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Hiratsuka Beach House Project 2009

by
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Hirofumi SUGIMOTO*3, Kazuhiro YAMAGUCHI*4, Nomura KEISUKE*5, and Kenta SHINODA*6
(Received on Mar. 30, 2010 and accepted on July. 7, 2010)

Abstract
This project is a social contribution activity of Campus Street Project (C.A.P.) at Tokai University Challenge Center. This beach house was designed in the technology with new wooden architecture by Tokai University Community Design Laboratory (TCDI) team in C.A.P, and constructed on the coast of Hiratsuka City. This report discusses the project and the technical outline of architecture.

Keywords: Wooden architecture, Beach house, Gallery

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Study of Neutron Production Mechanism for Inertial Electrostatic Confinement Fusion

by
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(Received on Mar. 31, 2010 and accepted on July 16, 2010)

Abstract
An Inertial Electrostatic Confinement Fusion (IECF) device has been studied to develop a compact and economical neutron source. It is generally known that neutrons in the glow discharge type IECF device are mainly produced by beam-background reaction and fast neutral-background reaction. The beam-background reaction occurs at the center of the device, while the fast neutral-background reaction occurs throughout the device. When the contribution of fast neutral-background reaction is higher than beam-background reaction, it seems that neutron production rate (NPR) depends on anode structure. So, we measured NPR by changing the anode structure in order to investigate the contribution of fast neutral-background reaction. As a result, it was found that the contribution of fast neutral-background reaction depends on the anode structure and operated gas pressure. This experimental data should be useful for reducing the size of IECF device.

Keywords: Fusion reaction, High-energy neutrons, Charge exchange reaction, Fast neutral particles.

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Abstracts

Memory Switching Phenomena in Sulfur Films
by
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(Received on March 25, 2010 and accepted on May 19, 2010)

Abstract
The reported device is a diode with a Ag - sulfur film - Mo structure showing a nonvolatile memory phenomena with high reproducibility. These films are prepared at a high growth rate of about 1μm/sec by the thermal PVD method (Physical Vapor Deposition) at atmospheric pressure. The combination of Ag electrode and other kinds of electrode material is essential for device fabrication. Initially, the device shows high resistance (OFF state) of several MΩ when forward voltage (Ag +, Mo −) is applied. At the typical switching voltage of 0.22 V, the device ON-state resistance drops to 250 Ω. This switching voltage does not depend on the sulfur film thickness and the Ag electrode area, but is related to the formation of a conductive silver sulfide layer (Ag−S layer) and electromigration of Ag+ ions in the sulfur film. Switching and memory effects are thought to be due to the bridging of both electrodes (Ag and Mo) by the conductive silver sulfide filament. The device is expected to serve as a new type of memory device with such advantages as low cost material and simple fabrication method.

Keywords: Nonvolatile memory, Sulfur film, Switching voltage, Ag2S, conductive filament

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Application of Improved Genetic Algorithm to Optimal Placement of SVR
by
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(Received on Mar. 31, 2010 and accepted on July 7, 2010)

Abstract
This paper presents a new approach to the optimal placement of a step voltage regulator (SVR) taking into consideration the installation of distributed generators (DG) based on a genetic algorithm (GA). In this case, it is necessary to solve problems such as the upper and lower limits of voltage at each node and line capacity. In addition, considering that the load and output of DG changes, it is important to solve more than one of these problems. In order to solve these problems, the conventional GA was improved and the proposed method was applied to the complex operative conditions of a distribution power system.

Keywords: Step voltage regulator, Optimal placement, Daily load variation, Voltage control, Genetic algorithm

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Application of ADC-Scheme to Multi-Objective Distribution Network Expansion Planning

by

Terukuni Shiino*1 and Hidenori Aoki*2
(Received on Mar. 31, 2010 and accepted on July 7, 2010)

Abstract

With the increase in power demand in recent years, power systems are becoming bigger and more complex. From this sudden progress of new load, existing systems are expected to lose their usefulness. In other words, due to the unexpected load distribution, the constraint can no longer be satisfied, and distribution loss increases conspicuously, etc. Distribution systems are expected to become more complicated due to the emergence of new load. Therefore, there is a need to deal with this problem from an early stage. Then, the authors thus attempted Distribution Network Expansion Planning in this study. In actuality, it has become a very complicated problem that is extremely hard to solve.

In recent years, the Multi Objective Meta-heuristics (MOMH) method is often applied to solve combinatorial optimization problems. In the Pareto optimal solution obtained by MOMH, it is important to surpass evaluations on the accuracy of the solution, uniform distribution and breadth. In one of these evaluations, in order to improve the breadth, the ADC-Scheme (Advanced Distributed Cooperation Scheme for Multi objective Optimization) was proposed in this paper. ADC-Scheme is applied to a 69-node distribution system model and the results of its usefulness are presented.

Keywords: Distribution network expansion planning, Multi-objective optimization, Meta-heuristics

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Field Survey on Thermal Adaptation of Occupants in University Campuses with Difference in Occupancy Environment Selection

by

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(Received on Mar. 31, 2010 and accepted on Sep. 7, 2010)

Abstract

A field survey was conducted to investigate the behavioral thermal adaptation of occupants in outdoor resting spaces with difference in occupancy environment selection. The occupancy area of University K was covered with foliage in summer, but allowed for sunshine in winter. Changes in sunshine were small and shady at University T all year long. Occupants in University K had higher degree of freedom in selecting different thermal environment to stay. One degree decrease in daily mean area temperature resulted in decline of 35 occupants per day and increase of 0.04 clo for clothing insulation. A higher percentage of occupants selected sunlit areas when air temperature was lower, but the gradient of occupant change was not affected by the degree of freedom for occupancy environment selection. Air temperature change became the dominant factor on behavioral adaptation for long-term evaluation, cancelling out the effect of other factors. Selection of appropriate evaluation period was found to be important for further understanding of behavioral adaptation.

Keywords: Thermal comfort, Adaptation, Outdoor, Environmental design, Field survey

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Abstracts

A Study on the Conservation/Restoration of Modern Reinforced Concrete Construction Buildings
—Case Studies of Earthquake-Resistant Structures of Buildings in Japan—

by

Kazuyuki TANAKA*1 and Shuji HANYU*2
(Received on Mar. 31, 2010 and accepted on May. 19, 2010)

Abstract

Earthquake-resistant structures are vitally important to conservation and restoration of Modern Reinforced Concrete Construction Buildings in Japan. Many kind of seismic retrofits are adapted to such buildings. In this paper, the authors evaluated 35 seismic retrofits with reinforced guideline for cultural properties of Japanese architectures. 17 were special ways that are higher evaluation but 18 were normal ways. Their higher evaluation are increasing, in the other hand, their lower evaluation are decreasing. The interior is changed because seismic retrofits of designated cultural properties are covered by finishing material. Other interior is same but seismic retrofits are naked so they make an appeal to accomplish the seismic retrofits. This paper, drawing on conservation and restoration research, will make recommendation for seismic retrofits of modern concrete construction buildings in Japan. This paper concludes that not only higher evaluation ways but also in an original way for each building.

Keywords: Conservation/Restoration, Reinforced concrete construction, Modern, Earthquake-resistant structures of buildings

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Abstracts

Fundamental Study On Construction System of Enlarged Base Tip Protection in Bored Pile Method in Japan

by

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(Received on Mar.30, 2010 and accepted on July. 7, 2010 )

Abstract

Recently, the pre-boring enlarged base tip protected pile method is the mainstream in pile installation methods. In this study, we investigated construction method and the transition of the enlarged base tip protection in the bored pile method in Japan. The enlarged base tip protection has many types of construction methods. In the case of a pre-boring method, the excavation of enlarged base tip protection is classified as straight excavation and enlarged excavation. The rotatory direction of the excavation of the enlarged base tip protection is classified as normal rotation and reverse rotation according to the mechanism of the excavation head. In the case of the inner excavation method, the enlarged base tip protection is constructed by high pressure jet cement milk. The diameters of enlarged base tip protection have increased over time to increase the end bearing capacity.

Keywords: Pile, Enlarged base tip protection, Expansion excavation

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Consolidation Behaviors of Osaka Bay Clays and Settlement of Kansai International Airport Island

by

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(Received on Mar. 30, 2010 and accepted on May. 19, 2010)

Abstract

The characteristics of Osaka Bay clay gathered from the site of the Kansai International Airport have been widely studied and the consolidation settlement of the airport considered by many researchers. According to the results of these researches, Pleistocene clay shows unique character. For instance, the $e - \log p$ curve is characterized by an overshooting pattern around $p_c$, which is observed for structured clays, and in the secondary consolidation stage of consolidation time curve, a coefficient of secondary compression decreases gradually with the logarithmic time. In this paper, we propose a simplified model taking into account this secondary compression. The proposed model is examined by numerical analysis for one-dimensional consolidation. It was shown that calculation results of the consolidation time curve obtained from the long term consolidation test of Osaka Bay clay (Ma12) by the proposed model agrees well with the experimental results.

Keywords: One-dimensional consolidation analysis, Secondary compression, Pleistocene clay

Loading Rate Effects of Diatomaceous Muddy Rock

by

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(Received on Mar. 30, 2010 May and accepted on Jul. 7, 2010)

Abstract

The mechanical characteristic of sedimentary soils is examined separately for normal consolidation and overconsolidation. It is well known that the undrained stress strain behavior of normally consolidated clay and soft rock can be significantly affected by the applied loading rate. However, it seems that little attention has been paid to overconsolidated soils because of typical elastic behavior. In this study, to determine the loading rate effect of normally consolidated and overconsolidated diatomaceous muddy rock, a consolidated-undrained triaxial compression test was performed. The influence of secondary compression on loading rate effect was clarified using a elasto-viscoplastic constitutive model.

Keywords: Loading rate effect, Triaxial compression test, Diatomaceous muddy rock, Overconsolidation

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Abstracts

Research on Skid Control of Small Electric Vehicle with Hydraulic-Mechanical Hybrid Brake System
(2nd Report: Effects of Mechanical Brake System on Braking Force)

by

Hirohiko OGINO¹, Shin HASEGAWA², and Seiya KOBAYASHI³

Abstract

In recent years, electric vehicles have come to be widely used. Most small electric vehicles only provide seat belts as safety equipment, and have no space for an antilock braking system, which is a basic skid control system, because an in-wheel motor system is used as the driving unit. For the same reason, small electric vehicles employ a mechanical braking system rather than a hydraulic braking system. Although the mechanical system is compact, the stiffness of the system is smaller than that of the hydraulic braking system, and the response performance of the braking force of the mechanical system is low. As such, small electric vehicles may be considered to lack safety. The purpose of the present study is to improve the safety of small electric vehicles. In this report, the change of brake force of a small electric vehicle was simulated for an antilock braking system combined with a mechanical braking system. A hybrid simulation model comprising velocity and the pressure of the brake fluid in the brake piping by the characteristic curve method was constructed for the hydraulic and mechanical systems. The braking pressure of the braking unit, which includes the antilock braking unit modeled by the lumped constant model, was controlled to compensate for the small stiffness value of the mechanical braking system.

Keywords: Small electric vehicle, Anti lock brake system, Hydraulic-mechanical hybrid brake system

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Effects of Damping Characteristics on Internal Sound Field of Cylindrical Enclosure with Coupling Phenomena

by

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(Received on Mar. 31, 2010 and accepted on Jul. 7, 2010 )

Abstract

In this study, we placed thin elastic plates at both ends of a cylindrical enclosure, whose vibrations cause coupling with the internal sound field, when one of the plates is applied with external periodic force. The behavior of the plate vibration depends not only on the dimension and the support condition but also on structural damping characteristics consisting mainly of the internal damping of the material that composes the plates. On the other hand, considerable influence factors, such as coupling coefficient, modal density, sound radiation efficiency of the end plate, etc. on the coupling phenomena relate to acoustic damping. In almost all related investigations, coupling phenomena were estimated by assuming that the structural and acoustic damping was fixed. Therefore, the structural and acoustic damping was expressed by respective loss factors in theoretical analysis, and influence on coupling phenomena was examined. Moreover, forced and acoustic excited experiments were also conducted. These results clarify that the loss factors of the end plates and the internal sound field assumed so far are appropriate.

Keywords: Coupling phenomena, Damping, Plate vibrations, Internal sound filed, Cylindrical enclosure

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Abstracts

Impact Absorbing Characteristics of Engine-Hood Inner Panel Structures for Pedestrian Head Protection Measures

by

Hideaki KATO*1, Ryosuke KOGA*2, Yu SHIBATA*1, Yoshiaki YASUI*3, and Hirakazu KASUYA*3

(Received on Mar. 31, 2010 and accepted on Jul. 7, 2010)

Abstract

Motor vehicles on the market are required to undergo the pedestrian head protection test since 2004 and engine-hoods need to meet the required standards for pedestrian head protection performance in addition to primary performance. The engine-hood of motor vehicles is evaluated by the pedestrian head protection performance test according to the Head injury criteria (HIC) which is calculated by 3-dimensional coordinate (x, y, z) acceleration generated against the head. All car manufacturers are recently required to develop the engine-hood for the purpose of protecting pedestrian heads. It is important to control the acceleration time history at the initial stage and late stage for pedestrian head protection. The engine-hood for pedestrian head protection needs to control local rigidity and whole rigidity by just one structure. To solve this problem we focus on inner panels which have a dominant role in absorbing energy. This study also aimed to evaluate that impact characteristics of inner panels adopting corrugated panels improve pedestrian head protection by numerical analysis. As a result, it was found that the inner panel could complement the performance of outer panel. In addition, the corrugated panel structure helped control the amount of displacement and it was effective in reduction of HIC.

Keywords: Engine-hood (Bonnet), Pedestrian protect, Head injury criteria (HIC), Acceleration, Corrugated panel

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Abstracts

Post-Buckling Analysis of Quasi-Isotropic Laminated Plates
Subjected to Biaxial Compressive Loads

by

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(Received on Mar. 31, 2010, accepted on May 19, 2010)

Abstract

Advanced composite materials represented by carbon fiber reinforced plastic (CFRP) has been increasingly used in wide a range of industrial applications because they have excellent properties such as high specific strength and specific stiffness. Postbuckling behaviors of thin laminated plates under uniaxial compression have been discussed by many researchers. However, little research has been performed on the secondary buckling phenomenon for thin laminated plate which occurs with further increase of load. In this paper, the stability condition of carbon-epoxy quasi-isotropic laminated plates under biaxial compressive loads which are simply supported along four edges is determined, using the second variation of total potential energy. The necessity of secondary buckling is proven analytically, and the effects of various factors, such as lamination constitution and biaxial compressive ratio, are clarified.

Keywords: Structural analysis, Composite materials, CFRP, Secondary buckling, Quasi-isotropic, Biaxial compressive ratio

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Combustion Analysis of Ethanol Diesel Blends

by
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(Received on March. 31, 2010 and accepted on May. 19, 2010 )

Abstract

This study was carried out by CHEMKINII for the combustion analysis of ethanol diesel blends by the application of elementary reactions. The simplified model of ethanol diesel blends model used in this study was constructed based on the Curran n-heptane model and the elementary reaction model of ethanol extracted from the Curran DME model. The effects of ethanol diesel blends on ignition delay, decrease of combusted heat value in low temperature oxidation, and decrease of PM emission were compared and clarified between experiment and analysis. Increase of ignition delay and decrease of combusted heat value in low temperature oxidation were observed in both of experiment and analysis, caused by the decrease of OH radical from the consumption by ethanol. In addition, decrease of combusted heat value in low temperature oxidation was also observed due to the decrease of ethanol activation energy.

Keywords: Combustion analysis, Ethanol, Low/high temperature oxidation, CHEMKIN

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Abstracts

Influence of Modified Longitudinal Visual View on Flying Qualities

by

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(Received on Mar. 29, 2010 and accepted on May. 19, 2010)

Abstract

The pilot controls an airplane, watching the outside view through the cockpit window. But if another movement different from the real one is given to the pilot as virtual visual cues, the flying qualities would change. This study investigates, using a fixed flight simulator, how the virtual visual cues, which are obtained by modifying the real movement of the outside view, influence the pilot’s handling qualities and task performances. The experimental parameters are to change the relationship between two longitudinal oscillation modes. This experimental result shows the limitations in the improvement of flying qualities.

Keywords: Airplane, Flying qualities, Human pilot, Visual cue

Analyses of the Physical Interactions among Human Glycosyltransferases Involved in Biosynthesis of O-Mannose Type Glycan

by

Tetsuo TAKAHASHI*
(Received on X. x, 2010 and accepted on Y. x, 2010)

Abstract

Eukaryote-specific O-mannose type glycan on the glycoprotein is restrict to be expressed in the muscle and nerve tissues, possibly due to limited expression of glycosyltransferases involved in biosynthesis of O-mannose type glycan. They are known to be localized on the membranes of rough endoplasmic reticulum (rER) and Golgi apparatus, and catalyze transfer of mannose, N-acetylglucosamine (GlcNAc), galactose (Gal), or sialic acid (Sia) in the stepwise manner. However, any physical interaction among them localized on the membranes of rER and Golgi apparatus has not yet been investigated. In this paper, in order to reveal the physical interactions among them in human, the yeast split-ubiquitin system which was devised to detect specifically detect physical interactions between two membrane-bound proteins was applied. Two of three known human glycosyltransferases [dolichol-P-mannose synthase (DPMS), protein O-mannosyltransferase (POMT1/POMT2) and GlcNAc transferase (POMGnT1) ] and four membrane proteins [Mannose-P-dolichol utilization1 (MPDU1), Fukutin, Fukutin-related protein (FKRP) and LARGE] were co-expressed in the same yeast NMY51 reporter cell, and the physical interactions between them were assayed for interaction-dependent viability on the selective media. In this assay, several novel types of interaction were detected among membrane proteins involved in assembly of O-mannose type glycan.

Keywords: Glycosyltransferase, O-mannose type glycan, Split-ubiquitin system
Abstracts

Preparation and ionic conductivities of the environmentally-friendly material for next generation solid electrolyte

by
Masashi HIGUCHI
(Received on Sep. 00, 0000 and accepted on Nov. 00, 0000)

Abstract
Environmentally-friendly materials showing high ionic conductivities have attracted widespread interest, due to a range of potential technological applications. In particular, study on oxide ion conductors has been driven by their potential use as the electrolyte in solid oxides fuel cells (SOFCs). Apatite-type rare earth silicates, such as lanthanum silicates, have recently been gained considerable attention as potential electrolytes for SOFCs. These materials exhibit excellent conductivity at relatively low temperatures and low oxygen partial pressures compared to that required for zirconia solid electrolytes. In this study, lanthanum silicates were firstly prepared by the conventional solid state reaction method. The phase formation of sample was studied by XRD. Electrical properties of obtained lanthanum silicate have been measured.

Keywords: Solid electrolyte, Ionic conductor, Environmentally-friendly material

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Development of New Painless Microneedle

by
Kazuyoshi TSUCHIYA
(Received on Sep. 00, 0000 and accepted on Nov. 00, 0000)

Abstract
In order to design a painless microneedle, we have proposed a pain assessment test to decide a marginal outer diameter of the needle for the pain. According to the result by the pain assessment test, it was confirmed that the marginal region for outer diameter “X_outside” for the needle was 95[μm] ≤ X_outside < 100[μm] from the viewpoint of the painless. The best shape of the needle, based on outer diameter of 95[μm] for the painless microneedle, from the viewpoint of (1) the minimum contacted area of the needle between skin and needle, (2) the largest geometrical moment of inertia of the needle, and (3) the minimum pipe friction pressure drop, were investigated. As a result, “pentagon” inscribed to the circle of 95[μm] of outer diameter with inner diameter of 44[μm] was the best shape for the painless microneedle.

Keywords: Microneedle, Painless, Objective Appraisal of Paine, Deformed pipe
Development of Key Technologies for Membrane Deployment Experiment Using Small Satellite

by

Kyoichi NAKASHINO

(Received on Sep. 00, 0000 and accepted on Nov. 00, 0000)

Abstract

For the development of future Gossamer space structures, it is crucial to investigate the deployment behavior of large thin membranes under microgravity environment through both experimental and numerical approaches. For this purpose, we propose a membrane deployment experiment in space using a 10cm-class small satellite, a crude breadboard model of which was developed and manufactured as last year's results of student hands-on project in Tokai University. Along with this project, we investigate dynamical behaviors of large thin membranes using nonlinear finite element method. The present paper describes recent results obtained in this investigation. Focuses are on newly developed contact algorithm for large deformation problem of thin membranes. Numerical results show that the developed algorithm is numerically more stable than other existing algorithms.

Keywords: Small Satellite, Membrane Dynamics, Finite element analysis