ABSTRACTS BOOK

ICSCI 2019

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KEYNOTE & PLENARY SPEAKERS

Smart Manufacturing Toward I4.0: From the Prospective of Infineon Technologies
Dr. Olaf Herzog
VP Corporate Supply Chain, Factory Integration Infineon,
Munich Germany

The semiconductor industry has gone through multiple phases of digitalizing information flow end-to-end and increasing the automation level of factories. The level of capabilities has increased from generation to generation. How do we approach this end-to-end, from the raw wafer to the assembled and tested parts and where are practical limits? Dr. Herzog will explain why replacing existing hardware in manufacturing industry may not be the ultimate solution for I4.0. Instead data analytics is important for smart manufacturing industry. The data that collected from the front end IC fabrication to the back end of IC packaging are important to predict the failure and make necessary intervention in rectifying the problem before shipping out the products to the customers. This presentation will summarize these aspects and propose a vision based on continuous collaboration within the industry to drive standards.

The Future of Big Data Analytics in Malaysia: Payments Industry
Dr. Shin Liang Chin
Director of Visa Consulting & Analytics Visa Inc.

Today, Big Data analytics, in the form of machine learning, AI and Deep Learning, is no longer just an academic discussion. It has become the essential building blocks of modern businesses. This is especially true for the payments industry where it has not only just transformed how business decisions are made but also improved customer experience by changing the way we pay, and the way we get paid. In improving the customer experience, Visa, as the world's largest payments network operating in over 200 countries or territories, with 3.5 billion Visa cards, is poised to take advantage of this Big Data revolution. Due to our sheer transactional data, this also means we have great responsibility when it comes to ensuring the data security and privacy. Visa have a long history of applying machine learning and deep learning methods in fraud detection. But increasingly in recent years, we believe that data is also key to giving consumers what they want, from understanding their desires to making the payment processes seamless, to developing products, communications and experiences. This talk is about what the payments industry are doing now in terms of Big Data analytics, what are the challenges that we face, what are the opportunities, and how does the future of Big Data in payments industry look like?

Control & Automation Evolution Toward Industry 4.0

Laurent Maillefer
Vice President, Robotics & Discrete Automation
ABB Malaysia Sdn Bhd

The internet and Industry 4.0 are a match made in heaven. The internet has enabled greater adoption of automation and digitalization technologies to accelerate the evolution of a new era in which machines, devices, sensors and people are connected and communicating with each other.

How are new and innovative solutions helping companies' increase operational excellence and grow in ways that may not have been possible just a few years ago?

The power and value of Industry 4.0 lies in the real-time visibility and access to enterprize-wide information, from different sources or locations which allow mitigation of risks, improved operational agility and efficiency.

INVITED SPEAKERS

Smart Farming Using IoT: Concept & Implementation
Kevin Tan Sze Pin
Director, Iconix Technology Sdn. Bhd.

Today, the Industrial Internet of Things {IoT) has disrupted many industries and the agriculture is not an exception but bounded to adopt the technology in order to feed the increasingly growing global population, which is set to touch 9.6 billion by 2050. Among this massive population, 70 percent of them live in urban areas, and IoT is also pushing smart farming in smart cities. With the advent of IoT, farmers move away from traditional farming, which is focused on acres of land, and manual interventions based on historical data, experience and 'feel', to utilise sensors, GPS, mapping and data analytics to provide accurate, real-time insights that they can use to tailor their activity and investment for maximum return. In this lecture, the concept and implementation of Smart Farming using IoT to meet the demand for more food while scaling down the use of water, energy, fertiliser, pesticides and labour, and also overcoming challenges such as rising climate change, extreme weather conditions and environmental impact that results from intensive farming practices, will be discussed.

I4.0 - The Journey towards Smart Manufacturing
Loo Guan Ki
Director, Infineon Technologies {M) Sdn Bhd

We are at the phase of technology revolution that changes all areas of our life - the way we live, work, study and inter-relate to one another. How Infineon embraces I4.0 and transforming into Smart Manufacturing? Introduction of automation, Internet of Things and Data Analytics into the manufacturing environment is ushering in a fourth industrial revolution, Industry 4.0. Infineon wants to leverage on this revolution and capabilities of digital platform to transform operations, drive efficiency and unlock opportunities in the value chain, incorporating breakthrough concepts in manufacturing and logistics. The aim is to make full use of networked information to optimize decision making and full control over end-to-end production value network. In this session, the general overview of I4.0 and Smart Manufacturing will be elaborated and sharing of Infineon's journey towards Smart Manufacturing implementation.

Digital Factory Transformation through Data and Insights
Damian Lim Hsi Hsiang
Senior Manager, Western Digital

Most manufacturers are focused on digital transformation and eager to achieve game-changing results to their products and process. While some achieved successes, others struggle to get started and some ponder how to leverage on overwhelming amount of data. This session shares the experience of the journey in becoming a data and insights driven business through digital factory transformation. It will also discuss the key considerations that lead to the ultimate achievement of the significantly impactful outcomes.

Sustainable Energy Source for Industry toward IR4.0
Ts Tan Pi Hua
Senior Consultant, Poyry Energy Sdn Bhd

In order to sustain the global activities, sustainable energy source is very important to industry especially in the Industrial Revolution 4.0 and national energy security. Renewable energy and energy efficiency are the two major components of sustainable energy systems and play pivotal roles in achieving international climate mitigation and sustainable development targets {UNDO, 2017). The combination sustainable energy transition and Industry 4.0 to share important characteristics: both are highly influenced by technological innovations, dependent on the development of new suitable infrastructures and regulations as well as are potential enablers for new business models. The new business models are energy sector digitization, saving energy in the manufacturing sector and sustainable energy in the manufacturing sector. Several energy policies has been introduced by government to encourage industrial to invest sustainable energy source. In this lecture, the key challenges of industrial investment to renewable energies and energy efficiency and social impact will be presented and discussed.

Big Data & Artificial Intelligence in Digital Manufacturing
Ammar Zolkipli
Enterprise Technical Specialist, Intel Corporation

The recent progress in technology has brought about a new wave of industrial change. This new wave is being dubbed, Industrial Revolution 4.0 {IR4). In particular, in the manufacturing industry, key technologies have been identified as pillars of Industry 4.0, that will drive the major shift into Digital Manufacturing or also known as Smart Manufacturing. A couple of the key technology pillar is Big Data Analytics, and Artificial Intelligence. The speaker will address broadly what is Industry 4.0, the current state of manufacturing in Malaysia versus the rest of the world, and deep dive into specific applications of Smart Manufacturing that are using Big Data and Artificial Intelligence as well as the underlying architecture powering both technology pillars.

Deep Learning and its Recent Advances
Ir. Dr. David Chuah Joon Huang
Head of VIP Research Laboratory, University of Malaya

Deep learning forms a hierarchical level of artificial neural net- works to perform the mathematical process of machine learning. The artificial neural networks are created with an inspiration from the connections of neurons within human brain, where these neural nodes are linked up together like a web with certain connection strengths. While conventional computer pro- grams carry out analysis with data in a linear way, the hierarchical function of deep learning systems enables machines to process data with a nonlinear approach. The learning process of the neural networks can be supervised, semi-supervised or unsupervised. Deep learning has been employed successfully in various fields such as computer vision, natural language processing, speech recognition, medical image processing, bioinformatics, etc. In this talk, recent advances of deep learning in a number of applications at the VIP Research Laboratory, University of Malaya will be discussed in detail.

TRACK 1 IoT & Smart City

Microcontroller-Based IoT System for *in-situ* Strain Monitoring of Stored Unvulcanized Rubber

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Keywords: Strain Detection, Arduino Uno Microcontroller, Internet of Things

Stored unvulcanized rubber compound is examined in terms of its degree of cure via standard tests such as ASTM D6204, before it is allowed to be utilized as raw materials for the manufacturing of rubber mounted product. However, the testing is time consuming and requires skilled inspector. This study proposes a IoT system to monitor the degree of cure of the stored unvulcanized rubber. Strain gauge sensors equipped with Arduino microcontroller and mobile application is to be applied on the unvulcanized rubber in the storeroom environment to monitor the change of rubber elasticity and relate to the degree of cure.

Analysis of an IoT based real-time production monitoring system

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Keywords: Production monitoring system, IoT, OEE

In a typical industrial shop floor, physical monitoring of the production performance is required on-site to address any problems and making important decision for better production yield. Generally, the production monitoring system captures (1) production performance; (2) machine efficiency; (3) production issues and etc. Such a system has limited access (remote viewing), time-consuming (decision making), requires physical presence of various department, etc. for better decision making on-site. Thus, internet of things (IoT) based real-time production monitoring system that streams live data/information to the management and decision-makers for prompt action as issues reported to the system. IoT is considered the way forward from a conventional monitoring system to real-time monitoring system with processed information for better decision making by the relevant department or personnel. This paper highlights an IoT based production monitoring system that shows current performance of each production line on the shop floor and retains the captured data for future decision making by the management to optimise company resources to increase profit.

Non-productive time tracking mechanism for assembly line operator performance optimisation

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Keywords: Operator tracking, IoT, RFID

It is a common practice for industry around the world to engage workers to assist production lines or as a machine operator for a repetitive cycle. Such practice has flatulating performance that reflects the production yield in a particular production line. In a chain like production lines, the effect can be amplified to a bottleneck situation where it will result in non-productive time of the operator where the inequality in allocated task can affect the production performance. This issue contributes to the wastage of available resources that impacts to the industry revenue. Hence, this paper highlights the implementation of Radio Frequency Identification (RFID) as an operator tracking mechanism using Internet of Things (IoT) in both semi-automated and manual production lines to increase the production performance in the long run. Close monitoring of production line operators using the proposed system can significantly reduce non-productive time especially in a chain-like production lines.

Design and Characterization of LED Light on Hydroponic Plant's Growth Stimulation

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Keywords: Plant's Growth Stimulation

Human population is increasing day by day, so as the demand for food. Hydroponic plants that are grown indoor need artificial light to grow. This project aims to develop a system of light capable of changing its color and brightness via Wi-Fi by using smartphone application to emit fixed spectrum of light and brightness. At the end of this research, the developed system will be able to produce accurate spectrum of red and blue light. The emitted light from the project was able to stimulate the growth of plants, showing longer and stronger stems and greener leaves.

Project Dragonfly

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Project Dragonfly is a two-in-one industrial wastewater and air toxicity monitoring solution that is environmentally friendly, non-invasive, and cost effective. The name suggests a biomimicry, where the drone in the project is able to fly, change its altitude, move forward and backward at relatively fast and slow speeds, change direction, spontaneously stop and hover, in addition to performing the signature act of dipping into the surface of water, resembling the nature of a dragonfly. The project utilizes Microsoft Azure platform along with Microsoft's proprietary cloud products and services, and Android mobile application for its software components and database; Lolin D32 Pro, Neffos Y5i, multiple sensors, and a quadrotor helicopter (quadcopter) are among its main hardware components. The sensors are packed into two functional units: Air Monitoring Unit (AMU) and Water Monitoring Unit (WMU).

Design of Drone Positioning Algorithm for Photo Capturing and Handling for Hydroponic Monitoring Application

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Hydroponic plantation technology has become a trend due to the significant decrease in agricultural land as well as the rapid population growth which demands more food. Physical appearance of plants is an indication of growth which can be derived from important elements such as leaves colour and fruit numbers which are not able to be captured by discrete sensors. Therefore, the plants' growth is can be monitored using a camera especially for big scale hydroponic plantation with multiple levels. In this project, the objective is to design an image guidance algorithm for drone to move to the targeted plants, to capture the photos of the plants and to upload them to a FTP local server. To achieve stability and accuracy of system, marker detection was fixed from a distance of 40cm, when drone's groundspeed was set at 0.1 m/s during marker detection and image files were compressed by approximately 14%.

Development of an Indoor Environment Quality Assessment Module for Office Building

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Keywords: Indoor Environment; Thermal Comfort; Indoor Air Quality (IAQ)

Indoor environment quality is one of the important factors in contributing towards a conducive and healthy environment. Therefore, there is a need to have a continuous monitoring device that can assist in analyzing the current condition. The purpose of the study is to develop an integrated module which is able to monitor both thermal comfort and indoor air quality (IAQ). By assembling several sensors, a module which monitor both thermal comfort and IAQ has been developed. Preliminary test shows that in a control environment the module is working within acceptable range.

Portable Warehouse Environmental Monitoring using LoRaWAN

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Keywords: Long Range Wide Area Network, Arduino Uno Microcontroller, Internet of Things

Warehouse environmental conditions requires regular monitoring to ensure the stored raw materials and manufactured goods are kept in good condition. Abnormal incidence such as electric power disruption or natural disaster will change the preconditioned warehouse environments and causes a huge capital loss. The current study is to design a portable warehouse environmental monitoring using LoRaWAN. The system is equipped with temperature, humidity, LDR and gas sensors which capable to measure and store the condition data. Using Arduino technology, the condition data also could be monitored by respective staff through mobile application from a remote location.

TRACK 2 Smart Manufacturing

Embedded Automated Guided Vehicle System (AGV) Using Line-following

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An automated guided vehicles (AGVs) system is a portable load carrier's robot that travels along the markers or wires in the floor, or uses vision, magnets, or lasers for navigation without an onboard operator or driver. In this paper, we study the of automated guided vehicle (AGV) systems. Line-following robot car and the system of Automated Guided Vehicle will be designed in a single loop as an example of manufacturing environment are discussed. Then, the problem of selection the home positions of two vehicles in a single loop type AGV network is addressed. Single loop home with 4 selection models, along with solution methodologies are presented. The models are constructed based on the objective of designing and analysis on the traveling time of vehicles.

The Concept of Cyber-Physical System for Programmable Controlled Material Handling System

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Material handling system is the major influence in manufacturing schedule and often ineffective when being executed on the shop floor. CPS is one of the intelligent concepts that able to collect information from physical system, making computational decision and give feedback to the physical system. This paper introduced the concept of CPS on programmable material handling system and develop initial framework for it. The framework is verified through control logic in simulation system. The framework consists the usage of PLC, conveyor system and industrial robot as the physical system. The framework utilize the usage of OPC and simulation system.

Spread Spectrum Modulation techniques analysis for DC-DC Converter using MATLAB

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Keywords: SSM; EMI reduction; DC-DC converter; MATLAB

The power supply is a crucial part of any electronic system especially in terms of stability and robustness throughout its lifespan. Thus, manufacturers perform numerous testing beforehand yet failures in EMC test is quite common due to concentrated energy in a narrow frequency band. This interference can cause circuit or system malfunction that becomes crucial especially in automotive safety application system. The commonly available techniques to reduce emission in automotive application is by improving grounding, shielding and filtering. Spread spectrum is one of the standard and effective method used to mitigate electromagnetic interference (EMI) issues in the electronic circuits. This paper highlights the frequency modulation strategies and simulated results in MATLAB that is relevant to automotive industry.

Smarter Tile Inspection and Monitoring System

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Keywords: Tiles, sorting, monitoring

Internet of Thing (IoT) and Industry Revolution 4.0 are the latest trend and technology being implemented in most industries, including manufacturing industry. Opportunities in tiles manufacturing have been identified and optimum solution for implementing IoT in tiles production line has been applied. SAS Visual Analytics and SAS Cloud Analytic Services (CAS) on SAS Viya have been used as for data collecting, storing and analysis. This research paper covers the challenges faced by production lines in tiles manufacturing. Automated tiles sorting and real-time monitoring system have been implemented. The overall project approach and implementation are also discussed.

IoT Based Self-Driven Vehicle Using Neural Network: A Prototype

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Keywords: Self-Driven Vehicle, IoT, Neural Network

This paper aims for a prototype of a self-driven vehicle that is remotely monitored from a control station with a conditional-automation between the vehicle and control station. The control station utilizes a secure server with a web-based or mobile based application to monitor and control the vehicle. Other functions embedded in the vehicle are inclusive of navigation, detection of obstacles to avoid front-crush and detection of traffic lights color (green, amber, red). Our proposed prototype is a miniature of a vehicle embedded with IoT devices such as Raspberry Pi, ultrasonic sensor and Pi-camera which is simulated in a designed environment. Raspberry Pi is the core processor that collects inputs from a Pi camera and the ultrasonic sensor. The collected data is sent to a Transmission Control Protocol (TCP) server wirelessly. The server is required to handle multiple tasks which include processing the received data from Raspberry Pi, object detection, distance measurement and navigation. To enable the car navigation, a neural network is used to train the vehicle for steering purpose. The advantage of using this method is once the vehicle is trained, the server only needs to load trained parameters in order to achieve accuracy and efficiency of navigation.

Performance measures of robotics implementation in lean aerospace company towards industry 4.0

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Keywords: Robotics; Lean Principles; Performance Measures

Robotics implementation is costly and risky to business if not evaluated at initial stage, or prior decision to purchase a unit. Lean principles have to be adopted during brainstorming and selection stage. A framework needs to be developed at selection stage, involving key members to prevent repetitive error by an aerospace organization.

Agile Production Management with Mobility

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Keywords: mobility; smart factory; digitalization

Mobility solutions, as a part of the overall production management portfolio plays a key role in realizing the core goals of Industry 4.0 (I4.0) of fully integrated systems that respond in real-time to meet changing needs in the factory. MobileXe is one such solution with the aim of improving the visibility, speed and efficiency of response times to operation tasks in the shop floor. Using Industrial Internet of Things (IIoT) devices that enable connectivity, data collection and analytics lay the foundation for Smart Manufacturing.

Development of Cp/Cpk Reporting Tool using MATLAB

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Keywords: Cp/Cpk, report, MATLAB

Process Capability Indices (Cp and Cpk) is one of the crucial criteria that need to be detailed within Production Part Approval Process documentation. The existing preparation of Cp/Cpk electrical test report consumes quite high number of man-hour. This paper explains the development of a sophisticated tool for Cp/Cpk report generation where it is able to read and map all the requirement files and generate a report with format defined by Quality Management (QM). The documentation preparation time is expected to reduce drastically as it assists user to do automated cross-checking of the details to refine the Cp/Cpk reporting.

I4.0 Enabler – Machine Connectivity

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In an automated industry, sensors connect to parts of production equipment transfer information to the rest of Factory Systems. Integration is being done from equipment to the host systems. There are two systems that enable this data transfer. Equipment Automation Framework (EAF) and Equipment Data Acquisition (EDA). EAF connects to the equipment and provides facilities for remote control as well as event reporting. EDA provides the facilities of performing data collection and for transmission to the rest of the infrastructure for automation, analysis and validation. These systems enable a paper-less environment, greatly enhancing quality, performance and streamlining process methods.

TRACK 3 Artificial Intelligence & Data Analytics

Performance Analysis for Convolutional Object Detector in Person Detection with TensorFlow

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Keywords: Accuracy; CNN; Inference time;

Speed/accuracy trade-off is one of the main concerns when selecting an object detection model for real world application deployment. The objective of this paper is to provide a guideline for selecting TensorFlow implemented object detection model that achieves the balance point between speed and accuracy. In order to achieve the goal, six of the identified Convolutional Neural Network (CNN) based object detection models are trained with person search dataset (~90k) and the obtained mean average precision (mAP) of the detected person is measured. Next, the relationship between the number of floating-point operation (FLOPs) of the models and the inference time is analyzed. Applying Darkflow for object detection can provides a reasonable speed/accuracy trade-off (0.62 mAP, 0.04ms mean average inference time).

Improving Inter-Person American Sign Language (ASL) Recognition Accuracy using Deep Learning

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Keywords: American Sign Language; Deep Learning; Electromyography

Sign language is a communication language used by the deaf-mute people for communication by expressing the words using hand Sign. This paper investigates the inter-person ASL recognition accuracy using Deep Feed-Forward Neural Network (DFFN) and Shallow Convolutional Neural Network (SCNN). There is no significant difference in both networks in the inter-person. It is noticed that the number of subjects improve the accuracy when the number of subjects increased for the training. Based on these results, the inter-person accuracy on the SCNN can be improved by using a generalized dataset.

Identification of Renal Function in Patients with Chronic Kidney Disease (CKD) Using The Clustering Method.

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The kidneys are excretory organs in vertebrates that are shaped like peanuts. In adult humans the kidney size is about 11 centimeters in length. The main function of the kidneys is to remove excess water from the body or maintain when needed, regulate phosphate levels, calcium and other minerals in the body. The kidneys also regulate blood pressure because they produce important hormones needed, as well as in the production of red blood cells that carry essential nutrients and oxygen throughout the body. This paper provides a scheme for detecting kidney performance levels based on the level of urea content in the blood and the level of serum creatinine content in the blood using the method of clustering. The level of kidney function is divided into 5 stages. Starting from the first stage, kidney function is slightly reduced and the worst condition is in stage 5 which is defined as kidney failure. Reduced kidney function known as chronic kidney disease (CKD), symptoms of chronic kidney disease (CKD) experienced by patients includes the appearance of blood in the urine, swelling of the legs, uncontrolled high blood pressure. The most severe effect of chronic kidney disease (CKD) is kidney failure where patients who experience it must undergo permanent kidney replacement therapy. This system will help the wider community to provide knowledge or information to patients who carry out a preliminary examination of kidney function in order to find out the severity suffered so that patients can make decisions in determining treatment. The results of the analysis of this system will be presented in the form of information and image data. The limitations of this study only present prediction of the level of renal performance of a patient indicated to suffer from chronic kidney disease (CKD) based on the level of urea content in the blood and the level of serum creatinine content in a patient's blood. The results of this study are to be able to help patients make decisions and analysis to agree to a more specific part of dealing with chronic kidney disease (CKD).

Evaluation on the Effect of EEG Pre-processing to the Performance of Convolutional Neural Network Motor Imagery Classification

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The effect of apply Exponential Running Standardization (ERS) to pre-process the public available brain computer interface competition dataset (BCI Competition IV 2-A) signal for modern end-to-end convolutional neural network (CNN) is study in this work. Results shows that CNN architectures were able to perform well even without applying Exponential Running Standardization (ERS) to pre-process the EEG signal during augmented dataset training. The results showed that CNN significantly performed well without applying ERS to EEG signal during the pre- processing step with 59.22% for Deep XBN-DO for trial-wise technique and 73.95% for Shallow XBN-DO for augmentation technique (average Best accuracy achieved over all subjects).

Implementation and Evaluation of Stereo Vision-based Vehicle Speed Survey System with Deep Neural Network

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Keywords: Stereo Vision, Vehicle Speed Survey, Deep Learning, Unscented Kalman Filter

An experiment is setup to evaluate the developed stereo vision-based vehicle speed survey system. By using combination of Stereo-RCNN network, noisy reading of detected target vehicle position is firstly obtained. The detected position of the vehicle is passed through an Unscented Kalman Filter (UKF) with Rauch-Tung-Striebel (RTS) smoothing algorithm to reduce the vehicle speed estimation error. Evaluation results show that an accurate measurement of vehicle speed (±2km/h mean error) can be obtained with the proposed method.

Fake News Detection Using Machine Learning

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Keywords: Fake News; Detection; Machine Learning

Fake news is defined as news that intentionally spreads disinformation via traditional news sources, social media or fake news websites. In recent years, the exponential increasing usage of internet and social media raises the occurrences of fake news, causing a fake news trend in the internet virtual world. The high diffusion rate of fake news in everyday access media outlets like online newspaper, online media feeds, and blogs have made it difficult and challenging to differentiate between true and fake news accurately, leading to the demand of various computational tools to assist in filtering and classifying the online news. Nevertheless, the detection of fake news is indeed a tough mission to execute as it requires the model to understand natural language like human, and to perform analysis to identify the accurateness of the news. In this project, a fake news detection system using machine learning is proposed. Firstly, a dataset is collected and validated in detail and some exploratory analysis on the characteristics of true and fake news content is carried out. Secondly, a set of learning experiments is conducted to construct the detection of fake news from the data mining perspective. The model is able to achieve an accuracy of 93.3% on test data. In addition, a comparative analysis of current approaches and our model is conducted.

Auto Deviation Detection and Control Management

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Keywords: Automated Deviation Detection, Prediction & Decision

Process control has always been a mandatory solution in Infineon for continuous monitoring of industrial process operational variables on machine and products. With adequate reliable process monitoring and deviation control, exceptions or unexpected process occurrence can be detected in early production stages and be eliminated to prevent an emerging problem and ensure process are quality safe. Infineon rely heavily on precise control process conditions where system such as Statistical Process Analysis & Control Environment (SPaCe), Automatische Los Freigabe (ALF), Advanced Process Control (APC) and Exception Management (EM) are used plant wide to served auto deviation detection and control management.

ELK - Data Maze to Knowledge

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Keywords: Big Data; ELK; Kibana

Data monitoring dashboard was developed with End to End system transaction performance visibility at a glance. This is also with an objective to ease incidents troubleshooting and analysis. ELK was the chosen tool that was used to develop this monitoring dashboard to provide a real time data visual analysis. This dashboard fulfills performance monitoring requirement and enables a more efficient troubleshooting. In addition, it also assists in future improvements related to application response time to ensure system stability.

Journey Towards Global Virtual Factory

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Keywords: global virtual factory; global production network

The fourth industrial revolution is making production faster, more efficient and flexible through smart, connected systems along the entire value chain. Industry 4.0 changes the working world and Infineon was early to adopt its ideas in real world scenarios. The Corporate Supply Chain of Infineon is working to enable the vision of managing its supply chain as Global Virtual Factory. One of the initiatives to enable this vision is introduction of Global Production Network (GPN) to have end-to-end (E2E) supply chain visibility & control in near real time. Given paper will share how Infineon enabled GPN towards it vision of managing its supply chain as Global Virtual Factory.

Let Data Talk

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Keywords: Data Analytics; Data Visualization; Digital Transformation

Data is King. It is a very important assets in the company especially when we talk about digital transformation. As data continues to explode and flood our database with more and more information coming in daily, data correlation is important to bring the value out of the data and presented in visualization for analysis. The ultimate goal includes automated decision making by bringing the right automation into our future complex factories.

Manufacturing Action and Response Satellite (MARS) – Digital Platform for 4M Deviations Management

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Keywords: Digital Manufacturing; Visual Analytic; Data Analytic

Data is the new oil that power much of the digital transformation and digitalization in many sectors, including smart manufacturing. Today, there is already ocean of production data being collected on a daily basis, so the challenge is to translate the data into useful information and knowledge that could help to improve productivity and efficiency in production. This project looks into a new manufacturing control method, using visual analytic to consolidate the 4M (Man, Machine, Material, Method) deviations in a digital performance dashboard, hence for the engineers to conduct correlation analysis effectively to prevent widespread of critical productivity detractors.

TRACK 4 Enabling Technologies, Energy & Sustainability

Piezoelectric and thermoelectric hybrid energy harvester scheme evaluation for wireless sensor node

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Keywords: Hybrid energy harvesting; Electrical power recovering; Wireless sensor node.

This paper assesses the effectiveness of hybridizing piezoelectric and thermoelectric harvesters for wireless sensor network utilizations. The novelty here lies in the hybrid topology of an AC and a DC harvesters combined as a single harvester, where it increases the WSN survivability. The experimental proves that the hybrid energy harvester-based sensor node is able to survive in an environment with the lack of vibration or heat emissions. Also, it shows that there is an improvement in the charging time of a 15mF capacitor by merging both harvesters in series topology, in which it takes only 20s to be fully charged with power of 86mW at 0.15kΩ.

Fault classification for air conditioning system using deep learning

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Keywords: air conditioning system; fault classification

Fault detection and diagnosis plays a vital role in the complex system in this modern industry. Air conditioning system is an example of a complex system where all components are interconnected to each other. Therefore, any faults that happened within the system may affect the overall performance of the system. Early detection of faults may save more energy, and total system breakdown can be avoided. This paper presents a classification method using deep learning to identify typical faults in air conditioning system. Six classes of operation conditions; with and without faults, were introduced to a small-scale air-conditioning system and the output from the sensors were trained using WEKA toolbox. Results show deep learning method was able to classify all classes with an overall accuracy of more than 94%.

Road thermoelectric system's performance improvement for power generation purpose

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Keywords: Thermal gradient; road pavement; thermal conductivity.

The objective of this paper is to investigate factors that can affect thermal energy harvesting from road which includes, thermoelectric configuration and cooling method. Pavement sample is built with copper plate installed to collect and transfer thermal energy from asphalt to thermoelectric generator (TEG). Result shows that 4x1 configuration and cooling method using water tank produces the highest potential differences.

Solar-Thermoelectric Device Optimization Using A Simultaneous TEG And TEC Characterization

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Keywords: solar-thermoelectric; thermoelectric-cooler; optimization

This project attempts to bring a two-design approaches (from temperature to electrical energy and from electrical energy to temperature) in developing two solar-thermoelectric devices. There would be two final products at the end of the project, a solar-power source for STEG, and a portable refrigerator for TEC. Since the relationship between temperature gradient and voltage in thermoelectric is linear under condition that is not exceed the limitation of the TE module labelled, the way to improve the output power from STEG is studied and at the end of this project showed the mean improvement of 164.15%. On the other hand, the problem that TEC is failed to operate for long period had been solved. The excessive heat energy that need to be removed had been reduced up to 72. 8% when relay is being triggered.

An H-shape Subterranean Cooling Method for Road Thermoelectric Energy Harvesting System (RTEHS)

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Keywords: Thermoelectric, FEA, Subterranean cooling, RTEHs

This paper presented a cooling method for the road thermoelectric energy harvesting system (RTEHs). The system consists of top plate and bottom plate with two thermoelectric modules in between. The bottom plate is welded with two 1.25" of diameter rods and an aluminum plate in between which resemblance to an H-shape which submerged into asphalt and soil. Using finite element analysis (FEA), this proposed method is simulated to predict its temperature distributions in order to achieve high-temperature differences, ΔT. Based on the findings, the FEA's simulation has given 20.18 °C of ΔT. While the outdoor experiment surpasses the FEA's DT with 22.91°C with given open-circuit voltage at 1.02 V

Comparison Study Between RSL10 and CC2650 Based Wireless Sensor Node for Low Power Application

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Keywords: Wireless microcontroller; wireless sensor nodes; low power

Wireless Sensor Network (WSN) comprises of huge quantity of miniature sensor nodes (SNs) with certain limitation of resources which have the capability for sensing, data gathering, data processing and wireless communication. Energy consumption remains the top consideration in the design of WSN technology nowadays. This paper compares two system on chips (SoC) based wireless sensor node to nominate the suitable system design for low power application. Both of the wireless sensor node were compared in term of size, cost and the power consumption. Since the wireless sensor node that proposed in this paper is targeted for low power application, its power consumption is the main parameter. The comparison outcomes reviled that the current consumption of the CC2650 based WSN is about 2.0mA while the RSL10 based WSN consumed 1.9μA during the sleep mode which is 1.99mA lower than the CC2650 based WSN. Therefore, RSL10 based WSN is chosen due to its low power consumption.

Experimental Analysis on Vibration Energy Regeneration System using Piezoelectric sensor for Wideband Application

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Keywords: Piezoelectric sensor; Wide bandwidth; Nonuniform mass

This paper presents a method on widening the operating frequency bandwidth of piezoelectric vibration energy harvester by using non-uniform mass which use the concept of center of gravity. Piezoelectric acts as a tool to convert vibration energy into electrical energy. The displacement from the liquid movement plays a role to enhance the bandwidth as the beam bends. The bandwidth is widened by 2 times when compared to the sensor that without tip mass and increased by 1.6 times than the one with solid tip-mass. High viscosity and density give greater effect on the bandwidth at low volume compared to the lower properties of fluid. Rectangular container has the ability to resist the tension of liquid due to high viscosity and volume. The fluid-filled mass technique widened the bandwidth without reducing the harvested power.

Thermal distribution evaluation of aluminum rod for Road Thermoelectric Energy Harvesting System (RTEHs)

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Keywords: Thermoelectric, RTEHs

This paper investigates the thermal distribution evaluation on multiple diameters of aluminum rod as cooling element in road thermoelectric energy harvesting system (RTEHs). The RTEHs were constructed to evaluate the relative significance of thermal diffusivity ratio of tested aluminum rod by measuring the maximum temperature difference between top and bottom aluminum plate. Experiment results indicate that rod C which has the biggest diameter of 31.75mm and the highest calculated thermal diffusivity value (8.1174E-05 m^2) performed the best by producing the highest temperature difference of 11.34°C.

Converting Living Plants Into A Battery To Power A Wireless Device

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Electric potential is produced by plants via its cycle of photosynthesis and respiration process as well as through its intercellular process in response to external stimuli. This electrical energy can be harvested from the living plant as a new potential energy source to power any ultra-low power consumption load. Hence, this paper presents a characterization of the specific setup condition to harvest the desired energy from an Aloe Vera plant as well as proposing a power management circuit that can manage the energy to convert the plant into a plant-based cell into powering a wireless device.

Pre-Assembly Load & Go

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Digital Manufacturing in Infineon has come a long way since it first started. As a target for Industry 4.0, a fully automated solution is needed for improvement in quality and stability. The Load & Go initiative was introduced as a pilot project in the Backend Pre-Assembly Dicer and Auto Inspection Line to reduce the operator's scope to only reserve the lot to the equipment, then to load in the carrier to the equipment. Everything else like system tracking and transaction info collecting happens automatically until the unloading.

SDT – Single Device Traceability

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Keywords: Traceability; Product Genealogy; Correlation

Automation holds the potential to transform high volume manufacturing and deliver higher productivity. One of the key enablers to achieve this is to understand & control the flow of individual device through supply chain. Single device Traceability is the key solution here. This enables us to collect, analyze and consume data at a granular level, to enable faster learning speed, improve process, delivery quality and yield improvement. The method of single device traceability is to provide a comprehensive access to the unique identifiers linked to process and product data and thus facilitates tracking of single devices through FE to BE process correlations and also real time process controls.

Semiconductor Manufacturing Case Studies: Wedge Bonder Characterization via Advanced Process Control

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Keywords: Current; Deformation; Advanced Process Control

Advanced Process Control (APC) enables solution to finer levels of control and diagnostics with integration between machines to manufacturing system. Orthodyne Power Fusion™ machine platform will be the primary case studies for abnormal characterization detection with the help of APC Trend Suite Software. Consequently, the study also looked into Fault Detection, Classification and Prediction (FDC+P) of clamping finger wear and tear rate corresponding to Lot Run Yield and Clamping Touch Down.

Simulation Driven Design of Automated Storage and Retrieval System

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Keywords: Industry 4.0; Semiconductor industry; Transformation methodology

Industry 4.0 connects digital and physical technologies — artificial intelligence, the Internet of Things, robotics and cloud computing — to drive businesses to be more flexible, responsive, and interconnected in order to have a more informed decisions [1]. In Infineon Melaka, the stepping stone into Industry 4.0 involves a centralized storage and transportation system that begins in test segment. Automation is a broad concept of manufacturing with the purpose of optimizing production and product transactions by making full use of advanced information and manufacturing technologies [2]. Infineon's Backend (BE) sites have already enabled CAMSTAR (Infineon's Manufacturing Execution System) as a paperless system used for lot tracking. However, there is no storage location traceability and there are many manual handling between processes. Automated Storage and Retrieval System (ASRS) opens the doors to data driven backend semiconductor. A system of this expanse naturally involves sequences of revisions and changes along the way that impacts costs, resources and time. This paper studies on the best effective method to derive to the design of the ASRS with the help of technology, with theoretical evaluations, simulation and 3D modelling.

INTERNATIONAL CONFERENCE ON SMART COMMUNITY & INDUSTRY (ICSCI 2019)
16TH – 18TH OCTOBER 2019
MELAKA, MALAYSIA