

Project Code	EMBEDDED IEEE PAPERS -2016 PROJECT TITLES WITH ABSTRACT
EMB16NXT01	<p>TITLE: Development of a Brain-Computer Interface Based on Visual Stimuli for the Movement of a Robot Joints.</p> <p>ABSTRACT: This paper presents a brain computer interface(BCI) to control a robotic arm by brain signals from visualstimuli. The following signal processing steps were established; acquisition of brain signals by electroencephalography (EEG)electrodes; noise reduction; extraction of signal characteristics and signal classification. Reliable brain signals were obtained by the use of the Emotive EPOC® commercial hardware. The Open ViBE® commercial software was used to program the signal processing algorithms. By using Matlab® together with an Arduino® electronic board, two servo motors were controlled to drive two joints of a 5 degrees-of-freedom robot commanded by P300-type evoked potential brain signals from visual stimulation when a subject concentrates on particular images from an image matrix displayed in the computer screen.The experiments were conducted with and without hearing and visual noise (artifacts) to find out the noise influence in the signal classification outcome. The obtained experimental results presented an efficiency in the identification stage up to100% with and without hearing noise conditions. However, under visual noise conditions a maximum efficiency of 50%was reached. The experiments for the servomotors control were carried out without noise, reaching an efficiency of 100% in the identification stage.</p>
EMB16NXT02	<p>TITLE: Experimental Validation of High-Voltage-Ratio Low Input- Current-Ripple DC-DC Converters for Fuel Cell Applications</p> <p>ABSTRACT: This work describes the practical implementation of a Floating-Interleaving Boost Converter (FIBC) for fuel cell applications. The paper aims to validate the concept of digitally controlled from four-phases-FIBC for fuel cell applications. FIBC exhibits interesting performance in terms of magnetic ,</p>

	<p>input, and output current ripple, part count and distributed power losses. A potential field of application is indeed medium and higher power fuel cell front-end converters, where minimizing input current ripple is significant but also redundancy and reliability are crucial. Actually, this approach covers all these aspects since provide module and device redundancy with real-time and flexible digital control reconfiguration. Relevant aspects related to design; modeling, simulation and experimental verification of IOOW, Arduinocontrolled,4-phases-FIBC are treated in this paper.</p>
<p>EMB16NXT03</p>	<p>TITLE: Point-n-Press: An Intelligent Universal Remote Control System for Home Appliances</p> <p>ABSTRACT: With numerous connected devices and appliances, the smart home is one of the representative fields of Internet of Things (IoT). As the complexity of devices/appliances increase, numerous buttons (sometimes dozens) are designed on the remote controller in home spaces even if several of them are seldom used. A user may be confused with the controller even if he or she only intends to perform a simple operation. This confusion also leads to a higher probability of mal-operations. In addition, conventional methods of communication between remote controllers and connected devices, such as extensible Markup Language (XML)messages, are usually bandwidth-consumptive. To address these problems, an intelligent universal remote control system for home appliances named Point-n-Press is proposed. Point-n-Press addresses the directionality feature, which enables easy and intuitive control by pointing to the target device to display the target's control interface on the screen of the remote controller. By leveraging the state dependencies of home device/appliance operations, only functional buttons that are relevant to the current context are utilized. Two real prototypes are implemented to verify the feasibility of the proposed scheme. The evaluation results show that Point-n-Press is a useful and suitable control scheme for IoT-based smart homes.</p>

<p>EMB16NXT04</p>	<p>TITLE: Developing an Open Access Monitoring Device for Off-Grid Renewables</p> <p>ABSTRACT: Electricity access is a key driver for developing a modern society. The use of locally generated renewable energy can overcome limitations of expensive grid infrastructure. However, there are still barriers to access particularly for the rural poor in the global south. When individuals or communities invest in electricity provision it is important to know how well the system is performing. Commercial monitoring systems have been developed for large scale renewable energy systems. The cost of these can outweigh the cost of a small decentralised renewable energy system. This paper describes the development of a low cost data logger that is going to be used to monitor the system performance of small photovoltaic nano-grids in Kenya and Bangladesh. The device performs within the expected range for the current, voltage, temperature and irradiance sensors. Data from the data logger device is sent via GPRS to a website where it can be accessed as real time graphical displays and data files.</p>
<p>EMB16NXT05</p>	<p>TITLE: Design and Implementation of Interoperable IoT Healthcare System Based on International Standards</p> <p>ABSTRACT: In Internet of Things (IoT) environment, IoT devices are limited to power supply, CPU capacity, memory, etc. and have a constrained network performance such as bandwidth, wireless channel, throughput, payload, etc., the resources of IoT devices however can be shared by other IoT devices. Specially, in IoT healthcare service, the way of management and interoperability of patient-related and device information are very important. In this paper, we propose the design and implementation of an IoT healthcare system using ISO/IEEE11073 PHD (Personal Healthcare Device) and CoAP(Constrained Application Protocol) standards in order to enhance the interoperability and reduce the data loss between the devices and measured information while in transmission. To demonstrate the proposed architecture,</p>

	<p>we implement comparative performance evaluation between HTTP and CoAP in terms of the number of packets in one transaction, the number of packets by data loss rate in during transmission and a syntax usage between XML and JSON.</p>
<p>EMB16NXT06</p>	<p>TITLE: Impact of VLC on Light Emission Quality of White LEDs</p> <p>ABSTRACT: This paper reports the effect of data modulation on the emitted light quality of phosphor converted white LEDs. The results showed that provided the expected average current driving the LEDs remains unchanged then the emitted light quality will stay the same. For a DC-balanced modulating signal, with a non-varying average value, any fluctuations in the instantaneous driving current due to data modulation do not have any significant impact on the measured light quality metrics. For visible light communication applications therefore, a DC-balanced signalling becomes a prerequisite if the expected quality of light emitted by the LEDs is to be preserved. The findings are premised on adequate thermal management for the LEDs under test.</p>
<p>EMB16NXT07</p>	<p>TITLE: Uncoordinated Multiple Access Scheme for VLC Systems with Positioning Capability</p> <p>ABSTRACT: Visible light communication (VLC) has attracted a lot of attention in past several years. VLC systems can be used for both communications and indoor positioning. Several designs of VLC systems have been proposed and most of them require central units to control the light emitting diodes (LEDs) in the transmitters to avoid interference at the receiver side. In this paper, we propose a novel multiple access scheme for VLC systems that does not require central unit. The transmitters simultaneously broadcast different information. The receiver can extract the information from the superposition of the received signals from the transmitters. The received power from individual transmitters can also be determined at the receiver so that positioning algorithms can be applied. Simulation results show that our proposed scheme</p>

	outperforms existing multiple access schemes for VLC systems without central unit.
EMB16NXT08	<p>TITLE: Coexistence of WiFi and LiFi Toward 5G: Concepts, Opportunities, and Challenges</p> <p>ABSTRACT: Smart phones, tablets, and the rise of the Internet of Things are driving an insatiable demand for wireless capacity. This demand requires networking and Internet infrastructures to evolve to meet the needs of current and future multimedia applications. Wireless Het Nets will play an important role toward the goal of using a diverse spectrum to provide high quality-of-service, especially in indoor environments where most data are consumed. An additional tier in the wireless Het Nets concept is envisioned using indoor gigabit small-cells to offer additional wireless capacity where it is needed the most. The use of light as a new mobile access medium is considered promising. In this article, we describe the general characteristics of WiFi and VLC (orLiFi) and demonstrate a practical framework for both technologies to coexist. We explore the existing research activity in this area and articulate current and future research challenges based on our experience in building a proof-of-concept prototype VLC Het Net.</p>
EMB16NXT09	<p>TITLE: Implementation of ZigBee-VLC system to support light control network configuration</p> <p>ABSTRACT: In this paper, ZigBee-VLC Transmitter and Receiver are designed, implemented and tested. By utilizing the ZigBee-VLC Transmitter and Receiver, commissioning procedures for light control network configuration are simplified and commissioning time is drastically reduced. With this configuration, lighting control network configured to use a maximum of 216 lighting is possible. As a result of this research, the transmitter is complete with ZigBee-VLC features implemented in the Single MCU without rising production costs and the 1-board solution receiver including a ZigBee and VLC functions are implemented. In addition, as a result of the test work using the</p>

	<p>light control app, dramatically shortening commissioning time, easy lighting control is possible was confirmed.</p>
<p>EMB16NXT10</p>	<p>TITLE: Stereo Audio Streaming via Visible Light</p> <p>ABSTRACT: Visible Light Communication (VLC) is emerging as a next generation data transmission method for short-range communication applications. In this paper we implement and characterize two prototype stereo audio streaming methods utilizing VLC. A software architecture is developed to process and stream data. The software architecture is bridged with a hardware section, which facilitates free-space VLC channel, over a Universal Serial Bus (USB) to serial interface. A particularly attractive feature of our system is that it uses commonly available, low-cost components which enables its implementation in everyday applications.</p>
<p>EMB16NXT11</p>	<p>TITLE: A Real-time Electrically Controlled Active Matching Circuit Utilizing Genetic Algorithms for Wireless Power Transfer to Biomedical Implants</p> <p>ABSTRACT: This paper discusses the feasibility of a real-time active matching circuit (MC) for wireless power transfer applications, especially for biomedical systems. One prototype of low-cost real-time automatic MC, utilizing a variable circuit topology, including discrete passives and p-i-n diodes, has been implemented and the principle has been verified by measurements. One genetic algorithm was introduced to optimize the design over a wide range of impedances to match. As a result of preliminary operation verification tests, the proposed real-time MC system results in improving the transfer coefficient in the range of 10–16-cm coil separation distance a maximum of 3.2 dB automatically in about 64ms. Similar performance improvement results were observed in additional tests under misaligned conditions, as well as for non symmetrical Tx–Rx coil configurations further verifying the potential applicability of the proposed system to practical biomedical devices.</p>

<p>EMB16NXT12</p>	<p>TITLE: A Compact Portable Microwave Life-Detection Device for Finding Survivors</p> <p>ABSTRACT: In this letter, an ultra-sensitive compact portable microwave life-detection device is introduced and implemented with promising results. By utilizing Doppler effect-based systems, vital signs such as heartbeats and breathing can be detected and can be used for finding survivors under earthquake rubble, injured soldiers on battlefields and as lie detection device. This device is tested in both simulated and realistic situations, and it can accurately detect crucial signs of life through highly dense construction materials of about 1.5 m thick and standard density materials of about 10 m while operating at 1.15 GHz center frequency.</p>
<p>EMB16NXT13</p>	<p>TITLE: Adaptive Energy-Oriented Multitask Allocation in Smart Camera Networks</p> <p>ABSTRACT: Emerging computer vision applications of smart camera networks (SCNs) often require that the network cameras operate under limited or unreliable power sources. Therefore in order to extend the SCN lifetime it is important to manage the energy consumption of the cameras which is related to the workload of the vision tasks they perform. Hence, by assigning vision tasks to cameras in an energy-aware manner it is possible to extend the network lifetime. In this letter, we address this problem by proposing a market-based solution where cameras bid for tasks using an adaptive utility function. The early results for different SCN configurations and scenarios indicate that the proposed methodology can increase network lifetime.</p>
<p>EMB16NXT14</p>	<p>TITLE: Deflection Routing in Hierarchical Mesh NoCs</p> <p>ABSTRACT: Deflection routing has benefits that may make it attractive especially when inexpensive network-on-chip (NoC) implementations are considered. In this letter, we present a proposal of deflection routing in hierarchical mesh NoCs. An evaluation of performance and power, obtained</p>

	<p>with a cycle accurate simulator and using both synthetic and application benchmarks, is reported. We introduce interleaving and shifting, two techniques that reduce the number of routers with a high radix crossbar without reducing network performance.</p>
<p>EMB16NXT15</p>	<p>TITLE: Energy Efficient Outdoor Light Monitoring and Control Architecture Using Embedded System</p> <p>ABSTRACT: In this paper, we propose an energy efficient ZigBee-based outdoor light monitoring and control system that can monitor and handle outdoor lights more efficiently as compared to the conventional systems. The proposed system uses the ZigBee-based wireless devices which allow more efficient lamps management. The designed system uses sensors to control and guarantee the optimal system parameters. To realize effectiveness of the proposed system, the prototype has been installed inside the University, where the experimental results proved that the proposed system saves around 70.8% energy for the outdoor street environment because of using sensors, LED lamps, and ZigBee based communication network.</p>
<p>EMB16NXT16</p>	<p>TITLE: ANT3D: Simultaneous Partitioning and Placement for 3-D FPGAs based on Ant Colony Optimization</p> <p>ABSTRACT: Three-dimensional technologies offer great promise in providing improvements in the overall circuit performance. This letter introduces a novel netlist partitioning and placement algorithm, named ANT3D, targeting 3-D reconfigurable architectures, based on ant colony optimization (ACO). Experimental results show the effectiveness of ANT3D algorithm as we achieve performance enhancement by 10% on average, compared to state-of-the-art tools, while using significantly fewer through-silicon vias (TSVs). Finally, by taking benefit from the inherent parallelism found in ACO algorithms, it is feasible to notable reduce the execution run-time of our algorithm.</p>

<p>EMB16NXT17</p>	<p>TITLE: A New XOR-Free Approach for Implementation of Convolutional Encoder</p> <p>ABSTRACT: This letter presents a new algorithm to construct an XOR-Free architecture of a power efficient Convolutional Encoder. Optimization of XOR operators is the main concern while implementing polynomials over GF(2), which consumes a significant amount of dynamic power. The proposed approach completely removes the XOR-processing operation of a chosen nonsystematic, feed-forward generator polynomial and reduces the logical operators, thereby the encoding cost. Hardware (HW) implementation of the proposed design uses Read-only memory (ROM) with a preprocessed addressing operations to reduce ROM size by nearly 50%. The results of the new architecture reduce the dynamic power up to 21.4% and HW cost up to 15% with lesser design complexity as compared to conventional method. The Hardware cosimulation of the architecture is first validated and then implemented with Xilinx Virtex-V FPGA.</p>
<p>EMB16NXT18</p>	<p>TITLE: Extending Amdahl's Law for Heterogeneous Multicore Processor with Consideration of the Overhead of Data Preparation</p> <p>ABSTRACT: We extend Amdahl's law by considering the overhead of data preparation (ODP) for multicore systems, and apply it to three "traditional" multicore system scenarios (homogeneous symmetric multicore, asymmetric multicore, and dynamic multicore) and two new scenarios (heterogeneous CPU-GPU multicore and dynamic CPU-GPU multicore). It demonstrates that potential innovations in heterogeneous system architecture are indispensable to decrease ODP</p>
<p>EMB16NXT19</p>	<p>TITLE: Towards the Trustworthy Development of Active Medical Devices: A Hemodialysis Case Study</p> <p>ABSTRACT: The use of embedded software is advancing in modern medical devices, so does its capabilities and complexity. This paradigm shift brings</p>

	<p>many challenges such as an increased rate of medical device failures due to software faults. In this letter, we present a rigorous “correct by construction” approach for the trustworthy development of hemodialysis machines, a subclass of active medical devices. We show how informal requirements of hemodialysis machines are modeled and analyzed through a rigorous process and suggest a generalization to a larger class of active medical devices.</p>
<p>EMB16NXT20</p>	<p>TITLE: Battery Currents Fluctuations Removal in Hybrid Energy Storage System Based on Optimized Control of Super-Capacitor Voltage</p> <p>ABSTRACT: In a hybrid energy storage system, batteries play an important role to store and release energy when it is required. Because batteries are very expensive, increasing their life cycles has a paramount importance in cost justification of the energy storage systems. However, current fluctuations reduce normal life cycles of batteries. As a remedy, supercapacitors are adopted to reduce the current fluctuations to smooth battery’s current. Recently researchers have attempted to minimize the batteries’ current fluctuations by controlling the supercapacitor’s current and/or voltage, with a limited reported success. This paper proposes an enhanced approach to reduce batteries’ current fluctuations and to minimize energy lost for residential applications, by controlling the supercapacitor’s voltage using two optimization stages: predictive reference voltage determination, and online voltage adjustment. The proposed method has been evaluated using simulated and real data, and results validate the superiority of the proposed method compared to the state-of-the-art.</p>
<p>EMB16NXT21</p>	<p>TITLE: In-Situ Requirements Monitoring of Embedded Systems</p> <p>ABSTRACT: We present a requirements-driven methodology enabling efficient runtime monitoring of embedded systems. The proposed approach extracts a runtime monitoring graph from system requirements specified using UML sequence diagrams with timing annotations. Non-intrusive, in-situ, on-chip</p>

	<p>hardware dynamically monitors the system execution, matches the specified requirements, and provides detailed information that can be analyzed in the event of a system failure. We present a case study using an autonomous vehicle subsystem demonstrating the approach can achieve 100% detection rate of common failure types, including timing, dependency, synchronization, and sensor failures. We further analyze the relationship between coverage of system events, detection rates, and hardware requirements.</p>
<p>EMB16NXT22</p>	<p>TITLE: Bringing Hardware Multithreading to the Real-Time Domain</p> <p>ABSTRACT: The emergence of hardware multithread (HW-MT) architectures increased the performance of MT applications. However, traditional HW-MT architectures are not suitable to real-time operating systems as their performance-oriented scheduling algorithm may conflict with RTOS software scheduling. This letter presents RT-SHADOWS, a portable architecture which provides a unified hardware-software scheduling, bringing the benefits of HW-MT to the RTOS domain. We show that tightly-coupled real-time compliant hardware integration achieves throughput benefits, maintaining the RTOS scheduling policy intact while increasing the predictability of RTOSes. Our solution shows on average, speed-ups between 3 and 4 times over the native versions with very low area usage/performance overhead ratio, due to its minimal cost (2% of extra slices per hardware-supported thread). This work surpasses related work by providing a complete and agnostic hardware solution which is independent of any specific RTOS.</p>
<p>EMB16NXT23</p>	<p>TITLE: Wearable Camera- and Accelerometer-Based Fall Detection on Portable Devices</p> <p>ABSTRACT: Robust and reliable detection of falls is crucial especially for elderly activity monitoring systems. In this letter, we present a fall detection system using wearable devices, e.g., smart phones, and tablets, equipped with cameras and accelerometers. Since the portable device is worn by the subject,</p>

	<p>monitoring is not limited to confined areas, and extends to wherever the subject may travel, as opposed to static sensors installed in certain rooms. Moreover, a camera provides an abundance of information, and the results presented here show that fusing camera and accelerometer data not only increases the detection rate, but also decreases the number of false alarms compared to only accelerometer-based or only camera-based systems. We employ histograms of edge orientations together with the gradient local binary patterns for the camera-based part of fall detection. We compared the performance of the proposed method with that of using original histograms of oriented gradients (HOG) as well as a modified version of HOG. Experimental results show that the proposed method outperforms using original HOG and modified HOG, and provides lower false positive rates for the camera-based detection. Moreover, we have employed an accelerometer-based fall detection method, and fused these two sensor modalities to have a robust fall detection system. Experimental results and trials with actual Samsung Galaxy phones show that the proposed method, combining two different sensor modalities, provides much higher sensitivity, and a significant decrease in the number of false positives during daily activities, compared to accelerometer-only and camera-only methods.</p>
<p>EMB16NXT24</p>	<p>TITLE: Analyzing the Efficiency of Biased-Fault Based Attacks</p> <p>ABSTRACT: In this letter, we analyze a class of recently proposed fault analysis techniques, which adopt a biased fault model. The purpose of our analysis is to evaluate the relative efficiency of several recently proposed biased-fault attacks. We compare the relative performance of each technique in a common framework, using a common circuit and a common fault injection method. We show that, for an identical circuit and fault injection method (setup time violation through clock glitching), the number of faults per attack greatly varies according to the analysis technique. In particular, DFIA is more efficient</p>

	<p>than FSA, and FSA is more efficient than both NUEVA and NUFVA. In terms of number of fault injections until full key disclosure, for a typical case, FSA uses 8x more faults than DFIA, and NUEVA uses 33x more faults than DFIA. Hence, the post processing technique selected in a biased-fault attack has a significant impact on the success of the attack.</p>
<p>EMB16NXT25</p>	<p>TITLE: Design and Implementation of Interoperable IOT Healthcare System Based on International Standards</p> <p>ABSTRACT: In Internet of Things (IOT) environment, IOT devices are limited to power supply, CPU capacity, memory, etc. and have a constrained network performance such as bandwidth, wireless channel, throughput, payload, etc., the resources of IOT devices however can be shared by other IOT devices. Specially, in IOT healthcare service, the way of management and interoperability of patient-related and device information are very important. In this paper, we propose the design and implementation of an IOT healthcare system using ISO/IEEE11073 PHD (Personal Healthcare Device) and COAP(Constrained Application Protocol) standards in order to enhance the interoperability and reduce the data loss between the devices and measured information while in transmission. To demonstrate the proposed architecture, we implement comparative performance evaluation between HTTP and COAP in terms of the number of packets in one transaction, the number of packets by data loss rate in during transmission .</p>

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