—Abstracts—

ROHM PLAZA 3F

ROHM PLAZA 5F

Session1

No.1   Takeyoshi Nakano

[Title]

Characteristic Functions of Sensing Node in for Monitoring Landslide Disaster

[Abstract]

This study shows telemetric sensing network system for landslide disaster surveillance. The sensing network system consists of Local Sensing Node Network System and Host System. Local Sensing Node Network System is placed at monitoring area (slope of mountains and hills). And Host System is placed at a remote location. Local Sensing Node Network System is a network of distributed Sensing Nodes. Sensing Node can create network, communicate with the other Nodes, measure data and sense landslide disaster. The Host System manages the operation of Local Sensing Node Network System remotely and monitors landslide disasters. The characteristics of telemetric sensing network system are autonomous operation function of Local Sensing Node Network System and remote management function by Host System using dual way communication. My presentation introduces characteristic functions of Sensing Nodes for observing, measuring, sensing and communicating autonomously and flexibly. Finally, my presentation shows the effectiveness of characteristic functions.

No.2   Yoshiki Fujita

[Title]

Multi-monolith Synchronization based on NTP for t-Room

[Abstract]

t-Room is a large-scale computer supported cooperative work system that has multiple life-sized displays. This system consists of multiple computers, and each of them communicates with its corresponding computer in a remote site. The communications over the computers unavoidably causes delay, which is caused by such computational procedures as networking and signal/data processing in computers, and hinders users from doing effective and smooth collaboration using the t-Room systems. In this study, we focus on the problem of degraded synchronization in the adjacent displays of t-Room, and aim to alleviate the problem by introducing NTP in the t-Room computer communications. First, we tested the perceptual assessment of visual image synchronization by performing experiment with college students. In this experiment, several student subjects evaluate the objects that are projected across the two adjacent displays, and we found that even only one-frame gap, which roughly corresponds to 30ms, caused a feeling of discomfort for the users when the objects move in the vertical direction. Introducing the NTP servers to the t-Room environment provides basic time information that is needed for keeping the synchronization among all the computers used to project objects in the displays. However, the image processing to the large amount of visual data often cause unexpected degradation of synchronization during a long use of t-Room. Thus, the visual transmission system in t-Room, this system must regularly compare the time information embedded in their packet data with that provided by the NTP servers. If the degradation of the synchronization is detected, the system must also correct it by editing (e.g., temporally expanding or shrinking) the interval of the visual data display. Obviously, a simple the visual data editing causes unnatural and inappropriate projections of objects. To avoid this problem, we also aim at developing a new procedure of editing visual data, which causes no degradation of visual perception in object projection.

No.3   Syunsuke Fukushima

[Title]

Fluorine plasma treatment on InN films grown by RF-MBE

[Abstract]

InN has attractive material properties, like small effective electron mass, very high mobility (14000 cm^2 /Vs), and high saturation drift velocity (6.0×10^7 cm/s) [1]. Due to these properties, InN is consider to be a promising material for application to optoelectronic and electron devices. On the other hand, InN has a unique electronic property at the surface with a high density of electron accumulation. This prevented the successful development of InN-based electron devices. The surface electron accumulation layer is induced by downward band bending at the surface, which comes from Fermi-level pinning at well above the conduction band minimum. Therefor study on new technique to prevent InN surface carrier accumulation is strongly desired. Recent study suggested that fluorine plasma treatment using RIE was successfully applied to depleted 2DEG on AlGaN to realize normally off operation of AlGaN/GaN HEMT [2]. The purpose of this study is to reduce InN surface electron accumulation by fluorine plasma. In this paper, we will report on preliminary results on fluorine plasma treatment of InN. We prepared (0001) InN samples grown by RF-MBE on MOCVD-grown GaN/sapphire templates. It was 300 nm thick, and the carrier concentration and mobility were 3.9×10^{18} cm^{-3} and 859 cm^2 /Vs, respectively. The samples was treated by CF_4 plasma in RIE system at an RF power of 25 W and plasma irradiation time was 150s. The InN was evaluated by Hall effect measurement, electrochemical capacitance voltage (ECV) and secondly ion mass spectroscopy (SIMS) In this study, we confirmed that electron concentration near InN surface was slightly decreased by measuring ECV profiles. Furthermore, in the sample after fluorine treatment, carrier concentration and mobility were 2.5×10^{18} cm^{-3} and 1210 cm^2 /Vs, respectively. In consequence, the results obtained in this study suggest that Fluorine can control electron concentration of InN.

[1] V. M. Polyakov, et. al. Appl. Phys. Lett. 88, 032101(2006).

[2] Y. Cai, Y. Zhou, K. J. Chen, IEEE Electron Devices 26, 435 (2005).

Session1

No.4   Kotaro Maekawa

[Title]

Power analysis and modeling of quadcopters on horizontal flight

[Abstract]

Recently, various robots driven by battery are widely spreading in our life. Drone are one of hopeful robot toward practical applications such as delivery service and disaster investigation. However, available flight time of quadcopter is from about 30 minutes to 50 minutes, and effective power management is necessary to avoid falling down due to power shortage. In this research, we used quadcopter being one of drone and spread as cheap hobby products. In order to realize the effective power management, the estimation method of power consumption is necessary. This means the power analysis and modeling of quadcopters are important. In this research, power consumption is measured on various scenarios such as flight speed and weight. We utilized Parrot AR. Drone 2.0 and corresponding library named CV Drone to control the quadcopter. Additionally, the power consumption is measured by original data logger, and the logger is inserted between the battery and the quadcopter. CV Drone outputs the flight log such as velocity and altitude in the supposed time interval. On the other hand, the logger also takes voltage and current log in different time interval. Therefore, we first merge these logs to understand flight and corresponding power consumption. In case of changed flight speed, The results of the analysis was that flight speed did not affect by power consumption. In case of changed weight, The results of the analysis was that power consumption increased with increase of weight. However, weight did not affect by energy consumption than flight speed. Then, energy model is constructed. Future work includes further experiment to analyze more scenarios assessed model constructed and constructing power model on more complicated flight patterns.

Session1

No.5   Marin Yasugi

[Title]

Lossless multi-channel EEG compression based on Kruskal's algorithm

[Abstract]

Cerebral aneurysm is not a rare disease and is found in about 5% of adults. Ruptured aneurysm is the main cause of the subarachnoid hemorrhage. The subarachnoid hemorrhage results in death about 50%. Although the survival cases, most patients will be suffered from the after effect. Therefore, we should avoid rupturing aneurysms. Clipping and coiling are surgical procedures to treat unruptured aneurysms. They are very effective, however, all treatment should have some risk of side effect such as damaging brain, causing rupture, and so on. Consequently, it is very meaningful to prevent the occurrence of cerebral aneurysm.

It is known that lifestyle habit and genetic factor are main reasons that occur cerebral aneurysms. In addition, some studies suggest that cerebral artery shape might be correlated with a risk of occurring aneurysms. For the purpose of preemptive medical care of the cerebral aneurysm, this study proposes a method to estimate a risk of occurring cerebral aneurysms based on the cerebral artery structure. The method extracts morphometric features of the Wills ring such as 3-D artery shape and bifurcation angle in 3-D magnetic resonance angiography (MRA) images. It then estimates the risk of occurring cerebral aneurysms from the extracted features using support vector machines (SVM). To validate the proposed method, we employed 40 subjects with cerebral aneurysms, and 40 subjects without cerebral aneurysms. Leave-one-out cross validation test was performed, and the method using 3-D artery shape achieved a sensitivity of 75% and a specificity of 75%; one using bifurcation angle did a sensitivity of 33% and a specificity of 71%; one using all features did a sensitivity of 68% and a specificity of 89%. The results showed that 3-D shape is effective for cerebral aneurysm occurrence risk prediction.

No.6   Naoki Yoshida

[Title]

A development of the high efficient charger recycling the surplus power of unstable solar panels

[Abstract]

In recent years, distributed power has attracted attention by global warming. By the distributed power, it is possible to create a low-carbon society. What is important in a distributed power source is both "Efficient utilization of natural power source" and "Efficient usage of battery." Output power of solar panels varies by the amount of solar radiation and temperature. Storage battery is used to stabilize the power from the solar panels. It is necessary to develop an optimized power system in consideration of characteristics of the solar panels and the storage battery, spontaneously. We have developed a system to charge the storage battery by the SiC step down converter from solar panels. This system performs MPPT (Maximum Power Point Tracking) control by controlling the current to the storage battery. If generated output of the solar panels are increased, the current to the storage battery is larger than the rated current. Considering the optimal current to the storage battery, this system cannot use all of the generated output of the solar panels. Surplus power is the power that is not used in the generated power by the solar panels. This paper proposes a charger system to minimize the surplus power. The system connects two charging circuits in parallel to make it possible to perform optimum charging and MPPT control at the same time. The surplus power is reduced by the MPPT control. In addition, we confirmed that charger corresponds to the fluctuations of the solar panel output and variable-speed charging.

Session2

No.1　Seiya Sirakuni

[Title]

Analysis of Hierarchical 32-Core Architectures for FPGA-based Embedded Systems

[Abstract]

Due to the ever increasing capacity of FPGA devices, an FPGA is able to implement a number of CPU cores in order to realize high-performance embedded systems. In our prior work, we had designed a hierarchical 32-core architecture (hereinafter called ARCH1) for FPGA-based embedded systems. ARCH1 has a host core and 31 slave cores. Linux and most applications run on the host core, while some computationally-expensive applications are off-loaded to the slave cores. The slave cores are partitioned into four clusters, and the four clusters and the cost core are connected to a memory bus. ARCH1 was successfully implemented on an FPGA, but quantitative comparison of ARCH1 with other architectures has not been made yet.

In this work, we design another 32-core architecture (ARCH2). ARCH2 is based on ARCH1, and the difference between the two architectures is the location of the host core. In ARCH1, the host core is isolated from the slave clusters. In ARCH2, on the other hand, the host core is located inside one of the slave clusters. In other words, ARCH1 is asymmetric, while ARCH2 is symmetric.

We have implemented both ARCH1 and ARCH2 on Xilinx's Kintex-7 FPGA KC705 board. Both architectures operate at 100 MHz. We ran a grayscale conversion program on the architectures and measured their performance. For each architecture, we varied the cache size and the number of slave cores and evaluated the performance. The evaluation results show that ARCH1 achieves higher performance than ARCH2. In future, we will conduct more experiments with various benchmark programs.

No.2　Kentaro Kawabe

[Title]

New contactless power transfer to articulated arm robot based on a disk repeater

[Abstract]

The present report aims at the contactless power transfer to the motor at each joint in industrial articulated arm robot.　Feeding cable in the arm robot to the motor cuts in around one month due to too fast and frequent rotation of each joint, and hence, it proposes to reduce cost and time for changing spare cable. We have studied the contactless power transfer through the joint region in addition to the power distribution to the motors with different power requirement towards the realization of contactless power transfer system using a disk repeater comprised of a copper disk, a wire, and the electromagnetically coupling open spiral resonator. Consequently, we have confirmed good control of power distribution to multiple loads and high transmission efficiency by simulation and measurement, reporting the result.

Session2

No.3   Hiroaki Ito

[Title]

Study of method that detect sign of circulatory system disease.

[Abstract]

In an aging society, the majority of the cause of death in recent Japan is circulatory system diseases. Since patients have no subjective symptoms, it is usually difficult to find a sign. The possibility of making full recovery will be greatly increasing if these diseases are found, diagnosed, and cured in early stage. However, patients need to see or conduct a doctor regularly in order to detect the sign of diseases.

Therefore, we thought that greatly decreasing deaths from circulatory system diseases, if we can develop a system that detect circulatory system abnormality. We are working on analysis of the bio-sound that be obtained by the carotid artery.

Currently, we can separate the bio-sound into three components, which are heartbeat, a bloodstream and a breath sounds. We find a sign of diseases to analyze these sounds. We separate the bio-sound in an algorithm of sound separation. However, there are still several problems we have to resolve.

My current issue is to explore the possibilities of detecting the sign. Currently, we study NMF and ICA for references that were useful algorithm in the past.

No.4   Akira Higuchi

[Title]

Dynamic Evaluation of Pedestrian Walking Field by their Flow Measurement

[Abstract]

To realize smooth and safe walking of people outdoors in city or town, it is necessary to know latent characteristic (congestion and dangerousness) of the field where they are walking.   The latent characteristic of field is estimated by analyzing pedestrian flows. The dynamical state of pedestrian flows expresses the changing of congestion and the latent dangerousness of field where they are. To know the latent state of field is very useful to predict frequent accidents for pedestrians and to redesign the arrangement of structures/facilities and the formation of road/field.

In this study, the system structure to estimate pedestrian walking flow has been investigated. As results, dynamic states of congestion and dangerousness are visualized and estimated.

Session2

No.5   Wang Yiqi

[Title]

Algorithm associated with the separation of sound with achievement of circulatory system

[Abstract]

With deep effect on aging population, patients suffered circulatory system increases year by year, which makes the diagnose by stethoscope become more important. Meanwhile, the development of specialists and nurses became much important with internal medicine. So it is better to develop the improvement of specialists by the separation of the voice of heart, sphygmus and breadth with circulation system. Furthermore, it needs improve the speed and accuracy of separation. So I will do more research on the arithmetic separation link to functionality.

No.6   Ryota Sakamuki

[Title]

Research of stethoscope to catch circulatory system diseases

[Abstract]

In current Japan, the number of deaths from circulatory system diseases is increasing. Circulatory system diseases are more prevalent in the elderly, but circulatory system diseases have become serious problems for people of young age in recent years. Patients of these diseases recover completely, if they can catch these diseases early and receive early treatment. However, they must make regular a diagnosis to catch these diseases and pay a lot of medical expenses.

  Therefore, we have conducted research electronic stethoscope to catch these diseases. In overview, the system has a microphone to be attached to the neck for obtaining bio sound. If the biosound is abnormal, it informs the doctor and the patient of abnormal. Currently, the microphone which we have used has some noise when the person who attached the microphone is not at rest. In addition, the logger which we have used is a large size, so the logger is inconvenient to carry. Therefore, my goal of the study is to clear some noise of the microphone and to make the logger smaller.

Session2

No.7　　Yoshinori Ogami

[Title]

Weighted Double Sideband Modulation for Parametric Loudspeaker

[Abstract]

  Recently, a parametric loudspeaker has been utilized for transmitting an audible sound in a particular area. It has a sharper directivity by using an ultrasonic wave, and it can transmit the audible sound to a particular listener. Thus, it is useful to transmit the audible sound to people who need that sound at museums, station and so on. The parametric loudspeaker emits an intense amplitude modulated (AM) wave, and the emitted intense AM wave is demodulated into the audible sound in the air. However, the sound quality of the parametric loudspeaker is lower than that of a general electrodynamic loudspeaker because it is difficult for the parametric loudspeaker to reproduce the sound in lower frequency. Furthermore, the reproduced sound degrades by a harmonic distortion. Therefore, in this study, we attempt to improve the sound quality in the parametric loudspeaker. It is known that the sound quality of this loudspeaker depends on the modulation method. As a conventional modulation method, a double sideband(DSB) modulation and a single sideband(SSB) modulation have been proposed. The DSB modulation realizes a large sound pressure level (SPL), but also occurs the large harmonic distortion. On the other hand, in the SSB modulation, we can reduce the harmonic distortion, but the SPL of the reproduced sound is lower than the DSB modulation. Therefore, in this study, we propose a new modulation method to improve the sound quality in the parametric loudspeaker. The proposed method combines the DSB and the SSB modulations, and controls a weight of sideband amplitude at each frequency. Specifically, the proposed method utilizes the DSB modulation at a lower frequency to emphasize the SPL, and utilizes the SSB modulation at a higher frequency to reduce the harmonic distortion. In addition, the proposed method also controls the weight of sideband amplitude to improve the sound quality further. From the results of evaluation experiments, we confirmed the effectiveness of the proposed modulation method.

No.8　　Akira Akamatsu

[Title]

  Research of super-resolution that is suitable to security cameras for the criminal investigation support

[Abstract]

In recent years, the number of terrorism are on the increase, therefore the deterioration of public security has been a concern. In japan, Tokyo Olympics Games will be held in 2020. There are problems such as the threat of terrorism in it. There is a criminal investigation using security cameras as one of the ways to solve or deter them. However, Image of general security cameras has a lower resolution. It cannot be grasped accurately the features such as the face or character. Therefore, it is necessary to super-resolution technology that is able to see clearly by increasing the resolution of the input image. It is difficult to achieve a clear high-resolution image by the multi-frame super-resolution technology, because many of security cameras are a few recording frames. Therefore single frame resolution technology is suitable for the security camera. The aims of future are to develop a single-frame super-resolution technology and to conduct research of algorithm that is suitable to the image of security cameras.

Session1

No.1　Kenji Hayashi

[Title]

Physical Behavior Estimated by Dynamic Data Flows in Telemetric Body Area Network System

[Abstract]

This research focuses on the relationship between healthcare and quality of life also known as Health Related Quality of Life (HRQOL). It is important to maintain a high QOL by improving user's body behavior and monitoring health condition. Wearable Body Area Network (BAN) system is one of the useful methods to realize them. Not only showing physical parameters, by feedback of vital information to user. BAN system is extended to the autonomous system closed to user. Getting such information, user is able to improve his body behavior consciously. Moreover, addition of the telemetric function is able to transmit the vital parameters to Host System. Telemetric function realizes to inform user's physical condition dynamically to his family or home doctor far from him. To install these functions to BAN, it is necessary to design flexible and robust data flows among Sensor nodes, Hub system, Local Human Interface and Remote Host System. By using such a data flow system, BAN system can realize the improving walking posture, the monitoring health condition at a remote place and visualization of jogging exercise intensity. This research describes the design of dynamical data flow and management of such a BAN system for real time health monitoring and system management.

No.2　Che-Tsung Lin

[Title]

See-through:Driving as You've Never Seen

[Abstract]

Rear-end collision is one of the most prevalent auto accidents. It takes place when the preceding vehicle slows down suddenly, leaving insufficient time and space for the following vehicle to brake. The main reason is that the blind spot resulting from the preceding vehicle's body fully or partially blocks the following vehicle's field of view when the in-between distance is close. V-to-V communication enables collaborative vehicle safety applications by allowing vehicles to exchange information. This research proposes a new vision-based driver assistance system which could eliminate the blind spot resulting from the preceding vehicle's body in the host camera's video stream.

The proposed algorithm makes use of feature correspondences which are seen by both cameras, extracted and identified in these images. Such feature correspondences enable (1) the estimation of the relative pose of the two cameras, (2) determining the location of the front vehicle in the rear vehicle's camera, and (3) translucentizing the front vehicle's body in the video stream captured by rear vehicle.

Experimental results of challenging on-road video sequences demonstrate that the proposed algorithms can let the following driver see-through the preceding vehicle's body once both of them equip with camera, GPS and V-to-V communication devices.

By integrating the above-mentioned algorithm, only the region that front vehicle's body occupies in the image captured by the back vehicle would be translucent. Therefore, on the screen, the driver of the back vehicle could visually know both where the front vehicle is and the view that the front driver sees.

No.3   Yuji Kubonaka

[Title]

Growth of N-polar InN by RF-MBE

[Abstract]

III-nitrides are particularly stable, so there are expectations for applications of high temperature and high power transistor.   They are characterized by wide range of bandgap.

InN, a part of III-nitrides, is used future photonic and electronic devices because it has large mobility, high peak and saturation velocities and small direct bandgap.

However, InN has been the least studied of nitride semiconductors. This is because it is difficult to obtain high quality InN due to the low dissociation temperature of InN and high equilibrium vapor pressure of nitrogen.

Metalorganic vapor phase epitaxy (MOVPE) has disadvantage because it needs the conditions for NH3 pyrolysis and prevention of InN dissociation, which impose conflicting temperature requirement. In contrast, Radio frequency plasma-assisted molecular beam epitaxy (RF-MBE) has essential advantage over MOVPE for obtain high-quality InN.

In addition, we reported new growth method of InN named droplet elimination by radical-beam irradiation (DERI) [1]. These growth techniques improved InN quality. However, devices are indicated higher quality InN than ever.

N-polar InN is grown by RF-MBE in order to InN quality is further improved.

N-polar growth is possible to increase temperature (about 100℃) because N polarity is stable compared to the In polarity. N-polar InN is grown on sapphire substrate was treated nitridation for long time at a low temperature.

The structure of the films during growth was monitored by in-situ reflection high-energy electron diffraction (RHEED). After growth, the samples are estimated ex-situ by X-ray diffraction (XRD), scanning electron microscopy (SEM), and Hall measurements.

[1] T. Yamaguchi and Y. Nanishi, Appl. Phys. Express 2, 051001 (2009).

Session1

No.4   Naotaka Oka

[Title]

Performance evaluation of mega solar photovoltaic systems with different rated value photovoltaic modules connection

[Abstract]

The authors stress the importance of photovoltaic module (PV) output difference in mega solar photovoltaic systems. A mega solar power plant has thousands of PV modules. When the part of it has been damaged, for example, by disasters or aged deterioration caused from using PV modules for long term, there is a possibility of replacing PV modules. In this kind of situation, it is not always easy to replace PV modules with the one that has been used before, because the company may have already finished selling it or there may be a chance of using secondhand PV modules due to a cost. These problems result in using PV modules that have different electric characteristics (replacement PV module). Generally, there are protection devices like bypass and blocking diodes to prevent accidents and deterioration of power generation. However, when the protection devices break down due to a difference in electric characteristics of PV modules, there are risks of smoke emission or decrease in the amount of power generation. Hence, considering the electric characteristics of PV modules are essential for replacement. The authors first describe modelling of the various types of the crystalline silicon PV modules based on the experimental data by current vs. voltage and power vs. voltage characteristics. Then, the authors discuss the power generation performance using an index called performance ratio in the case of connecting different types of PV modules serially or in parallel to a PV array. Also, discussed is an optimal arrangement of PV modules replacement in a PV system. As a result, an optimal arrangement of PV modules: serially connection for replacement PV module with low short circuit current and parallel connection for replacement PV module with low open circuit voltage.

No.5   Keitaro Nakasai

[Title]

Analyzing the relations between donations and development progress in open source software projects

[Abstract]

I'm working on analyzing the relations between donations and development progress in open source software projects. We are interested in the following research questions. Who donates to the projects? What kind of events have impacts on the amount of donations? Do donation gifts contribute to the increase of donations? The purpose of this research is understanding the relations and the impact of donations on development progress. We are analyzing the donation histories and source code repositories in the eclipse project.

Session1

No.6   Aomi Kobayashi

[Title]

<div align="center">Comfortable Sound Design Based on Sound Reconstruction of Infant Cry</div>

[Abstract]

Infant cry becomes recognized as a noise and is the cause of noise trouble and stress due to it. Therefore it is necessary to reduce discomfort of infant cry. We have been proposed the method which reduces discomfort of infant cry based on auditory masking and mitigation of time fluctuation. In the method based on auditory masking, spectral peaks which are discomfort components of noise are detected and the masker signal which can mask detected spectral peaks is designed. Reducing discomfort of infant cry is realized when hearing infant cry and designed masker signal at the same time. However, there is a problem that this method does not focus on characteristic features of infant cry. And also from the feature analysis of infant cry, we confirmed that infant cry is the sound which has large and sharp time fluctuation. So we proposed the method based on mitigation of time fluctuation. In this method, time fluctuations are detected and control signal which can mitigate time fluctuation is designed. Reducing discomfort of infant cry is realized when hearing infant cry and control signal at the same time same as the method based on auditory masking. We confirmed the regular effectiveness of this method, however, it is not sufficient to reduce discomfort of infant cry because it only focus on attenuation of time fluctuation. Therefore, in this paper, we propose the method to reduce discomfort of infant cry based on mitigation of time fluctuation not only focus on attenuation of time fluctuation but also ascension of time fluctuation. In the proposed method, we design control signal which can mitigate time fluctuation and reconstruct sound. Reducing discomfortand designing comfortable sound is realized when hearing infant cry and control signal at the same time as same as previous methods.

Session2

No.1   Yoshiki Fujiki

[Title]

Surface potential measurement of a-Ga$_2$O$_3$ by Kelvin probe force microscopy

[Abstract]

It is important for power devices (such as diodes and transistors) to have low on-resistance and high breakdown voltage.

SiC and GaN have been studied for the application of power devices. These materials have wide-band-gap, so these materials have larger breakdown field than that of Si[1], which is one of the most famous semiconductor materials.

Recently, in contrast to these materials, Ga$_2$O$_3$ is being considered as a promising candidate for power device applications, because it has a larger bandgap than that of SiC or GaN. Ga$_2$O$_3$ takes five different polymorphs (a, b, g, e, and d) and the b-Ga$_2$O$_3$ is the most stable crystal structure among them[2]. On the other hand a-Ga$_2$O$_3$ has the largest bandgap in this crystals, and can be grown on sapphire substrates at a low cost by using mist chemical vapor deposition despite of its metastable polymorph [3].

There is a problem for fabricating high-quality a-Ga$_2$O$_3$ based devices. It is difficult to form a good Ohmic contact on the a-Ga$_2$O$_3$. In the case of b-Ga$_2$O$_3$, this is also severe problem and some researchers explain its origin as the energy band of un-doped b-Ga$_2$O$_3$ is bent upwards at the surface due to negatively charged crystal defects at the surface, and this upward band bending might cause the degradation of an Ohmic contact[4].

As the difference of crystal structure between a-Ga$_2$O$_3$ and b-Ga$_2$O$_3$ is small, we think that similar phenomenon occurs in a-Ga$_2$O$_3$. In this work, we revealed of the upward band bending in a-Ga$_2$O$_3$ by Kelvin probe force microscopy (KFM).

We measured surface potentials of three samples with different Sn doping concentration (un-dope, Sn-dope 0.8%, and Sn-dope 8%, respectively) by KFM. We found that surface potential increases with Sn doping concentration. Therefore, for the highly Sn-doped sample, the upward band bending due to negatively charged defects seems to be reduced.

[1] M. Higashiwaki, K. Sasaki, A. Kuramata, T. Masui, and S. Yamakoshi, Appl. Phys. Lett. 100, 013504 (2012)

[2] M. Oda, R. Tokuda, H. Kambara, T. Tanikawa, T. Sasaki, and T. Hitora, Appl. Phys. Express. 9, 021101 (2016)

[3] D. Shinohara and S. Fujita, Jpn. J. Appl. Phys. Vol. 47, No. 9 (2008)

[4] T. C. Lovejoy, Renyu Chen, X. Zheng, E. G. Villora, K. Shimamura, H. Yoshikawa, Y. Yamashita, S. Ueda, K. Kobayashi, S. T. Dunham, F. S. Ohuchi, and M. A. Olmstead, Appl. Phys. Lett. 100, 181602 (2012)

Session2

No.2   Muhammad Azary Rusli

[Title]

<p style="text-align:center">Autonomous Stabilization of Exercise Intensity in Physical Activities</p>

[Abstract]

Improving Quality of Life (QOL) has long been an absolute goal nowadays. The understanding, measurement and evaluation of human's vital signs and their applications are essential in order to prevent any complications, which may reduce one's QOL. This study presents a concrete application of measurement health-related QOL with an autonomous Wireless Body Area Network System (WBANs). A method of evaluating vital signs is performed and linked to physical intensity assistance in exercise. Specifically, BAN acts as a supportive system which can assist a user in monitoring user's vital parameters, providing real-time feedbacks and dynamically sharing information from any location to one or more users. This research presents the stabilization measurement of exercise intensity in walking, jogging and running.

No.3   Yuki Terai

[Title]

<p style="text-align:center">Lossless multi-channel EEG compression based on Kruskal's algorithm</p>

[Abstract]

  Nowadays, electroencephalogram (EEG) has become one of the useful signals. It uses for diagnosis of epilepsy or BMI (Brain Machine Interface).   In this case, we require long period of time of measurement and multi-channel measurement for precise diagnosis and behavior. Therefore, storage of EEG data become large. If EEG data is large, it happens problem of power consumption and wireless communication. To prevent this situation we need to compress EEG data. Every sample of EEG signals is very important and cannot be neglected without the consideration by a few experts, therefore, legal storage of these long-term EEG signals for further analysis has to be done losslessly. BMI also need real-time to reflect the equipment immediately. Propose method achieve high compression ratio and low computation time compression scheme while satisfying the requirements.

A previous researches proposed EEG compression scheme using KLT (Karhunen–Loève transform). KLT can decorrelate the EEG inter-channel correlation. However, KLT need much amount of calculation and overhead information to decode compressed EEG data. Proposed method can decorrelate the EEG inter-channel correlation with amount of calculation and overhead smaller than KLT. Decorrelation is taken place by using difference between two channels. It is important to choose best pair of EEG channel in the proposed method. The way to choose best pair is solving the minimum spanning tree problem. To solve this problem, Kruskal's algorithm is used. As a result, proposed method achieve high compression ratio with less computation time than KLT method.

In some research, EEG compression scheme using neural network are proposed. These method record high compression. In the future, we consider these methods to achieve further high compression ratio.

Session2

No.4   Chin-Po Chen

[Title]

Vocal and Head Pose Coordination during Turn-taking Predicts Ratings of Social Reciprocity and Rapport of Children with Autism Spectrum Disorder

[Abstract]

Autism spectrum disorder (ASD) is a neurodevelopmental disorder often characterized by social communicative deficits and social impairments. Autism Diagnostic Observation Schedule (ADOS), i.e., a gold standard diagnostic instrument, is a semi-structure interview session carried out by certified doctor to assess social and communicative behavior. In this work, we measure the mutual information of vocal and head pose behavior between clinicians and children with ASD at regions of turn-taking during ADOS interview. We demonstrate that these measures of vocal coordination achieve 0.73% accuracy in recognizing the amount of social reciprocity, and head pose coordination achieves 0.71% accuracy in assessing the quality of rapport of these children. Further analysis implicates the underlying differences in the characteristics of the social coordination phenomenon across these two modalities.

No.5   Yuto Honda

[Title]

An Optimal Wireless Power Transfer System for Lithium-Ion Battery Charge

[Abstract]

In recent years, wireless power transmission (WPT) technique is studied in order to increase convenience of EV and portable devices. In the wireless power transfer circuit using magnetic resonance, when the load resistance value is not optimum, the transmitting efficiency decreases. If the charging control of the Li-ion battery is not optimized, the deterioration of the Li-ion battery to proceed by heat generation. If the wireless charger uses the charging method of suppressing the deterioration during charging by controlling the charging current, the wireless transmission efficiency goes down. This is because the value of the charge load on the secondary side is deviated from the optimum load resistance value when changing the charging current. The efficiency reduction improvement technique of the wireless power transmission already has been proposed. However, several approach is not suitable for wireless charging of the lithium ion battery. This is because the efficiency control determines the output voltage. In this study, we propose the new wireless charging system. This system establish both of the suppressing reduction of the

transmission efficiency of wireless power transmission and the optimization of charging to the Li-ion battery. This system has the DC/DC converter in both of the secondary side and the primary side. Secondary side optimize charging current and voltage to the Li-ion battery. DC-DC converter on the primary side is indirectly improve efficiency by optimizing the DC-DC converter duty on the secondary side. To develop the proposed system, we analyzed the proposed method by finding out the optimum condition, modeling of the load, computing the numerical value. Additionally, we experimented by using prototyping the system to show the effectiveness of this method.

No.6   Taku Yoshimura

[Title]

<div align="center">

Localization of Sound Distance for 16ch Head-enclosed Loudspeaker-array

</div>

[Abstract]

  In fields of entertainment, such as a home theater, a three-dimensional (3-D) sound field reproduction system is required. It is important for this system to represent directions of arrival (DOA) of sound image and localization of sound distance. 5.1 channel surround system, which is widely used, can roughly reproduce the sound field in the horizontal plane. However, it is difficult for this system to represent the DOA of sound image and localization of sound distance with higher resolution. To achieve the accurate sound field reproduction, a binaural system has been proposed. This system can reproduce the sound field with head-related transfer functions (HRTFs). HRTFs are spatial transfer functions from sound sources to listener's ears. We can control the DOA of sound image and localization of sound distance by convolving a dry source and HRTFs. However, the binaural system has a problem that listeners feel bothersome for wearing a headphone. In addition, the actual measurement of HRTFs has a heavy burden for the subjects.

To solve these problems, we have previously proposed the new 3-D sound field reproduction system using16ch head-enclosed loudspeaker-array(16ch HLA). 16ch HLA consists of 3 layers and is setat16 loudspeakers around the human head. This system makes it possible to reproduce the sound field by utilizing the loudspeakers which are set at the sound source position.

In this paper, we focus on the localization of sound distance for the 16chHLA. In terms of the localization of sound distance, it is important to reproduce the early reflections of room impulse responses (RIRs) because listeners perceive the distance of sound image by utilizing floor and wall reflections. We therefore design the RIRs with a sound field simulator on the basis of the image method.

To confirm the effectiveness of the proposed method, we carried out the objective evaluation experiments for the performance of designed RIRs. We also carried out the subjective evaluation experiments for sound image distance on the horizontal plane.

As the result of evaluation experiments, we confirmed the validity of the proposed method.

Session3

No.1   Daichi Sugita

[Title]

Design of Active Human Interface Realized Closed Body Area Network System

[Abstract]

In daily life, health condition becomes one of important elements to keep and enhance Quality of Life (QoL). The physical behavior in daily life can be monitored by Body Area Network System (BAN) including several kinds of sensing nodes to measure some vital signs (heart rate, body temperature, partial accelerations and so on). By fusing these physical parameters, some information which should be given to subject as advice are made. In this study, Audio-Visual Human Interface (AVHI) is designed to give these information is investigated. AVHI is constructed by glasses as a screen, earphone as a speaker and acceleration sensor. At abnormal physical behavior or exceed physical stress are burdened to subject, using the information, AVHI shows the physical sounds, picture sign, animation and color. In the view point that subject notices and pay attentions to them, the design of human interface takes an important role. By the operation of AVHI, subject and BAN conclude as closed system.

No.2   Yuto Yamaguchi

[Title]

Growth of thick InGaN by RF-MBE

[Abstract]

Indium gallium nitride (InGaN) material is an alloy of InN and GaN. InGaN has a direct bandgap and the bandgap can be tuned from 0.65 eV to 3.4 eV by changing the composition, so it is thought to be quite attractive for optical devices, high-speed and high-frequency electronic devices and solar cells.

However the growth of high-quality InGaN is not easy. The large difference of lattice mismatch between InN and GaN cause some problem with increasing In-composition and being longer wavelength[2]. The main problem of them is a Piezo effect which comes from lattice strain. The structure of hexagonal crystal is asymmetry in the c-axis and a strain come from the lattice mismatch cause Piezo effect and decrease of the electron hole overlap[1]. It results in the external quantum efficiency decrease, especially high In composition. Decreasing Piezo effect is a key to achieve high-quality crystal for optical devices. The strain is relaxed as increasing the thickness and lattice constant of InGaN. Therefore, the InGaN active layer is grown on the thick InGaN layer in order to reduce the strain in the active layer. We investigated the effect of increasing the InGaN layer thickness.

Our epilayers were grown by radio-frequency plasma-assisted molecular beam epitaxy (RF-MBE) on GaN templates which were grown on sapphire substrate by metalorganic chemical vapor deposition (MOCVD). These samples were characterized by X-ray diffraction (XRD) including ω-2θscan and reciprocal space mapping (RSM).

[1] E.T.Yu, X.Z.Dang, P.M.Asbeck, S.Lau J.Vac.Sci. Technol. B 17(4), Jul/Aug (1999)

[2] 金田　昭男、船戸　充、川上　養一；日本結晶成長学会誌 Vol.36,No.3(2009)

Session3

No.3   Sakiko Mishima

[Title]

Indoor-environmental Sound Discrimination in Reverberant Environments
Based on Deep Neural Network

[Abstract]

Surveillance systems have been utilized for the safety of the elderly people who live alone. These systems usually utilize a video camera for detecting the hazardous situations. However, it is difficult to monitor the dark and blind areas with a video camera. In order to solve this problem, the surveillance systems have been proposed on the basis of the indoor-environmental sound discrimination. The indoor-environmental sound consists of various sounds in daily life. It is important to improve the discrimination accuracy of the indoor-environmental sound in order to accurately monitor the situations in the indoor-environment. In the previous researches, acoustic models have been utilized to discriminate the sound. The models have been constructed on the basis of hidden Markov models (HMMs) with mel-frequency cepstrum coefficients (MFCCs). However, it is difficult to discriminate the indoor-environmental sound because the acoustic model is insufficient to express acoustic features of the sound. Under the indoor-environment, some acoustic features are affected by the reverberation. Therefore, it is important to construct the acoustic model by using the acoustic features which are not changed under the reverberant environment. We focused on a deep neural network (DNN) as an effective method to construct the acoustic model. The DNN is possible to extract the features by training the complex network with input signals which are higher-dimensional features. The acoustic model based on the DNN can select and utilize the robust acoustic features for reverberation. However, it takes an expensive cost for training the model with the higher-dimensional features. The selection of suitable input features is required in order to reduce the computational cost while keeping the higher identification accuracy of the environmental sound. In this research, we therefore propose the method which utilizes the DNN with suitable features to discriminate the environmental sound. In order to find out the suitable acoustic features for the DNN, we investigate some kinds of acoustic features. As a result of evaluation experiment, we confirm the effectiveness of the proposed method by selecting the effective acoustic features.

Session3

No.4　Atsuki Tashita

[Title]

Macrophage tracking in time-lapse MR images

[Abstract]

Immune system plays the important role of protecting organs from attackers. Macrophage is the representative of immunes cell, and behavior analysis of macrophage in vivo is certainly useful for immunological research. There are some imaging modalities of macrophages, phase-contrast microscope, transmission electron microscopy, computed-tomography with nanoparticlulate contrast agent. However, they cannot observe deep tissues in vivo. Recent rapid advances of magnetic resonance imaging (MRI) enables us to acquire sectional macrophages images in vivo. It acquires time lapse sectional images with a contrast agent using 11.7 T MRI. We can observe the movement of macrophages, however, it is still difficult to measure kinematics such as speed and movement patterns due to low signal-to-noise ratio (SNR) and small size. There are few studies to analyze macrophage in time lapse MR images. But, no study investigates macrophage tracking in time lapse MR images. I propose a novel method for tracking multi macrophages simultaneously in time lapse MR images. The method detects macrophage candidates using temporal background subtraction method, and tracks macrophages using the Hungarian algorithm. The method is applied to mouse brain MR images for validation. The results show that the proposed method detected and tracked macrophages in the time lapse MR images successfully. Using the experimental results, we can quantify the average direction of movement, the average speed, etc. The quantification will strongly assist the immunology studies.

Session3

No.5   Ryoichi Fujita

[Title]

The reduction of threading dislocation density in InN by radical-beam irradiation

[Abstract]

Ⅲ-nitride semiconductors which are InN, GaN, AlN are attractive materials for light emitting devices and high-power high-frequency devices. In addition, their alloys cover a wide wavelength range and can be applied to light emitting devices and high efficiency solar cells. Especially, InN which has the smallest bandgap of 0.65eV and highest mobility is attracting attention for the application to high-frequency electronic devices and thermoelectric devices. However the growth of high quality InN is not easy due to low dissociation temperature and large lattice mismatch with substrates. Thus, InN has very large threading dislocation (TD) density about 1010 cm^{-2}. Because TD causes high electron concentration and low electron mobility in InN, it deteriorates the performance of device. In previous study, Muto et al. reported InN grown on KOH wet etched InN template had lower TD density than that of conventional InN[1]. We expect radical-beam irradiated InN template has the same effect as KOH wet etched InN template. To use radical-beam irradiate process in place of KOH wet etch process enables us to do in-situ and easily repeat. Therefore, in order to reduce TD, we have proposed growth of InN on nitrogen radical-beam irradiated InN template by radio-frequency plasma-assisted molecular beam epitaxy (RF-MBE).

  As first step of our study, InN was grown by RF-MBE to obtain current TD density in our system. GaN templates grown on sapphire substrates by metalorganic chemical vaper deposition (MOCVD) were used as substrates to grow InN. In beam flux is controlled by varying the In cell temperature from 830 to 850℃. The InN was characterized by X-ray diffraction (XRD), Hall-effect measurement, atomic force microscopy (AFM).

  TD density of their three samples was estimated by FWHM of X-ray rocking curve. The carrier concentration and mobility were measured and the difference of surface morphology was observed. Next, we will investigate the condition of radical-beam irradiation using these results.

Reference

  [1] D. Muto, H. Naoi, T. Araki, S. Kitagawa, M. Kurouchi, H. Na, and Y. Nanishi, Phys. Status Solidi A 203(7), 1691 (2006).

Session3

No.6   Yuya Nakahira

[Title]

A Study on Identification of Loudspeaker System Using Functional Link Artificial Neural Network

[Abstract]

Loudspeaker system generates nonlinear distortions that deteriorate sound quality.

Main factors of generating these distortions are nonlinearity of force factor and stiffness. However, it is difficult to reduce these distortions by improvement of physical structure. Then, the compensation of nonlinear distortions using digital signal processing has been examined. To compensate nonlinear distortions using digital signal processing, the identification of loudspeaker system is required. In the conventional studies, In the conventional study, the linearization system for compensating the nonlinear distortions has been developed. In this system, the nonlinearity of a loudspeaker system is identified by Volterra filter to design the linearization system. However, Volterra filter requires huge computational complexity. Then, we study identification of loudspeaker systems using functional link artificial neural network (FLANN). FLANN is used to identify nonlinear static and dynamic systems. Moreover, FLANN is expected lower computational complexity than Volterra filter because FLANN is flat net which has no hidden layer.

In this presentation, we examine the identification of nonlinear unknown system by first and second order Volterra kernels using FLANN with Chebyshev polynomials as functional expansion. The estimation accuracy of FLANN is examined through the mean square error and comparison of spectra between the desired signal and the output signal of FLANN when the input signal is sinusoidal wave whose frequencies are 391 Hz and 879 Hz. As a result, FLANN can accurately estimate linear components of an unknown system. Moreover, FLANN generates second order components whose frequencies are same as an unknown system. However, the estimation accuracy of second order nonlinear components is insufficient. Therefore, FLANN cannot identify second order components in Volterra typed nonlinear system sufficiently under this simulation condition.