S.NO	PROJECT TITLES	YEAR	ABSTRACT
SMES-01	Adaptive Fault Tolerant Control of a Half-car Active Suspension Systems Subject to Random Actuator Failures	2016-2017	Adaptive fault tolerant control problem for half-car active suspension systems subject to stochastic actuator failures is considered in this article. Two stochastic functions related to Markovian variables have been introduced to denote the failure for the front and the rear actuators embedded between the car body and the wheel-axle. This makes the problem practical, yet it makes the stability analysis of zero dynamics involving Markovian variables very challenging. By employing adaptive backstepping technique, a new adaptive fault tolerant control scheme is proposed, which ensures the boundedness in probability of the considered systems. Comparative simulation results for a half-car active suspension system are presented to show the effectiveness of the proposed control scheme.
SMES-02	Characterization of an Underwater Positioning System Based on GPS Surface Nodes and Encoded Acoustic Signals	2016-2017	This paper presents a characterization of an underwater positioning system based on surface nodes equipped with GPS and acoustic transducers. The positioning system calculates the coordinates of an underwater vehicle in one of the surface nodes or beacons, by the emission, detection, and reply of acoustic encoded signals. The characterization of the system has been performed by means of a statistical study, considering different numbers of beacons, beacons' position and physical phenomena, such as noise, multipath, and Doppler spread. The error propagation caused by these phenomena and the geometrical configuration of the system has been quantitatively assessed in different positioning algorithms, based on trilateration and iterative procedures. The results show how the different phenomena affect the vehicle estimated position errors for the different positioning algorithms. In addition, the obtained errors inside the projected area of the beacons are ~1 m or lower, rising to a few meters for the worst case scenario, showing the feasibility of the acoustic positioning system.

SMES-03	Size Optimization of a Magnetic System for Drug Delivery with Capsule Robots	2016-2017	In this paper, we present a methodology for the size optimization of an external magnetic system made of arc-shaped permanent magnets (ASMs). This magnetic system is able to remotely actuate a drug release module embedded in a prototype of capsule robot. The optimization of the magnetic system is carried out by using an accurate analytical model that is valid for any arbitrary dimensions of the ASMs. By using this analytical model, we perform parametric studies and conduct a statistical analysis (ANOVA) to investigate efficient ways to distribute the volume of the ASMs so that the dimensions and volume of the magnetic system are minimized while optimal flux densities and magnetic torques are obtained to actuate the drug delivery system (DDS). The ANOVA results, at 5% significance level, indicate that changes in the angular width followed by changes in the length of the ASMs have the highest impact on the magnetic linkage. Furthermore, our experimental results, which are in agreement with the analytical results, show that the size optimization of the magnetic system is effective for the actuation of the DDS in capsule robots.
SMES-04	Development of a distributed disaster data and human life sign probe system	2016-2017	This paper deals with a novel sensor network system designed for gathering disaster information including physical environmental information and potential signals of survivers. The system consists of numerous sensor probes and a central database server. The sensor probes organize their own ZigBee network, which is managed by the central database server. The server is connected to the Internet to be able to provide total disaster information worldwide. In this paper, the authors introduce their development and show some basic performance test to verify its potential usability.

SMES-05	A Vision-Based Teleoperation Method for a Robotic Arm with 4 Degrees of Freedom	2016-2017	The ability to remotely control a robotic arm through a human one is essential where human Involvement is needed but physical presence is not possible. Control provided through vision-based approaches comes with advantage over non-vision schemes, as vision-based approaches are less intrusive. On the other hand, the problem of estimating the hand pose comes with numerous difficulties due to the nature of the hand itself. These difficulties include the high complexity of the hand and the presence of self-occlusions. In this paper, we provide a method for controlling a 4 degrees of freedom robotic arm. The arm is composed of 3 segments connected and controlled via servo motors. The end effector of the arm (the 3rd segment) is a gripper that simulates the human hand opening and closing movements. Features necessary to control the arm are 2D coordinates of the center of the human hand, its orientation, and its open/closed state. The results are reported and analyzed, limitations of the scheme are discussed, and possible future work is proposed.
SMES-06	A Novel Wireless Multifunctional Electronic Current Transformer based on ZigBee-based Communication	2016-2017	Overhead and underground power line monitoring is an essential infrastructure for advanced operation in the smart grid. Wireless sensor networks (WSN) are attractive to remote power line monitoring, due to their rare geography restrictions, simple engineering design, and flexible equipment expansion. Considering the ZigBee's characteristic of low transmission rate, almost commercial sensors adopt the high-speed communication, such as Cellular and WiFi, to implement the real-time wireless monitoring. However, among all wireless technologies, ZigBee, characterizing high security, ultra-low power consumption, Reliable network, low cost, and ease of design, is widely used in many industries. This paper proposes a new ZigBee-based communication for multifunctional electronic current transformers (ECTs), which are used in overhead and underground line monitoring. To tackle ZigBee's low transmission rate, the proposed method involving a transmission strategy can make the ZigBee-based communication satisfy both

			measurable and protective purposes of multifunctional ECTs. Finally, the new ZigBee-based wireless communication is implemented and integrated with an ECT, which is based on the coreless Hall-effect current transformer (HCT), and the proposed ZigBee-based wireless multifunctional HCT is called ZiHCT. The measurement results show that the ZiHCT can achieve accuracy not only to Class 0.5 for measuring CTs, but also to Class 5P20 for protective CTs according to IEC standard 60044-8.
SMES-07	Energy Efficient Outdoor Light Monitoring and Control Architecture Using Embedded System	2016-2017	In this letter, 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.
SMES-08	WiFACT – Wireless Fingerprinting Automated Continuous Training	2016-2017	The increasing importance in ubiquitous computing and context-dependent information has led in the last years to a growing interest in location-based applications and services. A considerable market demand concentrates on Indoor localization tasks. In this setting, WiFi fingerprinting is currently one of the most popular and widespread techniques as it provides reasonable positioning accuracy while being able to exploit, at the same time, existing wireless infrastructures. WiFi-fingerprinting systems mainly operate though two distinct phases: one initial, named training, in which signals are collected and one subsequent, named usage, in which the recorded data are used to localize users. While the usage phase is fast and effective, the training phase is time consuming. Moreover, to maintain a localization accuracy, the training

			needs to be repeated anytime the network structure changes. The latter may occur, for example, if an access point goes off-line or it is (re)moved. In this paper, we propose a novel framework that allows for an automatic and continuous training in WiFi-fingerprinting systems, which is based on an opportune deployment of a WSN (Wireless Sensor Network). Precisely, the solution we propose allows for an efficient real-time updating of the database collecting the signals, without any human intervention.

SMES-09	Remote monitoring of photovoltaic systems using embedded system clusters	2016-2017	Remote monitoring of photovoltaic systems is critically important for the users. The performance of each component existing in these systems should be observable. In this study, a cheap and easily mountable remote monitoring design for low cost photovoltaic systems located near urban areas is proposed. With this design, it is aimed to transmit collected information at the remote solar energy station with MPI (Message Passing Interface). A design has been done for a remote monitoring of a 1kW photovoltaic system. With this design, panel and battery voltages, temperature and humidity can be observed remotely. An embedded system cluster consisting of single-board computers has been used in the design. This cluster is composed of a center single-board computer and remote node single-board computers as many as the photovoltaic system count. Collected information is broadcasted over internet using the single-board computer at the center.
SMES-10	Wearable Noncontact Armband for Mobile ECG Monitoring System	2016-2017	One of the best ways to obtain health information is from an electrocardiogram (ECG). Through an ECG, characteristics such as patients' heartbeats, heart conditions, and heart disease can be analysed. Unfortunately, most available healthcare devices do not provide clinical data such as information regarding patients' heart activities. Many researchers have tried to solve this problem by inventing wearable heart monitoring systems with a chest strap or

			wristband, but their performances were not feasible for practical applications. Thus, the aim of this study is to build a new system to monitor heart activity through ECG signals. The proposed system consists of capacitive-coupled electrodes embedded in an armband. It is considered to be a reliable, robust, and low-power-transmission ECG monitoring system. The reliability of this system was achieved by the careful placement of sensors in the armband. Bluetooth low energy (BLE) was used as the protocol for data transmission; this protocol was proposed to develop the low-power-transmission system. For robustness, the proposed system is equipped with analysis capabilities–e.g., real-time heartbeat detection and a filter algorithm to ignore distractions from body movements or noise from the environment.
SMES-11	UR-Solar Cap: An Open Source Intelligent Auto-Wakeup Solar Energy Harvesting System for Super capacitor Based Energy Buffering	2016-2017	Energy harvesting systems that couple solar panels with supercapacitor buffers offer an attractive option for powering computational systems deployed in "field settings," where power infrastructure is inaccessible. Supercapacitors offer a particularly compelling advantage over electrochemical batteries for such settings because of their ability to survive many more charge-discharge cycles. We share UR-SolarCap – a versatile open source design for such a harvesting system that targets embedded system applications requiring power in the 1–10 W range. Our system is designed for high efficiency and controllability and, importantly, supports auto-wakeup from a state of complete energy depletion. This paper summarizes our design methodology, and the rationale behind our design and configuration decisions. Results from the operation and testing of a system realized with our design demonstrate: (a) an achievable harvester efficiency of 85%, (b) the ability to maintain sustained operation over a two week period when the solar panel and buffer are sized appropriately, and (c) a robust auto-wakeup functionality that resumes system operation upon availability of harvestable energy after a period in which the system has been forced into a dormant

			state because of a lack of usable energy. To facilitate the use of the system by researchers exploring embedded system applications in environments that lack a power infrastructure, our designs are available for download as an archive containing design schematics, PCB files, firmware code, and a component list for assembly of the system. Additionally, a limited number of pre-assembled kits are available upon request.
SMES-12	Real-time patient health monitoring and alarming using wireless-sensor-network	2016-2017	The main objective of this research is design and realization of real-time monitoring and alarming system for patient health, especially for patients suffering from diseases during their normal life. The proposed system has an embedded microcontroller connected to a set of medical sensors (related to the patient case) and a wireless communication module (Bluetooth). Each patient is considered as a node in a wireless sensor network and connected to a central node installed at the medical center through an internet connection. The embedded microcontroller checks if the patient health status is going well or not by analysing the scanned medical signals. If the analysis results are abnormal, the embedded unit uses the patient's phone to transmit these signals directly to the medical center. In this case, the doctor will send medical advice to the patient to save his/her life. The implemented prototype has been tested and calibrated with standard devices. The experimental results confirm the effectiveness of the proposed system that is accurate in scanning, clear in monitoring, intelligent in decision making, reliable in communication, and cheap (about 100 US$).
SMES-13	Assessment of Robotic Picking Operations Using a 6 Axis Force/Torque Sensor	2016-2017	This letter presents a novel architecture for evaluating the success of picking operations that are executed by industrial robots. It is formed by a cascade of machine learning algorithms (kNN and SVM) and uses information obtained by a 6 axis force/torque sensor and, if available, information from the built-in sensors of the robotic gripper. Beyond measuring the success or failure of the entire operation, this architecture makes it possible to detect in real-time when an

			object is slipping during the picking. Therefore, force and torque signatures are collected during the picking movement of the robot, which is decomposed into five different stages that allows to characterize distinct levels of success over time. Several trials were performed using an industrial robot with two different grippers for picking a long and flexible object. The experiments demonstrate the reliability of the proposed approach under different picking scenarios since, it obtained a testing performance (in terms of accuracy) up to 99.5% of successful identification of the result of the picking operations, considering an universe of 400 attempts.
SMES-14	Evaluating User Gestures in Rehabilitation from Electromyographic Signals	2016-2017	One of the strategies being used over the last years to increase the user commitment and motivation on rehabilitation systems is the use of virtual reality (VR) environments. In addition to contributing to motivation, these systems can simulate real life activities and provide means to measure and evaluate user performance. The use of natural interaction devices originally conceived to the game market allowed the development of low-cost and minimally invasive systems. With the advent of interaction devices based on electromyography, the electromyographic signals of the user can also be used on the natural interaction process. This work has as goal to verify if, by using a evaluation model, is possible to evaluate user performance in real time through gesture recognition by means of an electromyography device attached to a rehabilitation system.
SMES-15	Implementation of ZigBee-VLC system to support light control network configuration	2016-2017	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 light control app, dramatically shortening commissioning time, easy lighting control is possible was confirmed.
SMES-16	Coexistence of ZigBee-Based WBAN and WiFi for Health Telemonitoring Systems	2016-2017	The development of telemonitoring via wireless body area networks (WBANs) is an evolving direction in personalized medicine and home-based mobile health. A WBAN consists of small, intelligent medical sensors which collect physiological parameters such as electrocardiogram, electroencephalography, and blood pressure. The recorded physiological signals are sent to a coordinator via wireless technologies, and are then transmitted to a healthcare monitoring center. One of the most widely used wireless technologies in WBANs is ZigBee because it is targeted at applications that require a low data rate and long battery life. However, ZigBee-based WBANs face severe interference problems in the presence of WiFi networks. This problem is caused by the fact that most ZigBee channels overlap with WiFi channels, severely affecting the ability of healthcare monitoring systems to guarantee reliable delivery of physiological signals. To solve this problem, we have developed an algorithm that controls the load in WiFi networks to guarantee the delay requirement for physiological signals, especially for emergency messages, in environments with coexistence of ZigBee-based WBAN and WiFi. Since WiFi applications generate traffic with different delay requirements, we focus only on WiFi traffic that does not have stringent timing requirements. In this paper, therefore, we propose an adaptive load control algorithm for ZigBee-based WBAN/WiFi coexistence environments, with the aim of guaranteeing that the delay experienced by ZigBee sensors does not exceed a maximally

			tolerable period of time. Simulation results show that our proposed algorithm guarantees the delay performance of ZigBee-based WBANs by mitigating the effects of WiFi interference in various scenarios.
SMES-17	ZigBee network system for observing operating activities of work vehicles	2016-2017	Observing activities of working vehicles on a work site, such as a factory, is important in regard to managing the lifetime of vehicles and achieving high operational availability. However, it is a problem that an administrator cannot completely grasp the activities of a working vehicle. Existing systems cannot cover a large area, particularly in an indoor environment. A system is proposed for monitoring operating activities of working vehicles, regardless of whether they are operating indoors or outdoors. The system calculates the activity rate of a vehicle by analysing the topology of a network configured by the wireless technology ZigBee. In addition, it was experimentally verified that network topology and RSSI can be used to estimate activities of working vehicles.
SMES-18	The Design of Building Fire Monitoring System Based on ZigBee-WiFi Networks	2016-2017	With the rapid development of wireless communication technology, people's life has undergone great changes. In recent years, the comfort and safety of the building environment have become a universal concern. However, building fire is the greatest threat to building safety. In consideration of the current issues on building security, the design applies the important part, the wireless sensor network technology to building fire safety monitoring system and establishes the wireless sensor network by using ZigBee technology and ZigBee-WiFi gateway which transforms ZigBee network into WiFi network, In addition, taking advantage of the ZigBee wireless sensor network locates a fire place so that the fire information is uploaded to the handheld terminal and the building security personnel work out the retreat and rescue plan in time. This paper provides a new solution for building fire monitoring system.

SMES-17	A low complex spread spectrum scheme for ZigBee based smart home networks	2016-2017	One of the biggest challenges that consumers and service providers have is connecting a wide range of consumer electronics in a smart home environment. Resource planning and bandwidth allocation for these networks in the license free Industrial Scientific Medical (ISM) frequency band cannot be guaranteed. In this paper, we propose improvements for ZigBee physical layer in order to cope with coexistence issue. A detailed MATLAB/Simulink simulator is developed to achieve our objective. In order to balance the trade-off between multipath effects and receiver complexity, the spreading gain of the conventional Direct Sequence Spread Spectrum (DSSS) scheme is limited to 9dB. Unfortunately, this reduces the interference suppression capability of spread spectrum schemes. Here, we propose a low complex spread spectrum scheme for the ZigBee physical layer. The proposed scheme is shown to be robust against multipath fading and interference with a low complexity.
SMES-20	Interference-Mitigated ZigBee-Based Advanced Metering Infrastructure	2016-2017	An interference-mitigated ZigBee-based advanced metering infrastructure (AMI) solution, namely IMM2ZM, has been developed for high-traffics smart metering (SM). The IMM2ZM incorporates multiradios multichannel network architecture and features an interference mitigation design by using multiobjective optimization. To evaluate the performance of the network due to interference, the channel-swapping time (Tcs) has been investigated. Analysis shows that when the sensitivity (PRχ) is less than -12 dBm, Tcs increases tremendously. Evaluation shows that there are significant improvements in the performance of the application-layer transmission rate (σ) and the average delay (D). The improvement figures are σ > ~300% and D > 70% in a 10-floor building, σ > ~280 % and D > 65% in a 20-floor building, and σ > ~270% and D > 56% in a 30-floor building. Further analysis reveals that IMM2ZM results in typically less than 0.43 s delay for a 30-floor building under interference. This performance fulfills the latency requirement of

			less than 0.5 s for SMs in the USA (Magazine of Department of Energy Communications, USA, 2010). The IMM2ZM provides a high-traffics interference-mitigated ZigBee AMI solution.
SMES-21	Energy-saving IAQ monitoring ZigBee network using VIKOR decision making method	2016-2017	Indoor Air Quality (IAQ) is an urgent topic nowadays. It is concluded that 90% of human's life is spent indoor. However, it is commonly known that materials used in construction or furniture is often detected to release Volatile organic compounds (VOC) which affect IAQ significantly and lead to dizziness, respiratory irritation, fatigue, asthma and allergic airway disease and even cancer. As a result, IAQ monitoring system assists of improving IAQ, and wireless sensor network is an efficient method for building up the system network. In this paper, a new ZigBee network for IAQ monitoring system is designed. A Multi-criteria decision-making method VIKOR is used to figure out the best parameters of the MAC layer and CSMA/CA mechanism under this environment. The network designed can achieve 35% improvement of energy saving without affecting the latency and throughput performance compared with the commonly-used TOPSIS method
SMES-22	A Mobile ZigBee Module in a Traffic Control System	2016-2017	Time is of the essence when ambulances are utilized to save people's lives, but when an ambulance needs to pass through a junction, its speed often must be reduced due to traffic. This complicates situations when the patient in the ambulance needs urgent treatment that can be administered only at a hospital. Due to the unavailability of advanced medical procedures in an ambulance, there is the possibility for patients to suffer a loss of life.
SMES-23	Configurable ZigBee-based control system for people with multiple disabilities in smart homes	2016-2017	Nowadays, home appliances manufacturers are increasingly relying on wireless sensor network and single chip embedded technologies to build smart environment. Many existing systems are already in the market, however, they were designed without envisioning the need of residents with special needs. This work presents a framework that enables the integration and

			control of devices within a smart home environment for residents with disabilities. The framework supports the integration of multiple control devices for different residents with different disabilities. Moreover, the work addresses the safety of the users by providing warnings and notifications in case of an emergency. A prototype was designed, implemented and tested
SMES-24	Self-configuration and smart binding control on IoT applications	2016-2017	The rapid development of wireless communication technology facilitates the realization of the Internet-of-Things (IoT). Automatic configuration and smart connection system have become relative important issue in accordance with extensive applications of IoT, and the energy saving concepts. Therefore, this work presents the integration of ???Automatic Configuration and Wisdom Connection System??? with Wireless Sensor Networks (WSN), IoT and ZigBee technology, to actualize automatic configuration based on a received signal strength indicator (Received Signal Strength Indicator, RSSI), lighting auto-configuration area, regional allocation, and sub-areas. The proposed???Automatic Configuration and Wisdom Connection System??? Automatically configures different lightings to the same position within in the range???3dBm when the RSSI value varies only slightly. The system is configured to the same lighting site within the experimental environment when the sub-area range set???3dBm. This study presents a significant contribution to new configuration of objects in Things (Web of Objects), context awareness control, and optimization of network control platform.
SMES-25	Accurate Wireless Sensor Localization Technique Based on Hybrid PSO-ANN Algorithm for Indoor and Outdoor Track Cycling	2016-2017	This paper aims to determine the distance between the mobile sensor node (i.e., bicycle) and the anchor node (i.e., coach) in outdoor and indoor environments. Two approaches were considered to estimate such a distance. The first approach was based on the traditional channel propagation model that used the log-normal shadowing model (LNSM), while the second approach was based on a proposed hybrid particle

			swarm optimization-artificial neural network (PSO-ANN) algorithm to improve the distance estimation accuracy of the mobile node. The first method estimated the distance according to the LNSM and the measured received signal strength indicator (RSSI) of the anchor node, which in turn used the ZigBee wireless protocol. The LNSM parameters were measured based on the RSSI measurements in both outdoor and indoor environments. A feed-forward neural network type and the Levenberg-Marquardt training algorithm were used to estimate the distance between the mobile node and the coach. The hybrid PSO-ANN algorithm significantly improved the distance estimation accuracy more than the traditional LNSM method without additional components. The hybrid PSO-ANN algorithm achieved a mean absolute error of 0.022 and 0.208 m for outdoor and indoor environments, respectively. The effect of anchor node density on localization accuracy was also investigated in the indoor environment.
SMES-26	Design and Evaluation of an Open-Source Wireless Mesh Networking Module for Environmental Monitoring	2016-2017	Wireless mesh networking extends the communication range among cooperating multiple low-power wireless radio transceivers and is useful for collecting data from sensors widely distributed over a large area. By integrating an off-the-shelf wireless design, such as the XBee module, development of sensor systems with mesh networking capability can be accelerated. This study introduces an open-source wireless mesh network (WMN) module, which integrates the functions of network discovery, automatic routing control, and transmission scheduling. In addition, this design is open source in order to promote the use of wireless mesh networking for environmental monitoring applications. Testing of the design and the proposed networking module is reported. The proposed wireless mesh networking module was evaluated and compared with XBee. The average package delivery ratio and standard deviation of the proposed WMN module and the XBee are 94.09%, 91.19%, 5.14%, and 10.25%,

			respectively, in a 20 node experiment. The proposed system was demonstrated to have the advantages of low-cost combined with high reliability and performance, and can aid scientists in implementing monitoring applications without the complications of complex wireless networking issues.
SMES-27	A smart helmet for air quality and hazardous event detection for the mining industry	2016-2017	A smart helmet has been developed that is able to detect of hazardous events in the mines industry. In the development of helmet, we have considered the three main types of hazard such as air quality, helmet removal, and collision (miners are struck by an object). The first is the concentration level of the hazardous gases such as CO, SO2, NO2, and particulate matter. The second hazardous event was classified as a miner removing the mining helmet off their head. An IR sensor was developed unsuccessfully but an off-the shelf IR sensor was then used to successfully determine when the helmet is on the miner's head. The third hazardous event is defined as an event where miners are struck by an object against the head with a force exceeding a value of 1000 on the HIC (Head Injury Criteria). An accelerometer was used to measure the acceleration of the head and the HIC was calculated in software. The layout of the visualisation software was completed, however the implementation was unsuccessful. Tests were successfully done to calibrate the accelerometer. PCB's that were designed and made included a breakout board and a prototype board. A whole software implementation was done based on Contiki operating system in order to do the control of the measuring of sensors and of calculations done with the measured values. This paper presents the undertaken design detailing solutions to issues raised in previous research.
SMES-28	Low-Power Wearable ECG Monitoring System for Multiple-Patient Remote Monitoring	2016-2017	Many devices and solutions for remote electrocardiogram (ECG) monitoring have been proposed in the literature. These solutions typically have a large marginal cost per added sensor and are not seamlessly integrated with

			other smart home solutions. Here, we propose an ECG remote monitoring system that is dedicated to non-technical users in need of long-term health monitoring in residential environments and is integrated in a broader Internet-of-Things (IoT) infrastructure. Our prototype consists of a complete vertical solution with a series of advantages with respect to the state of the art, considering both the prototypes with integrated front end and prototypes realized with off-the-shelf components: 1) ECG prototype sensors with record-low energy per effective number of quantized levels; 2) an architecture providing low marginal cost per added sensor/user; and 3) the possibility of seamless integration with other smart home systems through a single IoT infrastructure.
SMES-29	Development of a distributed disaster data and human life sign probe system	2016-2017	This paper deals with a novel sensor network system designed for gathering disaster information including physical environmental information and potential signals of survivers. The system consists of numerous sensor probes and a central database server. The sensor probes organize their own ZigBee network, which is managed by the central database server. The server is connected to the Internet to be able to provide total disaster information worldwide. In this paper, the authors introduce their development and show some basic performance test to verify its potential usability.
SMES-30	Characterization of RSS variability for biobot localization using 802.15.4 Radios	2016-2017	A cyber-physically organized swarm of insect biobots or biological robots can aid first responders in search-and-rescue scenarios after natural disasters or earthquakes by establishing an under-rubble sensor network. In such a network, the nodes are represented by the insect biobots equipped with electronic backpacks utilizing a system-on-chip. This application requires effective real-time localization of the mobile sensor nodes. Radio signal strength (RSS) is a measurement of the received signal power, and can be used in estimating the distance between two nodes, which then can help localize the biobotic sensor nodes in the future. This paper

			investigates RSS variability and its suitability for biobotic
SMES-31	Evaluation of Ultrasound-Based Sensor to Monitor Respiratory and Nonrespiratory Movement and Timing in Infants	2016-2017	Goal: To describe and validate a noncontacting sensor that used reflected ultrasound to separately monitor respiratory, nonrespiratory, and caretaker movements of infants. Methods: An in-phase and quadrature (I & Q) detection scheme provided adequate bandwidth, in conjunction with postdetection filtering, to separate the three types of movement. The respiratory output was validated by comparing it to the electrical activity of the diaphragm (Edi) obtained from an infant ventilator in 11 infants. The nonrespiratory movement output was compared to movement detected by miniature accelerometers attached to the wrists, ankles, and heads of seven additional infants. Caretaker movement was compared to visual observations annotated in the recordings. Results: The respiratory rate determined by the sensor was equivalent to that from the Edi signal. The sensor could detect the onset of inspiration significantly earlier than the Edi signal (23+/-69 ms). Nonrespiratory movement was identified with an agreement of 0.9 with the accelerometers. It potentially interfered with the respiratory output an average of 4.7+/-4.5% and 14.9+/15% of the time in infants not requiring or on ventilatory support, respectively. Caretaker movements were identified with 98% sensitivity and specificity. The sensor outputs were independent of body coverings or position. Conclusion: This single, noncontacting sensor can independently quantify these three types of movement. Significance: It is feasible to use the sensor as trigger for synchronizing mechanical ventilators to spontaneous breathing, to quantify overall movement, to determine sleep state, to detect seizures, and to document the amount and effects of caretaker activity in infants.
SMES-32	Smart real-time healthcare monitoring and tracking system using GSM/GPS technologies	2016-2017	Health monitoring systems have rapidly evolved recently, and smart systems have been proposed to monitor patient current health conditions, in our proposed and implemented system, we focus on monitoring the patient's blood pressure, and his body temperature. Based on last decade statistics of medical records, death rates due to

			hypertensive heart disease, shows that the blood pressure is a crucial risk factor for atherosclerosis and ischemic heart diseases; thus, preventive measures should be taken against high blood pressure which provide the ability to track, trace and save patient's life at appropriate time is an essential need for mankind. Nowadays, Globalization demands Smart cities, which involves many attributes and services, such as government services, Intelligent Transportation Systems (ITS), energy, health care, water and waste. This paper proposes a system architecture for smart healthcare based on GSM and GPS technologies. The objective of this work is providing an effective application for Real Time Health Monitoring and Tracking. The system will track, trace, monitor patients and facilitate taking care of their health; so efficient medical services could be provided at appropriate time. By Using specific sensors, the data will be captured and compared with a configurable threshold via microcontroller which is defined by a specialized doctor who follows the patient; in any case of emergency a short message service (SMS) will be sent to the Doctor's mobile number along with the measured values through GSM module. Furthermore, the GPS provides the position information of the monitored person who is under surveillance all the time. Moreover, the paper demonstrates the feasibility of realizing a complete end-to-end smart health system responding to the real health system design requirements by taking in consideration wider vital human health parameters such as respiration rate, nerves signs ... etc. The system will be able to bridge the gap between pat- ents - in dramatic health change occasions- and health entities who response and take actions in real time fashion.
SMES-33	Indoor Blind Localization of Smartphones by Means of Sensor Data Fusion	2016-2017	Locating the nodes in wireless sensor networks (WSNs) is currently a very active area of research due to their increasing number of potential applications. Wireless networks composed of smartphones have gained particular interest, mainly due to the high availability of such devices. This paper presents a novel algorithm for blind localization of commercial off-the-shelf

			smartphones in a WSN. The algorithm uses acoustic signals and inertial sensors to estimate the sensor positions simultaneously. Estimates of range and direction-of-arrival (DOA) locally obtained in each node are combined with a maximum likelihood estimator. A tailored optimization algorithm is also proposed to solve the DOA uncertainty problem. Our proposal obtains low localization errors without considering any reference node nor any prior synchronization between nodes.
SMES-34	Low-Overhead and High-Precision Prediction Model for Content-Based Sensor Search in the Internet of Things	2016-2017	A growing number of Internet-connected sensors have already promoted the advance of sensor search service. Accessing all available objects to find the sought sensor results in huge communication overhead, thus a low-overhead and high-precision prediction model (LHPM) is proposed to improve the sensor search efficiency. We design the approximation method to lower the reporting energy cost. Then a multistep prediction method is proposed to accurately estimate the sensor state. Furthermore, a sensor ranking method is presented to assess the matching probabilities of sensors, so as to effectively reduce the communication overhead of the search process. Simulation results demonstrate the validity of the proposed prediction model in the area of content-based sensor search.
SMES-35	Preprocessing Design in Pyroelectric Infrared Sensor-Based Human-Tracking System: On Sensor Selection and Calibration	2016-2017	This paper presents an information-gain-based sensor selection approach as well as a sensor sensing probability model-based calibration process for multihuman tracking in distributed binary pyroelectric infrared sensor networks. This research includes three contributions: 1) choose the subset of sensors that can maximize the mutual information between sensors and targets; 2) find the sensor sensing probability model to represent the sensing space for sensor calibration; and 3) provide a factor graph-based message passing scheme for distributed tracking. Our approach can find the solution for sensor selection to optimize the performance of tracking. The sensing probability model is efficiently optimized through the calibration process in order to update the parameters of sensor positions and rotations. An application for mobile calibration

			and tracking is developed. Simulation and experimental results are provided to validate the proposed framework.
SMES-36	Lightweight Mashup Middleware for Coal Mine Safety Monitoring and Control Automation	2016-2017	Recently, the frequent coal mine safety accidents have caused serious casualties and huge economic losses. It is urgent for the global mining industry to increase operational efficiency and improve overall mining safety. This paper proposes a lightweight mashup middleware to achieve remote monitoring and control automation of underground physical sensor devices. First, the cluster tree based on ZigBee Wireless Sensor Network (WSN) is deployed in an underground coal mine, and propose an Open Service Gateway initiative (OSGi)-based uniform devices access framework. Then, propose a uniform message space and data distribution model, and also, a lightweight services mashup approach is implemented. With the help of visualization technology, the graphical user interface of different underground physical sensor devices could be created, which allows the sensors to combine with other resources easily. Besides, four types of coal mine safety monitoring and control automation scenarios are illustrated, and the performance has also been measured and analysed. It has been proved that our lightweight mashup middleware can reduce the costs efficiently to create coal mine safety monitoring and control automation applications.
SMES-37	Improving the Locating Precision of an Active WIFI RFID System to Obtain Traceability of Patients in a Hospital	2016-2017	It is a challenge to integrate RFID technology into the healthcare sector to increase security by obtaining traceability of patients during their hospital stay. In this case, RFID provides arrange of technical architectures for implementing an RFID system. The installation or use of the WIFI network available in a hospital is a possible element in system design since a priori with a correct configuration of RFID components, excellent results in location accuracy can be obtained over other architectures available in the market. The accuracy of RFID Aeroscout WIFI system can be improved with the installation of exciters. These are components that assist the

			localisation engine in calculating the location of an active RFID tag WIFI. The precision offered by the localisation engine depends on multiple configurable parameters set by the engineers responsible for the design and development of an active RFID WIFI system.
SMES-38	Joint access point and user localization using unlabeled WiFi RSS data	2016-2017	This paper investigates the problem of joint estimation of a pedestrian user path and the available WiFi access point locations. The observations are limited to unlabeled WiFi received signal strength (RSS) values. The problem is formed as a partially observable Markov decision process and RSS gradients are integrated to estimate and update the user locations along the path. The RSS data is modelled as a Gaussian process and gradient vectors are updated for each step based on the motion dynamics. Realistic assumptions and constraints are introduced to model the user's movement and reduce the computational complexity.
SMES-39	Water Level Meter for Alerting Population about Floods	2016-2017	The most important thing immediately before, during and after a disaster occurs is the dissemination of information, a deployment of devices enabled by IoT (Internet of Things) could bring benefits in terms of giving to people information opportunely for making decisions in face of this disaster. In this paper, we present a sensor to measure water level in rivers, lakes, lagoons and streams. For such purpose and to prove our concept, we designed a pilot project through a micro-model that is constructed with a water level measurement sensor based on a simple open circuit that closes when in contact with water and experimentally tested into a water container under a controlled environment. This micro-model is performed on the basis of a programmable electronic board (Netduino Plus 2), an electronic circuit connected to electrical resistances that are located at a specific height, within a water container, when the water level rises and reaches the resistors, varies the

			impedance, this shows the actual water level and so on for different heights. The information from water level sensor is transmitted via WiFi to a laptop, then this information is also seen in smartphones, where users can see the water level in rivers. Finally, the micro-model is tested by experimental tests under a controlled environment and satisfactory results are obtained.
SMES-40	Brain-controlled devices: the perception-action closed loop	2016-2017	Future neuroprosthetics will be tightly coupled with the user in such a way that the resulting system can replace and restore impaired upper limb functions because controlled by the same neural signals than their natural counterparts. However, robust and natural interaction of subjects with sophisticated prostheses over long periods of time remains a major challenge. To tackle this challenge we can get inspiration from natural motor control, where goal-directed behaviour is dynamically modulated by perceptual feedback resulting from executed actions. Current brain-computer interfaces (BCI) partly emulate human motor control as they decode cortical correlates of movement parameters -from onset of a movement to directions to instantaneous velocity- in order to generate the sequence of movements for the neuroprosthesis. A closer look, though, shows that motor control results from the combined activity of the cerebral cortex, subcortical areas and spinal cord. This hierarchical organization supports the hypothesis that complex behaviours can be controlled using the low-dimensional output of a BCI in conjunction with intelligent devices in charge to perform low-level commands. A further component that will facilitate intuitive and natural control of motor neuroprosthetics is the incorporation of rich multimodal feedback and neural correlates of perceptual cognitive processes resulting from this feedback. As in natural motor control, these sources of information can dynamically modulate interaction.

SMES-41	Experimental investigation of remote control via Android smart phone of arduino-based automated irrigation system using moisture sensor	2016-2017	Climate change because of the greenhouse effect has been authenticated. Fallouts like the 2015 Chennai floods suggest techniques like precision agriculture that includes automation in the irrigation system are important. This paper suggests an economical and easy-to-use arduino-based automated irrigation system that utilizes the Android smart phone for remote control. The system design includes a soil moisture sensor that provides a voltage signal proportional to the moisture content in the soil which is compared with a predetermined threshold value obtained by sampling of various soils and specific crops. The outcome of the comparison is that appropriate data are fed to the arduino un processor. The arduino is linked wirelessly via the HC-05 module to an Android smart phone. The data received by the Android smart phone from the arduino is displayed on the User Interface (UI) (S2 terminal application). The UI in the Android smart phone allows the user easy remote control of the irrigation drive system that involves switching, on and off, of the drive motor by the arduino, wired to its controller, based on commands from the android smart phone. Studies conducted on a laboratory prototype suggest that the design is viable and can be easily adopted for real time application.
SMES-42	MAGIC: Model-Based Actuation for Ground Irrigation Control	2016-2017	Lawns make up the largest irrigated crop by surface area in North America, and carries with it a demand for over 9 billion gallons of freshwater each day. Despite recent developments in irrigation control and sprinkler technology, state-of-the-art irrigation systems do nothing to compensate for areas of turf with heterogeneous water needs. In this work, we overcome the physical limitations of the traditional irrigation system with the development of a sprinkler node that can sense the local soil moisture, communicate wirelessly, and actuate its own sprinkler based on a centrally- computed schedule. A model is then developed to compute moisture movement from runoff, absorption, and diffusion. Integrated with an optimization framework, optimal valve scheduling can be

			found for each node in the space. In a turf area covering over 10,000ft2, two separate deployments spanning a total of 7 weeks show that MAGIC can reduce water consumption by 23.4% over traditional campus scheduling, and by 12.3% over state-of-the- art evapotranspiration systems, while substantially improving conditions for plant health. In addition to environmental, social, and health benefits, MAGIC is shown to return its investment in 16-18 months based on water consumption alone.
SMES-43	Potential for improving green roof performance through artificial irrigation	2016-2017	Historically extensive green roofs were designed for natural precipitation with a plant selection focusing on hardy succulents such as sedums that can survive harsh, water stressed conditions. Although this seems a convenient solution to establish and maintain a green roof system, at a much broader level this does not optimize the functions and performance of the green roof. In this paper the influence of irrigation on green roof functions and performance is presented for an extensive green roof by an extensive literature study. Green roof energy saving potential under Sri Lankan climatic conditions is significant. The average water retention of green roof substrate under different climatic zone conditions in Sri Lankan context is simulated with hypothetical twelve extensive green roof types. Results justify the artificial irrigation requirement and provide key directions to develop water balance model considering locational factors to maintain set soil moisture target.
SMES-44	Dual Sink Efficient Balanced Energy Technique for Underwater Acoustic Sensor Networks	2016-2017	Underwater Acoustic Sensor Networks are considered to provide efficient monitoring tasks in aquatic environment but due to limited battery resource of sensor nodes, network lifetime collapses. Energy balancing is the major issue in low network lifetime. High energy consumption creates energy holes and ultimately leads to shorter network lifetime. Therefore, energy consumption must be balanced to increase network life time. To overcome these concerns a technique should be designed that minimizes the

			energy consumption and prolong network lifetime. This paper presents a Dual Sink Efficient and Balanced Energy consumption Technique (DSEBET) for UASNs. DSEBET overcomes the problem of limited network lifetime and high energy consumption over long distance. Dual sinks underwater model is established. DSEBET first establishes links between nodes on the basis of their optimum distance value and then picks relay nodes on the basis of their minimum distance "Nj" value for the transmission of data. In the data transmission phase every nodes have equal energy levels numbers (ELNs). Long distance nodes from one sink will share their data to other sink if come in range of sink otherwise they will establish a multi hop path for transmission of data to the respective sink.
SMES-43	Wireless Gas Leak Detection and Localization	2016-2017	Thousands of industrial gas leaks occur every year, with many leading to injuries, deaths, equipment damage, and a disastrous environmental effect. There have been many attempts at solving this problem, but with limited success. This paper proposes a wireless gas leak detection and localization solution. With a monitoring network of 20 wireless devices covering 200m2, 60 propane releases are performed. The detection and localization algorithms proposed here are applied to the collected concentration data, and the methodology is evaluated. A detection rate of 91% is achieved, with seven false alarms recorded over three days, and an average detection delay of 108 seconds. The localization results show an accuracy of 5 meters. Recommendations for future explosive gas sensor design are then presented.
SMES-44	Wireless Power Transmission for Multiple Devices	2016-2017	Wireless power transmission concept has being revolutionary emerging against the conventional charging methods of consumer electronics. In this paper, we present the concept of wireless power transmission for multiple devices. Simultaneous wireless power transmission via resonant inductive coupling is experimentally demonstrated for a system with single transmitter

			and two receivers. Resonance between source and load is achieved with lumped capacitors connecting the coils. The circuit design is developed to describe a system with a single receiver, and extended to describe the system with two receivers.
SMES-45	Implementation Of Grid Mapped Robot Planning Algorithm In A Continuous Map For Fire Fighting Robot	2016-2017	Fire-fighting robot is still one of the fields in robotic competitions held these days. This paper is aimed to see the implementation of the Markov Decision Planning (MDP) problem in a fire-fighting robot's navigation. The MDP algorithm evolves planning of the actions the robot should take according to the policy. This planning is mapped into a grid map. Yet in the implementation, this planning is applied in a continuous map. Using a firefighting robot the succession of this planning implementation is undertaken. The result shows that the implementation of grid mapped in a continuous map yields significant impacts that lead the MDP to be able to solve the limitation of wall following algorithm. This algorithm is also applied in the real autonomous mobile robot.
SMES-46	Improving Trace Precision for Concurrent Garbage Collection on Multicore Platform	2016-2017	Garbage Collection removes the programmer's responsibility for managing heap object de-allocation, and is now in widespread use in programming languages such as Java, C#, Python and Perl. On the other hand garbage collection is the most difficult component to be parallel and concurrent in runtime system. This paper proposed a high precision concurrent tracing garbage collector based on tracing reference count. The concurrent collector is modeled, by using the reference count in recycling process, most of the modifications by the application thread are monitored. The barriers are classified as either store protection or deletion protection. In this paper, the approach can effectively track the modifications of the object references, reducing the number of objects in the process of rescanning process, while effectively reducing the of floating garbage during the concurrent collection.
SMES-47	Building Smart Cities Applications using IoT and	2016-2017	The concept of a Smart City highlights the need to enhance quality, interconnection and performance of various urban services with the

	Cloud-based Architectures		use of information and communication technologies (ICT). Smart City technologies promote cloud-based and Internet of Things (IoT) based services in which real-world user interfaces use smart phones, sensors and RFIDs. Cloud computing and IoT are presently two most important ICT models that are shaping the next generation of computing. Both concepts have major impact on how we build and deploy smart Applications/solutions for smart cities. Cloud computing represents the delivery of hardware and software resources on demand over the Internet-as-a-service. On the other hand, IoT concept envisions a new generation of devices (sensors, both virtual and physical) that are connected to the Internet and provide different services for value-added applications. This paper addresses the convergent domain of cloud computing and IoT for any smart city application deployment. Dubai as a smart city is discussed with some application-based scenarios. An IoT based healthcare framework is also proposed in the paper.
SMES-48	Design of A Gripping Imitator Robotic Arm for Taking An Object	2016-2017	This paper presents the design of robotic arm which imitate the human hand movement to grip an object. The robotic arm is remote controlled so that it can be equipped to a robot which can explore inaccessible or hazardous area and do a Dangerous task. The operator's hand movement will be captured by camera and will be processed in three level approaches of video processing namely background subtraction, hand and finger Detection, and gripping recognition. The video processing result will be converted by inverse kinematics to become joint space of the robotic arm. The joint space data is sent to robotic arm as the signal control using Bluetooth module. The test result shows that the system can work properly and in its optimum parameters, it can achieve 85% of success rate.
SMES-49	*An Innovative Approach for Women and Children's Security Based Location Tracking System*	2016-2017	Now-a-days children and women are facing many security related problems. In such situations, they are helpless and don't have any way to protect them or inform it to their family members, neighbours or police station and they feel as handicaps. Hence there should be a system to

			protect them in such times. So this system helps them to seek help in any critical situation. For that, the system contains GPS to detect location and GSM mechanisms to pass their current location to any one of the trusted contacts as a Google map link and services are provided to track the locations from that moment onwards to save the person.
SMES-50	Research on Soil Moisture Measurement Using Moisture Sensor	2016-2017	In recent years, the aging of agricultural workers Has progressed rapidly, successor problem is becoming more serious. Under such circumstances are coming out also new farmers that will beginner to agriculture. However, the establishment of farming technology has become a major management challenge for new farmers. In this study, we focused on the fact that to compensate for the water management is a part of the management challenges of the new farmers (establishment of farming technology), to build a Soil moisture measurement system due to moisture sensor. In addition, clarification of irrigation amount and the visualization is performed which is based on the measurement data
SMES-51	Integrating Connected Vehicles in Internet of Things Ecosystems: Challenges and Solutions	2016-2017	Vehicles are becoming the next frontiers for Internet of Things (IoT) based platforms and services. Connected vehicles, Intelligent Transportation Systems (ITS) together with IoT technologies have the potential of unleashing efficient and more sustainable transportation system which is fast becoming an important societal challenge. This paper formulates several Main research and engineering challenges for integrating connected vehicles into IoT ecosystems. The challenges include – (i) a suitable alternative of cloud platform to support real time connected vehicular scenarios, (ii) uniform description and data collection mechanisms from vehicular sensors, (iii) integrating smart devices into transport systems, (iv) uniform mechanism for data fusion and analytics and (v) integrating all heterogeneous Elements into a standard IoT architecture for connected vehicles. To mitigate these challenges, we propose a novel IoT framework. The solutions, operational phases of the framework,

			software elements & their implementations and advantages are described in details. The building blocks of the framework are integrated into an oneM2M standard architecture. Finally, the paper concludes with best practice recommendations and lessons learnt from the prototyping
SMES-52	**Internet of Things Technologies in Smart Cities**	2016-2017	A smart city is a developed urban area that excels in the area of economy, governance, people and life through strong human capital, social capital and ICT infrastructure. It is a new approach to managing the complexity of city life, increase efficiency, reduce expenses and improve the quality of life of the citizens. This paper is on potential smart cities applications as applied to the domains of smart transport, smart tourism and recreation, smart health, ambient-assisted living, crime prevention and community safety, governance, monitoring and infrastructure, disaster management, environment management, refuse collection and sewer management, smart homes and smart energy. These smart cities applications support the future vision of cities, which aim at exploiting ICTs, namely internet of things technologies (IoT), for value-added service delivery. Furthermore, the paper presents a technical solution for energy control and comfort in a home for proof of concept of a smart city infrastructure application. The demonstrator described here is on how smart applications can manage energy control and comfort in a room that has a varied number of people and electrical appliances, with each being a source of heat.
SMES-53	IoT enabled Environmental Monitoring System for Smart Cities	2016-2017	A smart city enables the effective utilization of Resources and better quality of services to the citizens. To provide services such as air quality management, weather monitoring and automation of homes and buildings in a smart city, the basic Parameters are temperature, humidity and CO2. This paper presents a customized design of an Internet of Things (IoT) enabled environment monitoring system to monitor temperature, humidity and CO2. In developed system, data is sent from the transmitter node to the receiver node. The data received at the receiver node is monitored and recorded in an excel sheet in a personal computer (PC) through a Graphical User

			Interface (GUI), made in Lab VIEW. An Android application has also been developed through which data is transferred from Lab VIEW to a smartphone, for monitoring data remotely. The results and the performance of the proposed system is discussed.
SMES-54	Heart Rate Analysis and Monitoring of Patients from Offsite through Wireless Sensor Network	2016-2017	Researchers throughout the years have been searching for methods to improve the available technologies to ease the users worldwide. In medical industries, researchers have made many Improvements and development in medical equipment's to ease the medical professionals in serving patients. This work is the continuation of the previous research work in providing complete set of data for analysis on human behavior to set an accurate threshold for device detection. In this work, heart rate is monitored to all age groups for both genders wirelessly from remote locations. Results shown that these various age group is giving average reading that complies to the benchmark reading and is able to provide the Necessary threshold value for future device improvement and enhancement.
SMES-55	Securing IoT for Smart Home System	2016-2017	This paper presents an approach to incorporate strong security in deploying Internet of Things (IoT) for smart home system, together with due consideration given to user convenience in operating the system. The IoT smart home system Runs on conventional Wi-Fi network implemented based on the All Joyn framework, using an asymmetric Elliptic Curve Cryptography to perform the authentications during system operation. A Wi-Fi gateway is used as the center node of the system to perform the system initial configuration. It is then responsible for authenticating the communication between the IoT devices as well as providing a mean for the user to setup, access and control the system through an Android based mobile device running appropriate application program