

probability of false alarm equals 0.1. Finally, to testify the performance in application, a FPGA-based simulation is performed, the result of which shows that only a delay of 30 ns is needed to output the value of the optimal quiet period after SNR is inputted, indicating its feasibility in the engineering applications.

Analysis of Energy Consumption of the Mobile Cognitive Terminal in Heterogeneous Network Environment

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Keywords: Markov chain; energy consumption; heterogeneous network; cognitive radio.

Abstract. Energy consumption of mobile cognitive terminal in a heterogeneous environment is investigated based on four different wireless networks, Universal Mobile Telecommunications System (UMTS) as the prior voice service network, Global System for Mobile Communications (GSM) as the alternative voice services network, Wireless Local Area Network (WLAN) as the preferred data service network and Wireless Regional Area Network (WRAN) as the standby data services network. A Markov state transition diagram is formulated to obtain the relationship between the terminal energy consumption and its relevant affecting parameters. A Monte Carlo simulation model is built to validate the relation above. The simulation results fit the theoretical curves well and show that increase of the WLAN network coverage rate and decrease of the UMTS module power are significant for the sake of saving the energy consumption of mobile cognitive terminal

Application of Nonlinear Dimensionality Reduction Methods in Discrimination the Gradation of Longjing Tea

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Keywords: electronic tongue, nonlinear dimensionality reduction, kernel discriminant analysis, PCA.

Abstract. In an electronic tongue system, dimensionality reduction toward the huge data sampled from multi-sensor array is crucial for the performance of pattern classification. In this paper, Kernel-based nonlinear dimensionality reduction methods were employed to classify different grades of green tea. A comparison of their performances to that of normally used PCA and FLD was presented. Experimental results showed that **nonlinear methods** could better discover the features that represent the flavor of tea samples. Best discrimination was achieved when Kernel Discriminant Analysis was conducted.

Composite Magnetic Tunnel Junctions for Fast Memory Devices and Efficient Spin-Torque Nano-Oscillators

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Keywords: magnetic tunnel junction (MTJ), micromagnetic modeling, STT magnetic memory devices, STT nano-oscillators

Abstract. We investigate a possibility to use composite magnetic tunnel junction structures (MTJs) to compose fast memory devices and efficient spin-torque nano-oscillators. In terms of magnetic memory we study the switching statistics dependence on memory cell geometry by means of systematic micromagnetic simulations. We find that MTJs with a free layer composed of two ellipses with the axes $a/2 > b$ inscribed into a rectangle $a \times b$ demonstrate a substantial decrease of the switching time and the switching current as compared to conventional MTJs with a monolithic free layer. In terms of the spin-torque nano-oscillator we propose a novel structure based on two MgO-MTJs with a shared free layer. By performing extensive micromagnetic modeling we found that the structure exhibits a wide tunability of oscillation frequencies from a few GHz to several ten GHz.

Design of AMBA-compliant Image Scaler Circuit for Low Bus Bandwidth

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Keywords: Object detection, image scaling, AMBA-compliant, low-bandwidth.

Abstract. This paper proposes the design of AMBA-compliant image scaler circuit for vision-based object detection. In order to avoid the redundant memory access and reduce the bus bandwidth, the proposed circuit accesses the external memory only once to read each original image frame. The circuit size is reduced by sharing the operations of bilinear interpolation to generate the resized images. Since the proposed circuit generates nine resized images with different levels of resolution from each 640x480 image frame in real time, it can be used for real-time object detection. Furthermore, it can be easily interconnected with other IPs conforming AMBA 3.0 protocol.

Optimal Design of Permanent Magnet Linear Synchronous Motor Based on Genetic Algorithm

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Keywords: effect force, thrust fluctuation, genetic algorithm, PMLSM

Abstract. End magnetic field distortion of permanent magnet linear synchronous motor (PMLSM) causes end effect force, it results in thrust fluctuation and lower control accuracy. At first, detent force was analyzed and genetic algorithm was used for motor design. The optimization variables are tooth width,