the changes in bone mineral density following total hip and resurfacing hip arthroplasty. Three dimensional model of pelvis-femur was constructed from computed tomography (CT-based) images of a 79-year old female patient with hip osteoarthritis. Prosthesis stem of total hip arthroplasty was modeled as titanium alloy material while the femoral ball as alumina properties. Meanwhile, resurfacing hip implant was assigned as cobalt chromium material. Contact between components and bone was designed to be perfectly bonded at the interface. A distributed load of 60kg patients' body weight was considered to present a quiet standing position. Results indicate that the bone mineral density was modified over 5 years on all models, including hip osteoarthritis model. The changes of BMD were predicted high between year 0 and year 1 especially in the proximal region. The changes were observed to be minimal on the following years. The bone remodeling process was also predicted at the non-operated femur. However, the adaptation was lower as compared to operated limbs. The reduction of bone mineral density in bones suggested for the bone loss phenomenon after a period of time.

Key words: Hip arthroplasty, Pelvis-Femur model, Bone remodeling, CT-based images, Finite Element Analysis

Biography

Abdul Halim Abdullah is a Senior Lecturer of Mechanical Engineering as well as a member of the Biomechanical and Clinical Engineering (BioMeC) Group at Universiti Teknologi MARA, Malaysia. Dr Abdul Halim's main fields of interest are medical engineering, biomechanics, computaional analysis and 3D printing technology. His research specifically explore and emerge the application of mechanical engineering in medical and biological sciences. He holds a Dr.Eng. in biomechanical engineering from from Kyushu University, Japan in 2016 and M.Eng (Mechanical) from Universiti Teknologi Malaysia, in 2009. Abdul Halim also hold a B.Eng. from Universiti Sains Malaysia in 2005.

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Zinc Oxide Phase Transition Using Equilibrium Time of Total Energy in Isothermal and Isobaric Ensemble, a Molecular Dynamics Prediction

Zinc oxide is a forever promised semiconductor due to special properties like the chemical bonds which are between covalent and ionic. This last properties play a dramatically role under deferent pressures and temperatures, which appears in the total energy behavior of ZnO. In this work we investigated molecular dynamics technique (RAVEN supercomputer of Cardiff University in UK and dlpoly_4) to simulate the variation of total energy in time under extended conditions of pressures and temperatures in the ranges of 0-200GPa and 300-3000K. This equilibrium time of total energy in isothermal and isobaric ensemble permit us to use it as a new method to confirm the phase transition of ZnO wurtzite type. Our results are in agreement with theoretical and experimental data. These results will play a major role in thermodynamic behavior of materials in nanoscale and macroscale.

Biography

Yahia CHERGUI has completed his PhD from Badji Mokhtar University in Annaba, Algeria. His research field is Physics(condensed matter, simulation by molecular dynamics). He is a lecturer in Boumerdes University(Electrical & Electronics Engineering Institute) since 2012. He has published more than 9 papers in reputed journals and has been serving as a referee with condensed matter journal (IOP), Energy journal (Elsevier), and recently accepted to be a reviewer of *American Journal of Modern Physics*. He did all his PhD work in Cardiff University in UK. He is an academic member of the Athens Institute for Education and Research belonging to Physics Unit.

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Evaporator Surface Modification Using Super Ice-Phobic

Evaporator by creating the cold and sending it to the refrigerator and absorbing the heat from the refrigerator environment that is the refrigerators main task but due to freeze moisture on the surface of the evaporator, efficiency of this piece is reduced greatly and apply the heat to solve this problem as well as follow to damage to the surface**.** According to test conducted, this method according to SEM tests is based on the creation of the Nano scratches on various surface that this scratches are 3 to 4 times increase based on the properties of the surface tension of water that prevent to sit water on the surface that will not be possible to allowed to sit on the evaporator's Aluminium surface.

hydrophobia sol includes kinds of organic and mineral materials such as Cobalt chloride, Colin chloride was obtained after preparations using vacuum and magnetic and by utilizing from homogenizing methodThe results show that due to the hydrophobic property created prevented of creation ice crystals on the surface, so that to prevent formation Moisture and water droplets on the surface also that was prevented waste of energy particularly in the evaporator and continuing the activity changing in the DuPont material by utilizes some carbohydrates to needs for to improve the project as a result, the angle of droplets of water than the initial state increased about 70 to 90 degrees according to CA tests.

Organic matter in the structure of the material as well as with regard to the large contact area of matter on surface increases the adhesion and durability but it will not penetrate the main surface and the Aluminium surface of the evaporator only including layer that is separate but coherent and also therefore moisture around the evaporator does not get the ability to penetrate and reach the evaporator.

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Charge-based re-programmable logic device with built-in memory

We put forward a new proposal of designing charge-based logic devices considering a cyclic molecule that can be programmed and re-programmed for different functional logical operations and suitably engineered for data storage as well. The key idea is based on the appearance of bias induced circular current under asymmetric molecule-to-electrode interface configuration which does not dissipate even when the bias is off. Our results are valid for a broad range of parameter values, and provide a boost in the field of storage mechanism, reconfigurable computing, charge-based logic functions and other nano-scale applications.

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Electrospun nanofibers and their potentiality for biomedical application

The growing trend of tissue damages and diseases often caused by accidental injury and aging demands for more effective therapeutic intervention. Currently used tissue grafts for the treatment of patient with various types of tissue defects hold several unresolved issues including immunogenic rejection, donor site morbidity, risk of disease transmission etc.. Whereas, tissue engineering is a unique method that provides functional tissue grafts which may be a promising alternative to the conventional grafts used clinically. However, fabrication of scaffold matrices with biomimetic nano-feature architecture is one of the major challenges that need to be addressed for achieving success of their clinical application. Electrospun nanofibrous polymeric structures are promising because these can mimic body tissue and able to provide excellent micro-environment for cells to grow, proliferate, and differentiate into targeted tissue. The present lecture discusses the process of making nanofibers in different forms and the associated controlling factors for nanofiber generation. The nanofibrous functionalized structures derived from natural biopolymers and their potentiality to provide necessary biochemical and biophysical cues for cell function towards tissue regeneration and their application in drug delivery are also presented.

Key words: Electrospinning, nanofiber, nanocomposite, tissue engineering, natural biopolymer, drug delivery

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Multiplier Operating Machines with Rotary Slide Valves Sviyazheninov Eugene

Slide valve is a device that directs the flow of gas or liquid by displacing the windows of the moving part relative to the windows in the surface of the fixed part along which it slides. Rotary slide valves with progressively rotating spools are especially effective thanks to absence of reciprocating vibrational movements accompanied by inertial loads whose amplitudes are proportional to the square of the frequency. Meanwhile, the use of such rotating spool valves yet has been restrained by the following circumstance. With increasing rotational speed of the spool, the peripheral speed on its outer surface increases, and the sliding mechanism of the rotor and stator mating surfaces is complicated by significant heat generation, lubrication difficulties, wear of the mating surfaces and violations of the density of their mutual fit. Therefore, reducing the speed of the spool valves while maintaining functionality opens up the possibility of their widespread implementation. By means of multiplication it is possible to infinitely reduce the sliding speed of the rotor-spool over the stator surface in order to suppress the power of friction forces and heat generation, due to which rotary spools are still of little use in mechanical engineering compared to reciprocating ones, starting with the spools of steam engines, despite their great simplicity, reliability and efficiency, as well as complete absence of sticking zones of spools in the vicinity of their zero speeds.

Biography

Eugene Sviyazheninov has completed his PhD from Leningrad Polytechnic Institute and DrSci from the Russian Academy of Sciences. He is the Leading Scientist at the Institute for Problems in Mechanical Engineering of the Russian Academy of Sciences. He has published more than 100 papers in reputed journals and has got more than 20 patents for inventions.

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Design and Development of Size Segregation Sieve Machine with Centrifugal Action

This study aims to design and develop a size segregation sieve machine that utilizes centrifugal action to separate impurities from short Oil Palm Frond (OPF) fibers. OPF fibers can manufacture into various products such as erosion control mat and medium density fibreboard as an agricultural waste management program for achieving environmental sustainability. In this aspect, the role of the fiber sieving machine would be significant to support the industry in the production of OPF fibers. However, a thorough literature survey reviewed that limited publications are available in this area; most work done is published in the form of patents. In addition, most fiber sieving machines available in the market utilize manual labour work in the separation phase, where they are highly inefficient. Therefore, this study is designed to fill these gaps. The design of this study adopts the mechanism of various size segregation concepts available and includes centrifugal action in the separation process to increase efficiency. Eventually, a prototype was fabricated for laboratory testing. Several vital parameters are highlighted, which includes mesh surface inclination, sieving duration, a rotation speed of screen and maximum capacity that significantly affects the sieving efficiency. Findings from this study show that sieving duration is less significant to the developed design as higher rotation speed will tend to improve the passing percentage of the fibers. Testing results also revealed the potential application of such a machine in other particle separation applications such as soil separation. For future study, it is recommended to improve the current design in terms of parts, size simplification and multiple size segregation adaptation for achieving a higher production rate.

Biography

Pui San Lee is a student that is studying in University College of Technology Sarawak, Malaysia. She has a few years of working experience as research assistant. She has published book chapter and several papers in reputed journals.