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ETPL IoT - 001	A Wearable Device for Continuous Detection and Screening of Epilepsy during Daily Life

Epilepsy is a very fatal condition which is caused as a result of imbalance in the nervous system. The very common symptoms of epilepsy includes sudden fluctuations in heart beat rate and involuntary muscular movements (seizures). The aura (practical symptom) of epilepsy includes fluctuations in heartbeat, nausea, dizziness etc. The wireless electronic diagnosing system proposed here is exclusively meant for epilepsy patients. The system helps them in accurately predicting the occurrence of seizures. Sudden occurrence of seizures during driving may lead to accidents and its occurrence during sleeping hours can even lead to the patient's death, if no immediate, proper attention is provided by a bystander or a doctor. With the aid of this system, the patient can lead a normal life. Since the occurrence of seizures is unpredictable, it will be a very risky task to leave the patient alone. The electronic system proposed here is a wearable device which predicts the occurrence of epilepsy in a few minutes advance. The device utilizes the signals from human body to detect the occurrence of epilepsy. As soon as the device detects the symptoms, it transmits a coded signal to produce control signals for switching an alarm device, doctor or relative's mobile phone using wireless communication with help of GSM modem and GPS is used to trace out the exact location of the patient.

ETPL IOT - 002	AgriSys: A smart and ubiquitous controlled-environment agriculture system.

With new technological advancement in controlled-environment agriculture systems, the level of productivity has significantly increased. Agriculture systems are now more capable, reliable, and provide enhanced productivity. An agriculture environment can range from a single plant in a house, a backyard garden, a small farm, to a large farming facility. These agricultural automated systems will help in managing and maintain safe environment especially the agricultural areas. In this paper, we propose a smart Agriculture System (AgriSys) that can analyze an agriculture environment and intervene to maintain its adequacy. The system deals with general agriculture challenges, such as, temperature, humidity, pH, and nutrient support. In addition, the system deals with desert-specific challenges, such as, dust, infertile sandy soil, constant wind, very low humidity, and the extreme variations in diurnal and seasonal temperatures. The system interventions are mainly intended to maintain the adequacy of the agriculture environment. For a reduced controller complexity, the adoption of fuzzy control is considered. The system implementation relies on state-of-art computer interfacing tools from National Instruments as programmed under LabVIEW.

ETPL IOT - 003	Real-Time Driving Monitor System: Combined Cloud Database with GPS.

In recent years, EEG brainwave-reading device is used more and more in various academic fields and real life. Analyzing brainwave from drivers, we divide the brainwave data into light fatigue, medium fatigue and severe fatigue. Once the driver's Low-α <; 0.7, High-α <; 0.5, θ>0.5, or attention and meditation less than 40 degrees, then the system is determined that the driver is lethargic or inattention. The system will be based on the status of the different layers of the driving fatigue, showing the red, yellow and green lights warming message. Use the mobile device to alert the driver, and record the information in the database. In addition, the system is collocated with GPS positioning function. The user's brainwaves and GPS data will be integrated and analyzed after uploaded to the cloud server, to remind drivers if there are dangerous drivers within a radius of 20 meters what should be aware of.

ETPL IOT - 004	Development of IoT based Smart Security and Monitoring Devices for Agriculture.

Agriculture sector being the backbone of the Indian economy deserves security. Security not in terms of resources only but also agricultural products needs security and protection at very initial stage, like protection from attacks of rodents or insects, in fields or grain stores. Such challenges should also be taken into consideration. Security systems which are being used now a days are not smart enough to provide real time notification after sensing the problem. The integration of traditional methodology with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Keeping this scenario in our mind we have designed, tested and analyzed an 'Internet of Things' based device which is capable of analyzing the sensed information and then transmitting it to the user. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields, grain stores and cold stores for security purpose. This paper is oriented to accentuate the methods to solve such problems like identification of rodents, threats to crops and delivering real time notification based on information analysis and processing without human intervention. In this device, mentioned sensors and electronic devices are integrated using Python scripts. Based on attempted test cases, we were able to achieve success in 84.8% test cases.

ETPL IOT - 005	IOT based embedded system for home appliances human monitoring & control system.

Internet of Things (IoT) has stood at the forefront of technological advancements in order to reduce human labor. The idea of making the world smart arises from the fact that "things" can be connected via/to the Internet. Smart homes, smart cars, smart offices all these have brought about a massive change in the field of technology. The use of sensors in common household items can transform them into smarter devices is the next step. Grid based mapping is an easy way to map an entire house. Control of electronic devices through mobile phones or computers is at the core of this technology. This paper discusses how home automation system can be implemented and how the use of cloud computing technology along with IoT devices can be used so that the data collected by these devices can be safely stored and monitored.

ETPL IOT - 006	Improved pedestrian dead-reckoning based indoor positioning by RSSI based heading correction.

A novel indoor positioning method is proposed, enhancing the conventional pedestrian dead-reckoning (PDR) with the received signal strength indicator (RSSI)-based heading correction. PDR is reliable for steadily accurate positioning if its heading error can be rectified. Upon detecting a long straight trajectory estimated by PDR, the PDR-estimated headings shall be updated by headings derived based on RSSI data and linear regression. The proposed method had been tested in real complex indoor environments with varying density and availability of RSSI sources, and benchmarked against some existing methods in terms of positioning accuracy. The experiment results are presented to demonstrate the feasibility of the proposed method.

ETPL IOT - 007	IOT based smart home design using power and security management.

The paper presents the design and implementation of an Ethernet-based Smart Home intelligent system for monitoring the electrical energy consumption based upon the real time tracking of the devices at home an INTEL GALILEO 2ND generation development board, which can be used in homes and societies. The proposed system works on real time monitoring and voice control, so that the electrical devices and switches can be remotely controlled and monitored with or without an android based app. It uses various sensors to not only monitor the real time device tracking but also maintaining the security of your house. It is monitored and controlled remotely from an android app using the Internet or the Intranet connectivity. The proposed outcome of the project aims as multiple benefits of saving on electricity bills of the home as well as keep the users updated about their home security with an option of controlling the switching of the devices by using their voice or simple toggle touch on their smartphone, and last but most importantly, monitor the usage in order to conserve the precious natural resources by reducing electrical energy consumption.

ETPL IOT - 008	Towards fourth industrial revolution impact: smart product based on RFID Technology.

As presented in [1], the fourth industrial revolution is coming: one which promises to marry the worlds of production and network connectivity in an Internet of Things (IOT). "Smart production" becomes the norm in a world where intelligent information and communication technology or ICT-based machines, systems and networks are capable of independently exchanging and responding to information to manage industrial production processes. Smart industry refers to the technological evolution from embedded systems to cyber-physical systems. The deployment of cyber- physical systems in production systems creates the smart factory. In this context, it is expected that smart factories, smart products, smart materials and smart machines are characterized by cyber-physical systems. There is a need to understand smart products in this context.

ETPL IOT - 009	Balanced Energy Consumption Based Adaptive Routing for IoT Enabling Underwater WSNs.

Applications of Internet of Things underwater wireless sensor networks, such as imaging underwater life, environmental monitoring, and supervising geological processes on the ocean floor, demand a prolonged network lifetime. However, these networks face many challenges, such as high path loss, limited available bandwidth, limited battery power, and high attenuation. For a longer network lifetime, both balanced and efficient energy consumption are equally important. In this paper, we propose a new routing protocol, called balanced energy adaptive routing (BEAR), to prolong the lifetime of UWSNs. The proposed BEAR protocol operates in three phases: 1) initialization phase; 2) tree construction phase; and 3) data transmission phase. In the initialization phase, all nodes share information related to their residual energy level and location. In the tree construction phase, our proposed BEAR exploits the location information for: a) selecting neighbour nodes and b) choosing the facilitating and successor nodes based on the value of cost function. In order to balance the energy consumption among the successor and the facilitator nodes, BEAR chooses nodes with relatively higher residual energy than the average residual energy of the network. The results of our extensive simulations show that BEAR outperforms its counterpart protocols in terms of network lifetime.

ETPL IOT - 010	A Deep Learning Approach to on-Node Sensor Data Analytics for Mobile or Wearable Devices.

The increasing popularity of wearable devices in recent years means that a diverse range of physiological and functional data can now be captured continuously for applications in sports, wellbeing, and healthcare. This wealth of information requires efficient methods of classification and analysis where deep learning is a promising technique for large-scale data analytics. While deep learning has been successful in implementations that utilize high-performance computing platforms, its use on low-power wearable devices is limited by resource constraints. In this paper, we propose a deep learning methodology, which combines features learned from inertial sensor data together with complementary information from a set of shallow features to enable accurate and real-time activity classification. The design of this combined method aims to overcome some of the limitations present in a typical deep learning framework where on-node computation is required. To optimize the proposed method for real-time on-node computation, spectral domain pre-processing is used before the data are passed onto the deep learning framework. The classification accuracy of our proposed deep learning approach is evaluated against state-of-the-art methods using both laboratory and real world activity datasets. Our results show the validity of the approach on different human activity datasets, outperforming other methods, including the two methods used within our combined pipeline. We also demonstrate that the computation times for the proposed method are consistent with the constraints of real-time on-node processing on smartphones and a wearable sensor platform.

ETPL IOT - 011	A Hybrid Data Compression Scheme for Power Reduction in Wireless Sensors for IoT.

This paper presents a novel data compression and transmission scheme for power reduction in Internet-of-Things (IoT) enabled wireless sensors. In the proposed scheme, data is compressed with both lossy and lossless techniques, so as to enable hybrid transmission mode, support adaptive data rate selection and save power in wireless transmission. Applying the method to electrocardiogram (ECG), the data is first compressed using a lossy compression technique with a high compression ratio (CR). The residual error between the original data and the decompressed lossy data is preserved using entropy coding, enabling a lossless restoration of the original data when required. Average CR of 2.1× and 7.8× were achieved for lossless and lossy compression respectively with MIT/BIH database. The power reduction is demonstrated using a Bluetooth transceiver and is found to be reduced to 18% for lossy and 53% for lossless transmission respectively. Options for hybrid transmission mode, adaptive rate selection and system level power reduction make the proposed scheme attractive for IoT wireless sensors in healthcare applications.

ETPL IOT - 012	An Autonomous Wireless Body Area Network Implementation towards IoT Connected Healthcare Applications.

Internet of Things (IoT) is a new technological paradigm that can connect things from various fields through the Internet. For the IoT connected healthcare applications, the wireless body area network (WBAN) is gaining popularity as wearable devices spring into the market. This paper proposes a wearable sensor node with solar energy harvesting and Bluetooth low energy transmission that enables the implementation of an autonomous WBAN. Multiple sensor nodes can be deployed on different positions of the body to measure the subject's body temperature distribution, heartbeat, and detect falls. A web-based smartphone application is also developed for displaying the sensor data and fall notification. To extend the lifetime of the wearable sensor node, a flexible solar energy harvester with an output-based maximum power point tracking technique is used to power the sensor node. Experimental results show that the wearable sensor node works well when powered by the solar energy harvester. The autonomous 24 h operation is achieved with the experimental results. The proposed system with solar energy harvesting demonstrates that long-term continuous medical monitoring based on WBAN is possible provided that the subject stays outside for a short period of time in a day.

ETPL IOT - 013	A Model-Driven Methodology for the Design of Autonomic and Cognitive IoT-Based Systems: Application to Healthcare

Due to its abilities to capture real-time data concerning the physical world, the Internet of Things (IoT) phenomenon is fast gaining momentum in different applicative domains. Its benefits are not limited to connecting things, but lean on how the collected data are transformed into insights and interact with domain experts for better decisions. Nonetheless, a set of challenges including the complexity of IoT-based systems and the management of the ensuing big and heterogeneous data and as well as the system scalability need to be addressed for the development of flexible smart IoT-based systems that drive the business decision-making. Consequently, inspired from the human nervous system and cognitive abilities, we have proposed a set of autonomic cognitive design patterns that alleviate the design complexity of smart IoT-based systems, while taking into consideration big data and scalability management. The ultimate goal of these patterns is providing generic and reusable solutions for elaborating flexible smart IoT-based systems able to perceive the collected data and provide decisions. These patterns are articulated within a model-driven methodology that we have proposed to incrementally refine the system functional and nonfunctional requirements. Following the proposed methodology, we have combined and instantiated a set of patterns for developing a flexible cognitive monitoring system to manage patients' health based on heterogeneous wearable devices. We have highlighted the gained flexibility and demonstrated the ability of our system to integrate and process heterogeneous large-scale data streams. Finally, we have evaluated the system performance in terms of response time and scalability management.

ETPL IOT - 014	Performance enhancement and IoT based monitoring for smart home.

In recent years, home automation has become so popular due to its numerous advantages. The home environment has witnessed a rapid introduction of network enabled digital technology. This technology comes with new and exciting opportunities to increase the connectivity of different devices within the home for the purpose of home automation. This paper aims at designing a basic home automation system of controlling multiple appliances which can be monitored and accessed from anywhere in the world with very low cost. The technology incorporates Raspberry Pi and the web server. The Raspberry Pi and Arduino integrated with Nrf modules are used to monitor the home environment appliances, and the readings are passed to the web server designed. The parameters or commands sent through web page are monitored frequently and if any threats found the mobile connected to this web server is alerted through an alarm or message. The user can access this application from anywhere in the world. The result produced is low cost advantageous and absolute. Performance Analysis of different protocols (MQTT, HTTP and CoAP) is estimated using visualizations.

ETPL IOT - 015	Improving Smart Home Security: Integrating Logical Sensing Into Smart Home

This paper explains various security issues in the existing home automation systems and proposes the use of logic-based security algorithms to improve home security. This paper classifies natural access points to a home as primary and secondary access points depending on their use. Logic-based sensing is implemented by identifying normal user behavior at these access points and requesting user verification when necessary. User position is also considered when various access points changed states. Moreover, the algorithm also verifies the legitimacy of a fire alarm by measuring the change in temperature, humidity, and carbon monoxide levels, thus defending against manipulative attackers. The experiment conducted in this paper used a combination of sensors, microcontrollers, Raspberry Pi and ZigBee communication to identify user behavior at various access points and implement the logical sensing algorithm. In the experiment, the proposed logical sensing algorithm was successfully implemented for a month in a studio apartment. During the course of the experiment, the algorithm was able to detect all the state changes of the primary and secondary access points and also successfully verified user identity 55 times generating 14 warnings and 5 alarms.

ETPL IOT - 016	**A Model-Driven Methodology for the Design of Autonomic and Cognitive IoT-Based Systems: Application to Healthcare**

Due to its abilities to capture real-time data concerning the physical world, the Internet of Things (IoT) phenomenon is fast gaining momentum in different applicative domains. Its benefits are not limited to connecting things, but lean on how the collected data are transformed into insights and interact with domain experts for better decisions. Nonetheless, a set of challenges including the complexity of IoT-based systems and the management of the ensuing big and heterogeneous data and as well as the system scalability need to be addressed for the development of flexible smart IoT-based systems that drive the business decision-making. Consequently, inspired from the human nervous system and cognitive abilities, we have proposed a set of autonomic cognitive design patterns that alleviate the design complexity of smart IoT-based systems, while taking into consideration big data and scalability management. The ultimate goal of these patterns is providing generic and reusable solutions for elaborating flexible smart IoT-based systems able to perceive the collected data and provide decisions. These patterns are articulated within a model-driven methodology that we have proposed to incrementally refine the system functional and nonfunctional requirements. Following the proposed methodology, we have combined and instantiated a set of patterns for developing a flexible cognitive monitoring system to manage patients' health based on heterogeneous wearable devices. We have highlighted the gained flexibility and demonstrated the ability of our system to integrate and process heterogeneous large-scale data streams. Finally, we have evaluated the system performance in terms of response time and scalability management.

ETPL IOT - 017	Distributed sensor data computing in smart city applications

With technologies developed in the Internet of Things, embedded devices can be built into every fabric of urban environments and connected to each other; and data continuously produced by these devices can be processed, integrated at different levels, and made available in standard formats through open services. The data, obviously f a form of ‘big data', is now seen as the most valuable asset in developing intelligent applications. As the sizes of the IoT data continue to grow, it becomes inefficient to transfer all the raw data to a centralized, cloud-based data Centre and to perform efficient analytics even with the state-of-the-art big data processing technologies. To address the problem, this article demonstrates the idea of "distributed intelligence" for sensor data computing, which disperses intelligent computation to the much smaller while autonomous units, e.g., sensor network gateways, smart phones or edge clouds in order to reduce data sizes and to provide high quality data for data Centre’s. As these autonomous units are usually in close proximity to data consumers, they also provide potential for reduced latency and improved quality of services. We present our research on designing methods and apparatus for distributed computing on sensor data, e.g., acquisition, discovery, and estimation, and provide a case study on urban air pollution monitoring and visualization.

ETPL IOT - 018	Automation of Smart waste management using IoT to support “Swachh Bharat Abhiyan” - a practical approach

“Swachh Bharat Abhiyaan” is a national campaign initiated by the Government of India, which covers 4,041 cities and towns, to clean the streets, roads and infrastructure of the country. The main motto of the mission is to cover all the rural and urban areas of the country. With proliferation of Internet of Things (IoT) devices such as Smartphone & sensors, this paper describes the effective dry and wet dirt collection using Embedded System. The main motto of the application is collection of dry and wet waste separately which is placed in a conveyor belt on which the dry waste collected dust bins are placed left side and wet waste collected bins on right side. The system will get the input through the dust collecting person through switches and sends signal to the Micro controller unit using RF technology and that makes the H-bridge to rotate conveyor belt. When the belt starts rotating clockwise the dust bin's lid is automatically closed, simultaneously the waste is dumped into the underground garbage container placed at the ground floor. Here IoT module is used to control and monitor the waste and the information will be sent to the particular organization and the common man. The mobile app shows the collection of waste and the particular date and arrival time of the vehicle.

ETPL IOT - 019	IoT based Coffee quality monitoring and processing system

Coffee is Rwanda's main source of income, thus improving processing and monitoring has a large potential economic impact, we are introducing low-cost sensor Technology, by utilizing embedded system to monitor coffee washing station processing method and store centers, the system will be reporting the status of PH, moisture, temperature and humidity as basic information to keep the standard quality of coffee, continually monitor these stages and alerting right time to move from one stage to another to meet requirement of export market. In this paper we describe the background of coffee quality major issues through processing and monitoring, our proposed e-Kawa solution and preliminary experimental results obtained in lab testing. We believe that similar technologies could be beneficent in local coffee processing anywhere else with similar conditions.

ETPL IOT - 020	Real-Time Signal Quality-Aware ECG Telemetry System for IoT-Based Health Care Monitoring

In this paper, we propose a novel signal quality-aware Internet of Things (IoT)-enabled electrocardiogram (ECG) telemetry system for continuous cardiac health monitoring applications. The proposed quality-aware ECG monitoring system consists of three modules: 1) ECG signal sensing module; 2) automated signal quality assessment (SQA) module; and 3) signal-quality aware (SQAw) ECG analysis and transmission module. The main objectives of this paper are: design and development of a light-weight ECG SQA method for automatically classifying the acquired ECG signal into acceptable or unacceptable class and real-time implementation of proposed IoT-enabled ECG monitoring framework using ECG sensors, Arduino, Android phone, Bluetooth, and cloud server. The proposed framework is tested and validated using the ECG signals taken from the MIT-BIH arrhythmia and Physionet challenge databases and the real-time recorded ECG signals under different physical activities. Experimental results show that the proposed SQA method achieves promising results in identifying the unacceptable quality of ECG signals and outperforms existing methods based on the morphological and RR interval features and machine learning approaches. This paper further shows that the transmission of acceptable quality of ECG signals can significantly improve the battery lifetime of IoT-enabled devices. The proposed quality-aware IoT paradigm has great potential for assessing clinical acceptability of ECG signals in improvement of accuracy and reliability of unsupervised diagnosis system.

ETPL IOT - 021	Smart mobile device power consumption measurement for video streaming in wireless environments: WiFi vs. LTE

The extreme growth in the amount of mobile video streaming data over the world puts significant pressure on power consumption of smart mobile devices. In order to obtain a precise energy consumption model for smart devices streaming video and especially energy consumption for streaming video at various quality levels and with different wireless technologies, an open-source power consumption measurement platform was developed for real-time multimedia content delivery. Using this platform, real life smart device power consumption measurements were performed for different quality video delivery over both WiFi and LTE. The results are expected to be used in research for energy-aware video delivery in heterogeneous wireless network environments.

ETPL IOT - 022	Scalable tracking system for public buses using IoT technologies

Reliability in public transport is of great importance today. Millions of people travelling by public buses waste a lot of time waiting at bus stops. This paper focuses on presenting a solution to tackle the said problem by harnessing IoT technology stack. If the people travelling get accurate real time location of the buses along with estimate time for arrival at bus stop based on the real time traffic conditions, it will facilitate an overall increase in reliability on the public buses. The solution proposed in this paper involves using the existing internet enabled devices on the bus (like the e-ticketing system) or a simple android tablet to capture the real time location and send to the servers. Accessing this location data from servers will be facilitated by Representational State Transfer (REST) APIs which users can access through android application, SMS or web-portals. The system proposed will have distributed architecture in order to tackle high number of requests from users. Although there are existing solutions which harness the use of Global Positioning System (GPS) for bus tracking, they aren't ready to handle high demand on the backend which will exist in the near future. We have addressed this problem. The primary contribution of this paper is that it shows that a backend based on Message Queue Telemetry Transport (MQTT) instead of the traditionally used Hypertext transfer protocol (HTTP) based REST will be light weight, data efficient and scalable. We have proposed and implemented the backend as well as the front end required for the tracking system and presented the improvements.

ETPL IOT - 023	Worldwide auto-mobi: Arduino IoT home automation system for IR devices

The common in use for remote control tasks achieved via specific mobile (e.g. Android or iOS) and this control done only by radio remote control systems, infrared (IR) devices, etc.and limited in the edges of office/house, but not remote control automated for electric/ electronic devices from anywhere (outside of office/house). This paper proposed an Internet of Things (IoT) home automated system in two categories, the hardware via a device named Worldwide Auto-mobi and software has been designed to automate a favorite used devices such as TV, SAT, DVD addition to any other devices that can be controlled by an IR signal, locally and anywhere (wide world) via a hybrid mobile application will reduce the number of used controllers in the house by using a single mobile software that control devices using Internet via a WiFi module ESP8266 based on Arduino UNO. This system is being connected to a cloud server and to the mobile application can support iOS/Android mobile or iPad/Tablet. The implementation of the proposed system of home automated was achieved in minimum cost (about 30$) for office/house devices and with a delay in the range (0.4–1) s. this range near real-time (within a few seconds), i.e. it provides a good solution which can be reached in anywhere and anytime based on the cloud.

ETPL IOT - 024	Analysis of Three IoT-Based Wireless Sensors for Environmental Monitoring

The recent changes in climate have increased the importance of environmental monitoring, making it a topical and highly active research area. This field is based on remote sensing and on wireless sensor networks for gathering data about the environment. Recent advancements, such as the vision of the Internet of Things (IoT), the cloud computing model, and cyber-physical systems, provide support for the transmission and management of huge amounts of data regarding the trends observed in environmental parameters. In this context, the current work presents three different IoT-based wireless sensors for environmental and ambient monitoring: one employing User Datagram Protocol (UDP)-based Wi-Fi communication, one communicating through Wi-Fi and Hypertext Transfer Protocol (HTTP), and a third one using Bluetooth Smart. All of the presented systems provide the possibility of recording data at remote locations and of visualizing them from every device with an Internet connection, enabling the monitoring of geographically large areas. The development details of these systems are described, along with the major differences and similarities between them. The feasibility of the three developed systems for implementing monitoring applications, taking into account their energy autonomy, ease of use, solution complexity, and Internet connectivity facility, was analyzed, and revealed that they make good candidates for IoT-based solutions.

ETPL IOT - 025	Monitoring and control of the indoor environment

The time that people spend inside buildings is very significant, so the environmental quality of these spaces is recognized as an important risk factor for human health. The Internet of Things (IoT) represents a technological revolution in the ascendant that is already present in several types of equipment. Thus, combining the need to monitor environmental parameters with a view to improving occupational health, with the Internet of Things paradigm, an automatic system has been developed that allows the monitoring and control of environmental conditions in indoor spaces through the Internet. The system allows you to collect moisture, temperature and luminosity data that are stored in a structured database. Access to monitoring data is accomplished through three applications — a Web portal, an Android application, and a Desktop application. Real-time monitoring allows detection and correction of unfavourable occupational health and energy efficiency situations by controlling external devices.

ETPL IOT - 026	IoT Planting: Watering system using mobile application for the elderly

Nowadays, Thailand has become an aged society. The elderly's mental health has decreased resulting from physiological changes. At present, technology has connect everything to the world of the Internet called the Internet of Things (IoT). IoT can be applied to many ways, which can improve the quality of life and reduce spaces between the elderly and technology. In this paper, we studied the situation of the elderly and proposed the IoT Planting which consists of gardening platform prototype with soil moisture, temperature, water sensor, grow light, and Android application for the elderly. An evaluation was performed by Technology Acceptance Model (TAM). The result represents that the elderly perceived the usefulness and found that it easy to use contrary to their expectations. Moreover, by reviewing their opinion, it was found out that they have a positive attitude toward our application and willingness to use it.

ETPL IOT - 027	Low power sensor design for IoT and mobile healthcare applications

This paper reviews recent advances in radar sensor design for low-power healthcare, indoor real-time positioning and other applications of IoT. Various radar front-end architectures and digital processing methods are proposed to improve the detection performance including detection accuracy, detection range and power consumption. While many of the reported designs were prototypes for concept verification, several integrated radar systems have been demonstrated with reliable measured results with demo systems. A performance comparison of latest radar chip designs has been provided to show their features of different architectures. With great development of IoT, short-range low-power radar sensors for healthcare and indoor positioning applications will attract more and more research interests in the near future.

ETPL IOT - 028	An implementation of access-control protocol for IoT home scenario

This paper reviews recent advances in radar sensor design for low-power healthcare, indoor real-time positioning and other applications of IoT. Various radar front-end architectures and digital processing methods are proposed to improve the detection performance including detection accuracy, detection range and power consumption. While many of the reported designs were prototypes for concept verification, several integrated radar systems have been demonstrated with reliable measured results with demo systems. A performance comparison of latest radar chip designs has been provided to show their features of different architectures. With great development of IoT, short-range low-power radar sensors for healthcare and indoor positioning applications will attract more and more research interests in the near future.

ETPL IOT - 029	Experiences Creating a Framework for Smart Traffic Control Using AWS IOT

Public clouds such as Amazon Web Services (AWS) and Microsoft's Azure provide excellent capabilities for scalable Web applications and Hadoop-based processing. Recent additions to public clouds to support connected devices and IoT have the potential to similarly disrupt emerging home-grown and/or proprietary approaches. While early public cloud IoT success stories have focused on smaller-scale scenarios such as connected houses, it is unclear to what extent these new public cloud mechanisms and abstractions are suitable and effective for larger-scale and/or scientific scenarios, which often have a different set of constraints or requirements. In this paper, the design and implementation of a representative cloud-based IoT infrastructure in a specific public cloud - AWS - is presented. The system created is for dynamic vehicle traffic control based on vehicle volumes/patterns and public transport punctuality. We find that constructing server-less, stateful, and data driven IoT applications in AWS that can operate in real-time is non-trivial. The primary challenges span application manageability and design, latency performance, asynchronicity, and scalability.

ETPL IOT - 030	Autonomous Flexible Low Power Industrial IoT Controller for Solar Panels Cleaning Systems

Clean energy production increment is being led by advancements in photovoltaic plants, both for on-grid power generation, and for local usage (farms, industrial plants, etc.). The main challenge faced by PV plants is the dreadful reduction of power production caused by the accumulation of dirt and dust on the panels. This effect has a higher magnitude in areas where dust storms or dusty environments are present (such as deserts, urban areas). In order for the PV plants to remain operational at nominal installed power, periodical cleaning of the solar panels is required. For larger PV plants (with power north to 1MW) human manual cleaning of the panels is not feasible, especially in harsh and torrid environments or in cold weather conditions. In this paper, we present an architecture for a custom built low power autonomous Industrial IoT Controller dedicated for PV solar panel cleaning solutions. The controller, apart from controlling the operation of the mechanical device, is also designed to be connected to the internet, to be remotely monitored and to be capable of running VPN, iptables, and other security features that current devices cannot implement.

ETPL IOT - 031	Design and implementation of door access control and security system based on IOT

Security systems are often being breached by intelligent thieves and hence there is always the need of new methods to be invented to provide proper security to the homes and also anywhere else. Use of innovative technologies will improve the security to a great extent till the technology becomes open to all. The aim of this paper is to provide the door access control and security by using IoT Server. The proposed system is implemented by using biometric scanner, password and security question with IoT. Remote operating of door access can be done by IoT with a smart indication. This system can be used in any applications, where security is the critical issue.

ETPL IOT - 032	Low-power multi-sensor system with task scheduling and autonomous standby mode transition control for IoT applications

The low-power multi-sensor system with task scheduling and autonomous standby mode transition control for IoT applications are proposed, which achieves almost zero standby power at the no-operation modes. A power management scheme with activity localization can reduce the number of transitions between power-on and power-off modes with re-scheduling and bundling task procedures. And autonomously standby mode transition control selects the optimum standby mode of microcontrollers, reducing total power consumption. We demonstrate with evaluation board as a use case of IoT applications, observing 91% power reductions by adopting task scheduling and autonomously standby mode transition control combination.

ETPL IOT - 033	Poster Abstract: Wireless Control for the IoT: Power, Spectrum, and Security Challenges

We present recent work in the design and operation of wireless sensor-actuation systems along three aspects. At the device level, a major drive is the reduced power consumption of the wireless transceivers without loss of control performance. At the channel access level, a shared wireless channel needs to be administered between multiple systems with control performance guarantees for all systems. At the application security level, the broadcast nature of the wireless medium raises confidentiality concerns against eavesdroppers who may overhear sensor and actuator measurements.

ETPL IOT - 034	IoT device for object's power remote control

This paper represents the characteristic of current state of information technologies. In addition, it provides with the comparative analysis of wireless technologies and proves the relevance of the issues of the Internet of Things. Moreover, it describes the built working prototype of a device for remote power management, which will find its practical application at businesses, offices, data centers and in private homes and reduce energy costs.

ETPL IOT - 035	Power control in cognitive radios, Internet-of Things (IoT) for factories and industrial automation

Cognitive radio (CR) is fast emerging as a promising technology that can meet the machine-to machine (M2M) communication requirements for spectrum utilization and power control for large number of machines/devices expected to be connected to the Internet-of Things (IoT). Power control in CR as a secondary user can been modelled as a non-cooperative game cost function to quantify and reduce its effects of interference while occupying the same spectrum as primary user without adversely affecting the required quality of service (QoS) in the network. In this paper a power loss exponent that factors in diverse operating environments for IoT is employed in the non-cooperative game cost function to quantify the required power of transmission in the network. The approach would enable various CRs to transmit with lesser power thereby saving battery consumption or increasing the number of secondary users thereby optimizing the network resources efficiently.

ETPL IOT - 036	Smart Gas Level Monitoring, Booking & Gas Leakage Detector over IoT

This journal explains about the most common problem experienced in our day-to-day lives that is regarding GAS container going empty. We bring this paper to create awareness about the reducing weight of the gas in the container, and to place a gas order using IOT. The gas booking/order is being done with the help IOT and that the continuous weight measurement is done using a load cell which is interfaced with a Microcontroller (to compare with an ideal value). For ease it is even has a been added with an RF TX & Rx modules which will give the same information. When it comes it to security of the kit as well as gas container we have an MQ-2(gas sensor), LM 35(temperature sensor), which will detect the surrounding environment for any chance of error. Whenever any change is subjected in any of the sensors (load cell, LM35, Mq-2) a siren (60db) is triggered.

ETPL IOT - 037	Analysis of Three IoT-Based Wireless Sensors for Environmental Monitoring

The recent changes in climate have increased the importance of environmental monitoring, making it a topical and highly active research area. This field is based on remote sensing and on wireless sensor networks for gathering data about the environment. Recent advancements, such as the vision of the Internet of Things (IoT), the cloud computing model, and cyber-physical systems, provide support for the transmission and management of huge amounts of data regarding the trends observed in environmental parameters. In this context, the current work presents three different IoT-based wireless sensors for environmental and ambient monitoring: one employing User Datagram Protocol (UDP)-based Wi-Fi communication, one communicating through Wi-Fi and Hypertext Transfer Protocol (HTTP), and a third one using Bluetooth Smart. All of the presented systems provide the possibility of recording data at remote locations and of visualizing them from every device with an Internet connection, enabling the monitoring of geographically large areas. The development details of these

ETPL IOT - 038	IoT enabled proactive indoor air quality monitoring system for sustainable health management

In recent times indoor air quality has attracted the attention of policy makers and researchers as an important similar to that of external air pollution. In certain sense, indoor air quality must be paid more attention than outdoor air quality as people spend more time indoors than outdoors. The indoor environments are confined and closed compared to external environments providing less opportunity for the pollutants to dilute. With the advancement of technology, working places have become more automated using machines to carry out the tasks that were hitherto done manually. These devices emit various solids and gases into the environment during their operation. These emissions contain many substances that are harmful to human health, when exposed to them for a prolonged period of time or more than certain levels of concentration. This paper proposes an IoT based indoor air quality monitoring system for tracking the ozone concentrations near a photocopy machine. The experimental system with a semiconductor sensor capable of monitoring ozone concentrations was installed near a high volume photocopier. The IoT device has been programmed to collect and transmit data at an interval of five minutes over blue tooth connection to a gateway node that in turn communicates with the processing node via the WiFi local area network. The sensor was calibrated using the standard calibration methods. As an additional capability, the proposed air pollution monitoring system can generate warnings when the pollution level exceeds beyond a predetermined threshold value.

ETPL IOT - 039	Reconfigurable smart water quality monitoring system in IoT environment

Since the effective and efficient system of water quality monitoring (WQM) are critical implementation for the issue of polluted water globally, with increasing in the development of Wireless Sensor Network (WSN) technology in the Internet of Things (IoT) environment, real time water quality monitoring is remotely monitored by means of real-time data acquisition, transmission and processing. This paper presents a reconfigurable smart sensor interface device for water quality monitoring system in an IoT environment. The smart WQM system consists of Field Programmable Gate Array (FPGA) design board, sensors, Zigbee based wireless communication module and personal computer (PC). The FPGA board is the core component of the proposed system and it is programmed in very high speed integrated circuit hardware description language (VHDL) and C programming language using Quartus II software and Qsys tool. The proposed WQM system collects the five parameters of water data such as water pH, water level, turbidity, carbon dioxide (CO2) on the surface of water and water temperature in parallel and in real time basis with high speed from multiple different sensor nodes.

ETPL IOT - 040	Real-Time Signal Quality-Aware ECG Telemetry System for IoT-Based Health Care Monitoring

In this paper, we propose a novel signal quality-aware Internet of Things (IoT)-enabled electrocardiogram (ECG) telemetry system for continuous cardiac health monitoring applications. The proposed quality-aware ECG monitoring system consists of three modules: 1) ECG signal sensing module; 2) automated signal quality assessment (SQA) module; and 3) signal-quality aware (SQAw) ECG analysis and transmission module. The main objectives of this paper are: design and development of a light-weight ECG SQA method for automatically classifying the acquired ECG signal into acceptable or unacceptable class and real-time implementation of proposed IoT-enabled ECG monitoring framework using ECG sensors, Arduino, Android phone, Bluetooth, and cloud server. The proposed framework is tested and validated using the ECG signals taken from the MIT-BIH arrhythmia and Physionet challenge databases and the real-time recorded ECG signals under different physical activities. Experimental results show that the proposed SQA method achieves promising results in identifying the unacceptable quality of ECG signals and outperforms existing methods based on the morphological and RR interval features and machine learning approaches. This paper further shows that the transmission of acceptable quality of ECG signals can significantly improve the battery lifetime of IoT-enabled devices. The proposed quality-aware IoT paradigm has great potential for assessing clinical acceptability of ECG signals in improvement of accuracy and reliability of unsupervised diagnosis system.

ETPL IOT - 041	Design and implementation of a distributed IoT system for the monitoring of water quality in aquaculture

In this work we present the prototype and proof of concept of a distributed monitoring system of the most important variables in aquaculture water quality. This is of great importance because aquaculture is a lagging area of technology compared to other areas such as agriculture. So it is important to solve the problems that are in this area with the support of technology. Among the problems is the slow response time in the care of water quality, the waste of resources and losses. The system proposed in this work monitors the water quality based on wireless sensor networks and on the Internet of Things (IoT). This information is important for the development of this area, since it allows sharing the different conditions in the breeding of aquatic organisms between different breeders and organizations. This information is useful to know the conditions in which there is a better development of a product, worse development, what conditions can mean a possible disaster in the environment and how to optimize resources for the care of the pond.

ETPL IOT - 042	An IoT-Based Online Monitoring System for Continuous Steel Casting

Monitoring solutions using the Internet of Things (IoT) techniques, can continuously gather sensory data, such as temperature and pressure, and provide abundant information for a monitoring center. Nevertheless, the heterogeneous and massive data bring significant challenges to real-time monitoring and decision making, particularly in time-sensitive industrial environments. This paper presents an online monitoring system based on an IoT system architecture which is composed of four layers: 1) sensing; 2) network; 3) service resource; and 4) application layers. It integrates various data processing techniques including protocol conversion, data filtering, and data conversion. The proposed system has been implemented and demonstrated through a real continuous steel casting production line, and integrated with the Team Center platform. Results indicate that the proposed solution well addresses the challenge of heterogeneous data and multiple communication protocols in real-world industrial environments.

ETPL IOT - 043	Knowledge Based Real Time Monitoring System for Aquaculture Using IoT

Internet of things is one of the rapidly growing fields for delivering social and economic benefits for emerging and developing economy. The field of IOT is expanding its wings in all the domains like medical, industrial, transportation, education, mining etc. Now-a-days with the advancement in integrated on chip computers like Arduino, Raspberry pi the technology is reaching the ground level with its application in agriculture and aquaculture. Water quality is a critical factor while culturing aquatic organisms. It mainly depends on several parameters like dissolved oxygen, ammonia, pH, temperature, salt, nitrates, carbonates etc. The quality of water is monitored continuously with the help of sensors to ensure growth and survival of aquatic life. The sensed data is transferred to the aqua farmer mobile through cloud. As a result preventive measures can be taken in time to minimize the losses and increase the productivity.

ETPL IOT - 044	Environment monitoring system for agricultural application based on wireless sensor network using IOT

This paper proposes an Internet of Thing system architecture based on Wireless Sensor Network (WSN) for agricultural applications. The system consists of sensor nodes and a gateway, which allows a user to monitor environmental data for agriculture using a web browser. The sensor node is a microcontroller based Arduino including wireless module and connected sensors such as temperature, relative humidity, luminosity, air pressure and other sensors. A WiFi interface is deployed to exchange the environmental information from sensor nodes to the gateway running Linux. The gateway manages and transfers data to a Cloud where data were stored and visualized as graphs.

ETPL IOT - 045	Smart Garbage Monitoring System u sing Internet of Things (IOT)

The Internet of Things (IoT) shall be able to incorporate transparently and seamlessly a large number of different and heterogeneous end systems, while providing open access to selected subsets of data for the development of a plethora of digital services. Building a general architecture for the IoT is hence a very complex task, mainly because of the extremely large variety of devices, link layer technologies, and services that may be involved in such a system. One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort , time and cost which is not compatible with the present day technologies in any way. This an advanced method in which waste management is automated. This project IoT Garbage Monitoring system is a very innovative system which will help to keep the cities clean. This system monitors the garbage bins and informs about the level of garbage collected in the garbage bins via a web page. This web page also send all information to garbage collection vehicles

ETPL IOT - 046	Health Monitoring and Management Using Internet-of-Things (IoT) Sensing with Cloud-based Processing: Opportunities and Challenges.

Among the panoply of applications enabled by the Internet of Things (IoT), smart and connected health care is a particularly important one. Networked sensors, either worn on the body or embedded in our living environments, make possible the gathering of rich information indicative of our physical and mental health. Captured on a continual basis, aggregated, and effectively mined, such information can bring about a positive transformative change in the health care landscape. In partic- ular, the availability of data at hitherto unimagined scales and temporal longitudes coupled with a new generation of intelligent processing algorithms can: (a) facilitate an evolution in the practice of medicine, from the current post facto diagnose-and- treat reactive paradigm, to a proactive framework for prognosis of diseases at an incipient stage, coupled with prevention, cure, and overall management of health instead of disease, (b) enable personalization of treatment and management options targeted particularly to the specific circumstances and needs of the individual, and (c) help reduce the cost of health care while simultaneously improving outcomes. In this paper, we highlight the opportunities and challenges for IoT in realizing this vision of the future of health care.

ETPL IOT - 047	Secured Smart Healthcare Monitoring System Based on IOT

Technology plays the major role in healthcare not only for sensory devices but also in communication, recording and display device. It is very important to monitor various medical parameters and post operational days. Hence the latest trend in Healthcare communication method using IOT is adapted. Internet of things serves as a catalyst for the healthcare and plays prominent role in wide rang e of healthcare applications. In this project the PIC18F46K22 microcontroller is used as a gateway to communicate to the various sensors such as temperature sensor and pulse oximeter sensor. The microcontroller picks up the sensor data and sends it to the network through Wi - Fi and hence provides real time monitoring of the health care parameters for doctors. The data can be accessed anytime by the doctor. The controller is also connected with buzzer to alert the caretaker about variation in sensor output. But the major issue in remote patient monitoring system is that the data a s to be securely transmitted to the destination end and provision is made to allow only authorized user to access the data. The security issue is been addressed by transmitting the data through the password protected Wi - Fi module ESP8266 which will be encrypted by standard AES128 and the users/doctor can access the data by logging to the html webpage. At the time of extremity situation alert message is sent to the doctor through GSM module connected to the controller. Hence quick provisional medication can be easily done by this system.

ETPL IOT - 048	IOT Based Wearable Health Monitoring System for Pregnant Ladies Using CC3200

The world mortality rate has decreased but many women are still dying every day from pregnancy complications. Various technic resources are being used in an integrated manner in order to minimize even more the death of both mothers and babies. Pregnant women from rural areas can't do their regular checkups at the early stage of pregnancy. But routine checkup can avoid birth of physically challenged infant in this system. Some vital parameters of pregnant women like pressure, temperature, heartbeat rate are monitored and measured. This project provides a wearable device which will continuously monitor the vital parameters to be monitored for a patient and do data logging continuously. If any critical situation arises for a patient, this unit rise an alarm and co mmunicates to the web app using WIFI which is in - built in CC3200. It will collect and transfer the information to the doctor at the earliest because of IoT and the product is compact and wearable. Also in this proposed system IoT has been implemented and its related technology plays a dynamic role in pregnant women. IoT ensures the effective and efficient care of pregnant women in any environment .The usage of these advanced technologies in pregnant women care environment, absolutely eradicates the pregnancy c complications and harmful incidents .

ETPL IOT - 049	Development of IoT based smart security and monitoring devices for agriculture

Agriculture sector being the backbone of the Indian economy deserves security. Security not in terms of resources only but also agricultural products needs security and protection at very initial stage, like protection from attacks of rodents or insects, in fields or grain stores. Such challenges should also be taken into consideration. Security systems which are being used now a days are not smart enough to provide real time notification after sensing the problem. The integration of traditional methodology with latest technologies as Internet of Things and Wireless Sensor Networks can lead to agricultural modernization. Keeping this scenario in our mind we have designed, tested and analyzed an 'Internet of Things' based device which is capable of analyzing the sensed information and then transmitting it to the user. This device can be controlled and monitored from remote location and it can be implemented in agricultural fields, grain stores and cold stores for security purpose. This paper is oriented to accentuate the methods to solve such problems like identification of rodents, threats to crops and delivering real time notification based on information analysis and processing without human intervention. In this device, mentioned sensors and electronic devices are integrated using Python scripts. Based on attempted test cases, we were able to achieve success in 84.8% test cases.

ETPL IOT - 050	IoT in Precision Agriculture applications using Wireless Moisture Sensor Network

Internet of Things (IoT) is a network of sensors and connectivity to enable application like agriculture optimum irrigation. Wireless sensor network (WSN) and Wireless Moisture Sensor Network (WMSN) are components of IoT. One of the important processes in agriculture is irrigation. Improper irrigation will result in waste of water. Proper irrigation system could be achieved by using WSN technology. Monitoring and control applications have been tremendously improved by using WSN technology. It enabled efficient communication with many sensors. WMSN is a WSN with moisture sensors. In this study, Precision Agriculture (PA) used WMSN to enable efficient irrigation. In this paper, we describe about IoT and WMSN in agriculture applications particularly in greenhouse environment. This paper explained and proved the efficiency of feedback control method in greenhouse crop irrigation. A test was conducted to see the different these two methods. The methods are irrigation by schedule or feedback based irrigation. Irrigation by schedule is to supply water to the plant at specific time periods. Feedback based irrigation is to irrigate plant when the moisture or level of media wetness reached predefined value. The test shows that there is an average savings of 1,500 ml per day per tree.

ETPL IOT - 051	Design and development of CC3200-based Cloud IoT for measuring humidity and temperature

Measurement and control of humidity and temperature play an important role in different fields like Agriculture, Science, Engineering and Technology. Also, it becomes essential to monitor the real-time weather condition of one place from another place. In this paper, we present the design and development of CC3200-based Cloud IoT for measuring humidity and temperature. CC3200 is the first Simple Link Wi-Fi internet-on-chip Launch Pad developed by Texas instruments, USA in 2014. The HRT393 sensor is used for measuring humidity and temperature. Measured parameters are sent to the Cloud servers of AT&TM2X Cloud technology (HTTPS). Humidity and temperature measurements made in real-time are shown graphically. The software is developed in Energia integrated development environment (IDE). The measured values are compared with the measurements recorded by the ground station Laboratory set up by ISRO, India, on the University campus.

ETPL IOT - 052	IoT Based Mobility Information Infrastructure in Challenged Network Environment toward Aging Society

In Japan, since aging population and declining birth birthrate are advancing, most of the local areas are suffering from depopulation. The decrease of economic activity is deriving poor social infrastructure such as bad road conditions and challenged information communication infrastructure. For those reasons, it is very difficult to keep the lives and properties of the residents in local areas. In order to recover those problems, IoT based mobility information network is proposed. Road side wireless nodes and mobile node with various sensors and different wireless communication devices organize a large scale information infrastructure without conventional wired network and with very economic and low priced mobility network environment can be realized by V2V and V2X communication protocols. In this paper, the system concept and architecture are precisely explained. The expected applications and services for residents are also discussed.

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