ABSTRACTS OF PAPERS IN ENGLISH

SIMULATION OF 2D ELCTRON GAS IN ALGAN/GAN HEMT AND INVESTIGATION OF ITS BREAKDOWN VOLTAGE

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Abstract
The AlGaN/GaN heterostructure is used in power devices. Therefore, having large current density and breakdown voltage is important. The effect of different parameters on 2D electron gas is investigated and the best cases are shown. Also it is shown that, in some cases, there is an accumulation of holes on the top surface of AlGaN. But, because of the existence of traps, it is not seen experimentally. Then, the effect of traps on 2D electron gas is investigated. Finally, methods of increasing breakdown voltage are discussed, one case is simulated and it is shown how breakdown voltage increases.

DERIVING THE SUPER-RESOLUTION ARRAY SENSOR POSITIONS THROUGH CTB

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Abstract
Presently, the conventional methods in Direction-Finding (DF) are substituted by new array processing algorithms. The new ones are applied on many applications such as ,DF, RADAR, SONAR and etc. Although these are able to remove the failures of conventional algorithms, their abilities are affected by some factors such as, noise, unknown parameters of received signals,coupling effects of array sensors and many others.

On the other hand, Cramer-Rao Bound (CRB) is the minimum obtainable variance of the detection or resolution error. In this paper, it is intended

we are intending to extract the positions of sensors from the CRB so that it goes to minimum value. Also, the results are applied on some arrays with different shapes (sensor positions).

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DETECTION OF COMBUSTIBLE GASES BY TIN OXIDE RESISTIVE GAS SENSOR FABRICATED BY ELECTRON BEAM EVAPORATION

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Abstract
SnO_2 based thin film resistive gas sensors were assessed by the measurement of their sensitivities to various combustible gases. The gas sensitive thin films were deposited on cold silica substrates in vacuum by electron beam evaporation. The XRD analysis revealed the films to be amorphous. The crystallization of the films was carried out by annealing at 300°C for 140 min. The average particle size of the annealed layers was estimated to be 13 nm. The sample gas sensors were then fabricated by providing two ohmic contacts and the attachment of an electric micro-heater. The sensitivities of the sample resistive gas sensors to methanol, ethanol, propanol and butanol were measured at different concentrations. It was observed that, at low concentration levels, the sensitivity of the sensors increases with the molar mass of the target gas, i.e. at a constant concentration, the sensitivity to methanol was the lowest while that of butanol was the highest. It was also observed, for the first time, that the sensitivity saturation for the gases examined occurs at, approximately, a constant weight-concentration, regardless of the molecular weight of the target gas. A model is suggested for the gas-solid interaction mechanism, which describes the results presented.

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THE SECURITY ARCHITECTURE OF GSM MOBILE PHONE AND ITS VULNERABILITIES

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Abstract
The number of subscribers to mobile phone systems during its 25 year life time has passed the number of subscribers of fixed phone systems with a life time of 120 years. This shows that over the last 10-15 years, mobile telecommunication has grown from a being a small niche technology to a massive industry. A considerable amount of financial resources in our country has been invested for providing mobile phone services to the public. However, this system could not be customized and tailored to fit the operator's requirements and had to be implemented and used as it was. Against this background, security has always been an issue for mobile phones. GSM was designed to prevent cloning and to be no more vulnerable to eavesdropping than fixed phones. It has addressed, to a large extent, the needs of the operators and aspirations of users, but, new methods for analyzing algorithms and security protocols revealed weak points in its security features regarding privacy, authenticity and integrity. In this paper, the security architecture of the GSM mobile phone has been described in detail and its vulnerabilities and shortcomings are extracted, in order to reduce the risks involved using this system.

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A NEW APPROACH IN MODELING DYNAMIC EFFECTS OF MAGNETIC FIELD IN FERROMAGNETIC MATERIALS, USING FINITE ELEMENT METHOD

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Abstract
Most electromagnetic systems work under variable magnetic fields. Fast variation of a magnetic field

may cause eddy current and excess loss in ferromagnetic materials. This paper presents a simple and practical technique in field analysis of electromagnetic systems having dynamic effects (eddy current and excess loss effects). Based on existing formulations for eddy current and excess loss, an equivalent expression for field intensity has been introduced. A new technique has been presented, in order to include this expression in the finite element code. A typical system has been modeled by this code. Effects of relaxation and time step were examined on the stability and the convergence rate of the process. The validity of the proposed model has been checked by comparing its results with experimental measurements.

NONLINEAR ADAPTIVE FLIGHT CONTROL USING BACKSTEPPING AND NEURAL NETWORKS

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Abstract
A nonlinear adaptive flight control system is proposed using a backstepping and neural network controller. The backstepping controller is used to stabilize all state variables simultaneously without the two-timescale assumption that separates the fast dynamics, involving the angular rates of the aircraft, from the slow dynamics, which includes angle of attack, sideslip angle and bank angle. It is assumed that the aerodynamic coefficients include uncertainty and an adaptive controller, based on neural networks, is used to compensate for the effect of the aerodynamic modeling error. Neural networks are used to represent the nonlinear inverse transformation needed for feedback linearization. Neural networks capable of on-line learning are required to compensate for inversion error, which may arise from imperfect modeling, approximate inversion, or sudden change in aircraft dynamics. A stable weights adjustment rule for on-line training to the network is derived. Under mild assumptions on the nonlinearities representing the inversion error, the adaptation algorithm ensures that all of the signals in the loop are uniformly bounded and that the weights of the neural network tend to some constant values. It is shown by the Lyapunov stability theorem that tracking errors and the weights of neural networks exponentially converge to a compact set. Finally, nonlinear six-degree-of-freedom simulation results for an F-18 aircraft model are presented to demonstrate the effectiveness of the proposed control laws.

NOVEL DCVS REDUCTION ALGORITHM BASED ON A NEW LEVELS COUPLING RULE

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Abstract
In this paper, a new method is presented to simplify the pull down tree in DCVS logic, using a new levels coupling rule. This rule, which is introduced in this article, can provide more reduction possibility. The proposed algorithm introduces a new approach for the DCVS tree network design by making use of this rule and its combination with former rules. A matrix description is used for the first time, for describing the relation between the order of inputs and control variables in the decision diagram. By applying this method, one can achieve a remarkable improvement, in terms of speed and chip area. The simulation comparison of applying this algorithm to some standard benchmark circuits demonstrates a significant reduction in the number of nodes involved.

DETERMINING THE REQUIRED INFORMATION IN SCANNING OF THE OIL PIPLEINE CORROSIONS

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Abstract
For nondestructive testing of oil pipelines, an ultrasonic scanning system moves inside the pipes by the aid of oil pressure and measures the existence and location of the corrosions by the sensors well mounted on it. With these gathered data, critical points along the pipeline can be detected and probable difficulties can be handled. In this method, measuring of the time between the original pulse and the reflected one shows the situation of the internal and external walls of the pipe and, at last, the thickness of the pipe wall. The reduction in this amount shows corrosion at that location. In this research, first, the fundamental affairs of ultrasonic scanning and the effective factors in achieving the desired accuracy are considered thoroughly. Then, the corrosion depth resolution, ultrasonic transducer bandwidth, corrosion length resolution and sampling frequency of the ultrasonic transducer along the pipeline were determined and extracted. Considering the accomplished designs and justifying the results with simulations, the results of this research can be applied in the designing and the feasibility study of oil pipeline scanning systems.

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FINDING OPTIMAL SATELLITE LAUNCH TRAJECTORIES USING THE LINEAR TANGENT GUIDANCE LAW

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Abstract
The problem studied in this paper consists of the optimal launch of a satellite to a circular orbit of the earth. The effect of the air resistance is also taken into consideration. The equations of optimal launch are first derived and the main problem is converted to a Two-Point Boundary Value Problem (TPBVP). A set of state and co-state variables, corresponding to the ideal case of planar earth with no air resistance, i.e. the case in which the linear tangent guidance law is, in fact, optimal, is used as an initial guess, in order to solve the TPBVP using the shooting algorithm. A gradual or step-by-step introduction of the air resistance effect is shown to make the numerical computations converge, thus, alleviating the problems caused by the shooting algorithm's sensitivity to the initial guess. Simulations reveal that the proposed method also has a satisfactory speed of convergence.

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EBV, AN APPROACH TO AUTOMATIC CONSTRUCTING OF RUN-TIME VERIFIER OF THE SAFETY-CRITICAL SOFTWARE

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Abstract
Dynamic Verification, dealing with the validation of the run-time behavior of software, faces the challenges of constructing a run-time behavior verifier and a mapping between behavior and environmental events. In this paper, we propose an approach, based on the Event Calculus called EBV, that presents an automatic approach to the challenges by taking four steps. In the first step, using the Parnas model, we document the requirements, including interaction between the environment and the software and, in the second step, we present a high-level and event-based specification of the expected behavior of the software in response to environmental events. In the third step, we extract a middle-level and state-based specification from the event-based one (the first mapping). The specification is a reference point for verifying the correct and expected behaviors. In the fourth step, by exploiting the State Design pattern, we implement the verifier, using the mapping of the state-based specification on run-time activities of the software (the second mapping). In this way, i.e. by two mappings, we provide the connection between the high-level environmental events and the low-level run-time activities of the software. In an attempt to show the effectiveness of the EBV, we construct the verifier of a safety-critical software from its specifications and pursue it to its implementation.

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ANALYSIS OF SENSITIVITY OF FEED-FORWARD LINEARIZATION SYSTEM TO AMPLITUDE AND PHASE MISMATCH, APPLIED IN MICROWAVE POWER AMPLIFIERS

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Abstract

Among linearization methods, feed-forward linearization has the best performance in terms of the degree of linearity to be obtained. The degree of linearity depends highly on the quality of the components used and the degree of amplitude and phase matching in the corresponding branches of the system. In this paper, we present the application of the feed-forward linearization to a CDMA signal amplifier and we present, quantitatively, the effects of amplitude and phase mismatch in the signal quality. The results show that the signal quality is significantly degraded above a certain amount of amplitude or phase mismatch in the system.

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APPLICATION OF QUANTUM CORRECTED MONTE CARLO METHOD FOR A RESONANT TUNNELING DIODE

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Abstract

The boltzmann Transport Equation (BTE) is the basic differential equation used for simulation of semiconductor devices. BTE is a semiclassical equation that doesn't include quantum effects. Using the Wigner transport equation, a correction to BTE can be obtained that includes quantum effects. In this paper, the Monte Carlo method was used for solving quantum corrected BTE for a Resonant Tunneling Diode (RTD). As expected, a negative resistance in the current- voltage curve was observed. To obtain a deep insight into such behavior, the current-voltage curve was divided into three regions. In each region the effects of electrostatic potential, effective potential and carrier density variations on the current- voltage curve were studied.