Proceedings of The 12th International Conference on Advanced Information Technologies

(AIT 2018)

April. 21, 2018, Chaoyang University of Technology, Taichung, Taiwan

Editors: Li-Hua Li, Tzu-Chuen Lu, Hsien-Wen Tseng and Yu-Huei Cheng

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Message from the General Chair

We are now moving to the era of using sensing technology, data analysis, recognition methods, or machine learning to advance information technology (IT). Internet of Thing (IoT) has become an important factor for advance systems, future networks, smart robots, cognitive systems, while machine learning and AI has expanded the capabilities and the power of IT into a new dimension. Researchers are creating smart and advance systems to predict, to make decisions, and to react more accurately and, in the end, we want to use the advanced IT to improve the quality of life.

Since 2006, International Conference on Advanced Information Technologies (AIT) has encouraged researchers to exchange knowledge about further theoretical advances, new experimental discoveries and novel technological improvements. The theme of the conference this year is "Internet of Things and Smart Life."

The AIT 2018 aims to provide a forum for presentations and discussions of the recent methodological advances in Electronic Commerce, Knowledge Management, Network Communication and Applications, Information System Theory and Applications. The topics of the conference include, but are not limited to:

(A) Information Technology Theory and Applications

(B) Communication Network Technology and Applications,

(C) Business Intelligence and Knowledge Management.

I would like to gratefully acknowledge to our keynote speakers. You come all the way here to share with us advanced knowledge of your findings. I also thank all the authors and participants, without your support this conference would not be successful. Last but not least, I would like to thank the following respected organizations for their support: Ministry of Education, Engineering and Technology Promotion Center, Ministry of Science and Technology, IET Taipei Local Network (IET). Our conference cannot be fruitful without the friendship and support from our sister universities, University of OTH Regensburg, AIZU, IPU, NPU, XMUT, FJUT, and HZU which have given us a particularly prestigious dimension to this twelve edition of AIT 2018.

General Chair of AIT 2018

Dr. Li-Hua LI
Dean, College of Informatics
Professor, Information Management Dept.
Chaoyang University of Technology (CYUT), Taichung City, Taiwan

Message from the Program Chair

It is our great pleasure to welcome you joining The 12th AIT, International Conference on Advanced Information Technologies (AIT 2018) in Chaoyang University of Technology, Taichung on April 21, 2018. The series of AIT conferences have been well established for many years. All the past AIT conference events have led to fruitful results and impacts to the society.

The AIT 2018 conference provides a forum for researchers, Electronic Commerce and Knowledge Management, Network Communication and Applications, Information System Theory and Applications, and the latest results in the information technology. In this year, we have received 68 submissions from over 5 countries. Each submission is evaluated by at least two referees. There total 51 papers that meet to the evaluation of conference are accepted for presentation and inclusion in the proceedings at the end. The acceptance rates of this conference is 75%.

We would like to take this opportunity to thank all authors for their contribution and participation, with many traveled great distances to make their valuable presentations and to share their insights. Furthermore, we appreciate the program committee members, including the special session chairs, and the external referees who have put in hard work and long time to review each paper in a timely and professional manner.

Finally, we would like to thank the authors for choosing AIT as a venue to present their excellent research results. We believe each participant will enjoy the AIT 2018 and have a wonderful and exciting stay in Taichung City, Taiwan.

Program Chair, AIT 2018

Associate Prof. Tzu-Chuen Lu
Chairman, Department of Information Management,
College of Informatics, Chaoyang University of Technology,
Wufeng, Taichung 41349, Taiwan

Keynote Speech I: The new role of corporate IT departments: Shadow IT vs. Business-Managed IT

Professor Markus Westner

Professor of Faculty of Computer Science and Mathematics, OTH Regensburg, Germany

Abstract:

Companies nowadays face increased market pressure to become more digital and agile. Experts consider this to be a critical success factor for corporate survival in the 21stcentury. To address this challenge, academics and researchers focus on questions how to increase agility in corporate IT departments. However, could there be other options to make the business more digital and agile? Business-managed IT could be such an alternative solution: Allow, enable, and empower business units to develop and maintain their own information systems with the central IT department only acting in a consulting and assisting role. Where does the concept of Business-managed IT stem from, how does it differ from negatively connoted "Shadow-IT", and what are constituencies to make Business-managed IT successful? The keynote will provide perspectives on these aspects.

Short Biography:

Prof. Dr. Markus Westner is professor in the Faculty of Computer Science and Mathematics at OTH Regensburg, a Technical University for Applied Sciences. As an academic and educator he specializes in IT-Performance-Management and Management Consulting. His main research interests are in IT-Strategy and IT-Sourcing. Furthermore, he is passionate about improving the learning opportunities of his students by applying innovative teaching didactics. His doctoral thesis (German PhD equivalent) focused on success factors for implementing and managing IT offshoring projects. He also holds a Master of Computing degree from Unitec Institute of Technology, Auckland (New Zealand), and a diploma in Business Administration (German MBA equivalent) with distinction from EBS University, Oestrich-Winkel (Germany).

Markus is Associate Editor for Information & Management (I&M). Furthermore, he acted as reviewer for the Americas Conference on Information Systems (AMCIS), European Conference on Information Systems (ECIS), HMD Praxis der Wirtschaftsinformatik, Information Systems Management (ISM), JITTA, and Organizacija.

He is Deputy Dean of Student Affairs, International Coordinator in the Faculty of Computer Science and Mathematics and E-Learning Coordinator of the university.

Before he started his academic career he worked as a management consultant in a project manager position for Bain & Company, one of the world's largest management consultancies, in their Munich office. In this position he advised clients from the financial services, telecommunications, and high tech sector regarding issues of strategy, organization, and performance improvement.

Keynote Speech II: The 3rd Wave of AI

Professor Shou-de Lin
Department of Computer Science & Information Engineering, National Taiwan University, Taiwan

Abstract:

This talk will highlight the new trend of research direction in Artificial Intelligence, and summarize some of our recent research results including embedding learning, machine ethics and machine discovery.

Short Biography:

Shou-de Lin is currently a full professor in the CSIE department of National Taiwan University. He holds a BS degree in EE department from National Taiwan University, an MS-EE degree from the University of Michigan, an MS degree in Computational Linguistics and PhD in Computer Science both from the University of Southern California. He leads the Machine Discovery and Social Network Mining Lab in NTU. Before joining NTU, he was a post-doctoral research fellow at the Los Alamos National Lab. Prof. Lin's research includes the areas of machine learning and data mining, social network analysis, and natural language processing. His international recognition includes the best paper award in IEEE Web Intelligent conference 2003, Google Research Award in 2007, Microsoft research award in 2008, 2015, 2016, merit paper award in TAAI 2010, 2014, 2016, best paper award in ASONAM 2011, US Aerospace AFOSR/AOARD research award winner for 5 years. He is the all-time winners in ACM KDD Cup, leading or co-leading the NTU team to win 5 championships. He also led a team to win WSDM Cup 2016. He organized PAKDD Cup 2014, KDD Cup 2016, and WSDM Cup 2018, and served as the senior PC for SIGKDD and area chair for ACL.

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Mobile APP Real-Time Rendering for Remote Multiple 3D Printers Control

Yu-Huei Cheng[1,*], Ying-Zhi Pan[2], Biao-Biao Chen[3], Cheng-Zhi Lin[4], and Zhong-Hui Wang[5]

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***Abstract*— Currently, most of the 3D printers on the market are connected to the PC side one by one, and the conversion among various model formats is complicated. In addition, the lack of wireless 3D printing control makes the 3D printing control extremely inconvenient. In order to overcome the above shortcomings, this study implements a mobile APP as a bridge between client and server to achieve the functions of model rendering, model file transmission, and remote multiple 3D printers control. The proposed APP can be used based on model rendering techniques to view 3D models. When the model file is sent to the server, the server first determines whether any 3D printers are available according to a built device status table. If so, the user can select an idle 3D printer for remote printing. The server uses the Assimp for the model format conversion. After the format conversion is successful, the server uses the slicing engine CURA for slicing to obtain the GCode file. Finally, the server sends the GCode file to the 3D printer via the USB cable for printing.**

***Keywords*— 3D printer, 3D model rendering, model format conversion, remote control, mobile APP.**

1. INTRODUCTION

3D printing technology is the first rapid prototyping technology for additive manufacturing appeared in the 1980s [1]. Its core is the conversion of the complex 3D shape of the desired forming workpiece into a simple combination of 2D sections through the slicing process, eliminating the need to use conventional machining machines and tools. 3D printing is based on a three-dimensional computer-aided design (CAD) model of a workpiece. In the computer-controlled 3D printer, it deposits material in layers along the height direction to form a series of cross-sectional sheets of the workpiece and bond the sheets to the sheets to form a three-dimensional workpiece. Rapid prototyping only requires 30% ~ 50% of the working hours and 20% ~ 35% of the cost of the traditional cutting method. It can directly produce complex three-dimensional workpiece, known as the revolutionary technology that can subvert the traditional concept of industrial manufacturing.

The common 3D printing technologies on the market today include Vat Photopolymerization [2]. It is the use of light irradiation of photopolymerization curing resin liquid surface, the light irradiation to produce photopolymerization reaction becomes solid. After the completion of each layer of solid decline, layer processing completed production. Its advantage is the following power, strong contraction, curing speed, and production time can be greatly reduced. The other is material jetting [3]. Its working principle is that the liquid modeling material is sprayed on the modeling base plate by means of the inkjet technology, and the material is cured and moulded by light or temperature control. It has printed column speed, high resolution, multi-material, and multi-color and so on. Furthermore, powder-based binder jetting additive manufacturing technology [4]. This technology is based on powder, adhesive as powder and powder layer between the adhesive layer by layer to complete the production. In addition, there is sheet lamination technology [5]. It is a laminate of layers of layers of material combined manufacturing technology. Although the speed of single-layer processing has advantages, but this technique is prone to uneven

A framework of Supermarket Self-Checkout System

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***Abstract*— Science and technology drive economy and economy promote science and technology. These two are in the same shape in the history of human development. Economic activities have always been the main components of human social activities. Retail industry plays a leading role in human economic activities, and it is a strategic industry of the national economy. The total retail sales of social goods in our country increased from 9 trillion and 400 billion five years ago to 21 trillion last year (2013), and supermarkets are playing a leading role in the retail industry. In daily life, supermarkets are one of the most important places for shopping and well received by everyone. However, large-scale supermarkets, a wide range of goods, people may spend a long time looking for goods. Supermarkets' promotional information is usually displayed in the form of posters to customers, resulting in a great waste of paper. When people checkout, the supermarket cashier scans the QR codes one by one. If the traffic is relatively large, there is a problem of long lines, which seriously affects people's shopping enthusiasm. In addition, supermarket managers need to scan the barcodes when managing the products, which also brings great difficulties to the management of the products. At present, the population of China is too larg e , whenever the holidays, when you buy special purchases for the Spring Festival, supermarket is crowded, the time of checkout always have to queue for one or two hours. In addition to holidays, a lot of people usually go to the supermarket for about half an hour when they rush to the peak, so we want to make a low-cost self service cash register system to solve this problem.**

***Keywords*— RFID、Bluetooth、Arduino、Android APP、SQL.**

1. Introduction

Supermarket self-service cash register system is integrated with RFID radio frequency identification technology, database management technology, Bluetooth communication technology in one of the modern supermarket, with high operating efficiency, low risk costs, advanced scientific management, excellent service quality advantages

Supermarket cashier system has the following characteristics:

1) Convenient for customers to choose products: supermarket cashier system with a shopping cart, shopping cart equipped with an Arduino, Arduino with RFID scanner and Bluetooth, scanned by RFID product information, and then transmitted to the phone through Bluetooth client display.

2) self-checkout: With the emergence of self-service cashier supermarket, when you pay, you only need to pay on the phone side, you can pay for success.

3) Strict anti-theft measures: Each item in the supermarket is labeled with a corresponding RFID tag. As the RFID radio signal can penetrate clothes and other obstructions, it can greatly reduce the theft of goods in the supermarket.

4) to save manpower: on the one hand supermarket cashier self-service checkout function can be achieved, and its anti-theft measures closely, so the entire supermarket can save a lot of salesman; the other hand, the supermarket cashier system appears to greatly improve customer selection of goods And checkout efficiency. So make the entire supermarket faster flow of customers, the staff will appear even more sparse, to ensure a good public environment.

As shown in Figure 1, the user connects the shopping cart device with the bluetooth of the mobile phone, then reads the product information through the RFID scanner, transmits the payment information to the mobile phone through the

Achieve the Industry 4.0 for SMEs using Lean-Based IoT Platform (LBIP)

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Abstract

The revolution of Industry 4.0 is to build intelligent and resource-efficient manufacturing facilities that utilize the CPS (Cyber Physical Systems) to help businesses continuously performing smarter. Currently, to achieve Industry 4.0 needs heavy investment on facilities of CPS which can only be afforded by large enterprises. However, in many countries, small and medium-sized enterprises (SMEs) are the centers of gravity in manufacturing supply chains. In facing the shortage of legacy equipment and facilities of communication, it is difficult for SMEs to transform the old machine into CPS.

This study proposes a "Lean-Based IoT Platform (LBIP)" framework to help SMEs to achieve the Industry 4.0. Through the LBIP platform, a SME will be able to integrate the existing equipment and to utilize the problem-solving methods for continuing improvement. To gradually import the Internet of Things (IoTs), these 4T Technologies: (A) Operating Technology (OT), (B) Communication Technology (CT), (C) Data Technology (DT), and (D) Data Technology) Business Technology (BT) are required and to be integrated to assist SMEs in the realization of the digital management to achieve Industry 4.0.

The goal of LBIP framework is to enhance the performance of SME based on three core-issues of operation, i.e., the commitment of delivery, the performance of productivity, and the balance of inventory level. The proposed LBIP introduce a way to enable SMEs to establish a managerial model based on smart manufacturing by using proper IoT devices, and by reducing waste and costs, thereby enhancing the efficiency of supply chain and achieving sustained transformation of SMEs. In the long run a continuous upgrading and innovation can keep the SMEs performing smarter.

Keywords— Industry 4.0, Lean Manufacturing, digital Factory, Dashboard, IoT, Ubiquitous, ISA-95

1. INTRODUCTION

The definition of SME in various countries may be varied but in Taiwan it is defined in 2016 as (https://www.moeasmea.gov.tw) [23]: a company with capital less than NT$80 million dollars or less than 200 regular employees. The statistic shows [23] that there are total 1,408,313 SMEs in Taiwan and they account for 97.73% of all the registered companies.

The past researches about Industry 4.0 such as Keliang Zhou et al. [21] and Philipp Gölzer et al. [5], they focused mainly on technologies like the application of sensors, Internet of Things (IoTs), application systems, cloud technologies or big data analysis. They did not consider the capacity and the capabilities of the company. Based on the Friedrich-Ebert-Stiftung [16] report, we found that the SMEs in many countries are facing challenges in terms of moving toward the Industry 4.0. There also many related research Yong Yina et al. [20] pointed out that the limitations of SME for Industry 4.0 may include:

(1) A lot of legacy equipment in the SMEs and this equipment are independent with the assembly lines.

(2) The gap of SMEs' IT capability may be too large to carry out the integration among production equipment and production lines, no matter it is a horizontal or vertical integration.

(3) SMEs may lack of capital to invest on the equipment such as automation, robotic arms, and other equipment.

Arduino-Based Communication Maze Car

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***Abstract*— This study is proposed from the software design point of view on the maze of intelligent control to do a more in-depth discussion, and joined the communication function with Bluetooth in maze cars. Through software programming, this study realized the intelligent control of a maze car. The maze car can walk from the starting point to automatically explore the end in a designed maze, and send a optimized path to another maze car. After another maze car receives the message, it will walk according to the received path. This study focuses on the maze car to determine the logic in the path selection, as well as access to path information and car body control.**

***Keywords*— maze car, communication, Bluetooth, optimization path.**

1. INTRODUCTION

The advancement of human science and technology has driven the robot technology to become more intelligent. The choice of direction of travel is one of the key technologies of intelligent robot control. It is one of the important judgment conditions for mobile robots to choose their own route to reach the target location in the complex and unknown environment and is also the basis for the realization of the function [1]. A maze robot is a small robot with artificial intelligence (AI) [2]. It can do a series of maneuvers in the maze without human intervention.

There are many studies on current robot walking, and various algorithms are also widely used. Path planning of mobile robots is an important area of robotics research [3], which has attracted the attention of more and more researchers and achieved great results. But few studies have combined communication with the maze car. This study mainly combines the algorithm and Bluetooth [4] communication technology to make the maze car more efficient and innovative in collaboration. When compared with 8 to 10 sensors of a existing maze car, the proposed maze car only needs 5 sensors. Although the proposed maze car is designed with a certain degree of slowdown in accuracy and speed, it reduces the number of sensors and the cost of designing the material.

Furthermore, there are already many maze cars in the market, and almost all of them are stand-alone car and do not realize the intercommunication among the maze cars. This study in addition to design the maze car to look for the maze exit, it also optimizes the path it finds. By sharing the optimized path, so that other cars save the re-explored time for the mazes. The maze car can be directly out of the maze according to the optimized path, which greatly improves the efficiency in a maze walking. This study discusses the overall design of a maze car, material introduction, and material selection and analysis. Finally, this study also performed the experimental results, and analysed and discussed the improvements for future works.

2. METHODS

2.1. Overall Design for Communication Maze Car

The communication maze car proposed in this study just as the name implies is to let two cars or more to walk in the maze. There is communication between cars to improve the efficiency of the cars in a maze. In this study, we chose Arduino UNO [5] as the main module of the maze car. In addition, we use the TCRT5000 infrared sensing module as the tracking module

Agile Project Management in MIS: A Case Study in A Research Institute

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***Abstract*— Over the past decades, Management information system (MIS) has been playing an important role in an organization. The tools and techniques which support MIS development have also been updating. What is more, the requirements from users are endless since the administrative rules are often changing, especially in a government organization. Since the changeable pace is so fast in the MIS environment, the traditional waterfall method of developing MIS has been naturally replaced by agile methods. This study explores the procedures and methods of developing MIS in a research institute, and takes the patent management system for example to interpret agile methods. We hope this study give us a valuable lesson to keep in mind and be available for our reference in the future.**

***Keywords*—agile, XP, Scrum, MIS, waterfall, patent**

1. INTRODUCTION

Over the past decades, MIS has been playing an important role in an organization. The tools and techniques which support MIS development have also been updating. What is more, the requirements from users are endless since the administrative rules are often changing, especially in a government organization. Since the changeable pace is so fast in the MIS environment, the traditional waterfall method of developing MIS has been naturally replaced by agile methods.

The project case selected is patent management system which is also an important component of MIS in a research institute. Since patents are a form of protection for intellectual property and the quantity in the past 50 years have a sharp increase. To assess the value of the patent, compute the patent's cost, and launch the product into the market have become a critical job in the future. Thus, a good patent management system is essential for a research institute. And, it helps to evaluate R&D's performance as well.

In the case, an old patent management system was ever outsourced and launched in 2008. Since there were still many changes and other problems after launching, the system was finally replaced with the new one which was developed by IT department of this institute in 2016 and launched in 2017. From a conceptual point of view, the system to be implemented is segmented into 6 main functions, each of those functions consists of 3 to 10 user interfaces.

This study explores the procedures and methods of developing management information system in a research institute, and takes patent management system (PMS) for example to interpret XP and Scrum . We hope this study give us a precious lesson to keep in mind and be available for our reference in the future.

2. LITERATURE REVIEW

2.1. Agile

The name "agile software process", first originated in Japan. It denotes "the quality of being agile; readiness for motion; nimbleness, activity, dexterity in motion". In the last 25 years,

Study on the Capability Index of Information Education in 12-Year National Education

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***Abstract*— The study mainly explores the capability indicators that should be included in the learning performance of information education curriculum in the 12 years of basic education in the nation. For the viewpoint of academic information technology teachers and industry information agencies teachers, through literature review and modified Delphi method Conducted research, sorted out 13 capability projects and 69 indicators to build capacity indicators for the education of information technology. Based on the opinions of experts, the students in middle school should learn the ability to achieve the four directions of learning performance in the 108-year syllabus and their ability to learn in the future, provide education-related units as reference for improving teaching, thereby enhancing the relevance of information technology education in our country. The result of this research shows that the highest priority is "practicing law and ethical behaviour" and "innovation ability". Both "research ability" and "critical thinking ability" are also important.**

***Keywords*— Modified Delphi method, information technology education, 12-Year National Education, indicators construction**

1. INTRODUCTION

With the development of information technology, the application of information has obviously affected humankind's life. It is a common trend for all the people in the world to educate their citizens about the development of information technology (IT). Countries all over the world are beginning to attach importance to the cultivation of information technology professionals. Advanced countries are very keen on implementing information technology. Many studies and standards have been developed for the age and learning content of education. In 2012, Taiwan began implementing a nine-year curriculum that ranked information technology as a major issue [1] and focused on information technology tools and logical education of information to use information technology to solve problems in daily life and learning. However, information technology has gradually affected advanced technologies in various fields. For the development of sufficient living and professional skills of the Chinese people in the information age, the use of information technology tools alone is not sufficient. In order to meet the needs of the information age, information technology education should not stay in information and communication technology (ICT). It also needs to include the content of information science and learn from the principles of information science to cultivate the basic ability of the people to apply information technology to solve their life and career problems [2].

This trend is evident in the major advanced countries. Computer Science Teachers Association (CSTA) is started in 2004. Netherlands revised 2007 information science curriculum standards(Grgurina & Tolboom, 2008) and the Secondary School Information Science Curriculum Standard set by the German Computer Science Organization in 2008 (Brinda et al., 2008; Brinda, Puhlmann, & Schulte, 2009). All clearly point out that IT education should deviate from the use of information technology in the past and place more emphasis on the content of information science [2]. Therefore, according to the above criteria, the Ministry of Education of our country studies and formulates the curriculum outline of the 12-year basic education in science and technology in the country. Apart from the knowledge and skills of information technology, the Ministry of Education has introduced the "science of learning" of information technology in the hope of focusing on the "Application".

Exploring Developing Countries Immigrants' Intention to Use Information Communication Technology

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***Abstract*—Many researchers have studied how the implementation of Information Technology in developing countries would benefit its citizens and lessen the problems that they face today. Therefore, this study applies the Technology Acceptance model (TAM) to investigate the intention of adoption by these individuals on Information communication technology (ICT) found in the developed countries. TAM is extended with external variables self-efficacy and peer influence as influencers on the belief variables of perceived ease of use and perceived usefulness. 128 valid questionnaires were collected, and statistical SPSS techniques were used to evaluate hypotheses. The research results suggested that the proposed self-efficacy; peer influence will have a significant influence on the intention to use ICT. Through this, we understand the adoption of ICT by immigrants in can be predicted with the study providing theoretical support and suggestions for future studies.**

***Keywords*— Technology acceptance model, information communication technology, self-efficacy, peer influence, intention to use**

1. INTRODUCTION

Technological advancement has made our lives easier, and has had great influence on behaviour and cultures. As many previous studies have shown developing countries are taking advantage of these advancements; yet being synchronized with developed countries is a continual endeavour. Mursu et al. [1] and Ngwenyama et al. [2] argued that the gap between the different types of nations was due to the status and other problems developing nations are faced with. As a solution to this problem, the World Summit on the Information Society (WSIS) report of 2014 projected and aimed that by 2016 the half of the world's population would have access to information and communication technology (ICT) [3].

Previous studies' outcomes indicate that even though IT would benefit developing countries, the financial implication that come with it are high and the management of these systems would be complex since most of the population is not skilled on this area [4] [1] [5]. The scholars point out that Information and Communication Technologies (ICT) can be used culturally, economically, politically, and socially as aids in improving life. Ngwenyama et al. [2] also suggested that through ICT economic, political, cultural and social conditions of developing countries can be improved.

With more and more people travelling and studying abroad, the need to understand how they are affected by new influences of IT has become a vital yet understudied topic. As mentioned earlier, many studies focus on dividing the developed and developing nations in the case of ICT/IT adoption. The purpose of this article focuses on the Technology Acceptance Model (TAM) and applies it to explain the adoption of information and communication technologies by developing countries' populace in developed countries.

2. LITERATURE REVIEW

2.1. Information and Communication Technology (ICT)

Information and communication technology (ICT) has become a renowned focus all around the world. Yet even with its reputation, it still has not reached its full capacity worldwide. Poorer

Partial Recovery of Corrupted Compressed Text Files by Segmented Hoffman Encoding

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Abstract— **Most of the modern compression schemes are focused on minimizing the size of compressed files so that they will take less bandwidth to be transmitted online. However, the major disadvantage of these compression schemes is the lack of error corrections. It only takes just few erroneous bits in the compressed files lead to almost total loss of the content. However, this disadvantage can be easily mitigated by retransmission online.**

Now consider some unusual circumstances when retransmission is unavailable, then we need a new scheme to recover most of the corrupted files if errors do occur during transmission. We proposed a Huffman coding scheme with file segmentation to minimize the affected range of bit corruptions and recover most of the uncorrupted file content. The cost of our proposed scheme is a slight increase on the compressed file size and minor modification on the encoding and decoding algorithms.

Keywords— **Hoffman codes, data compression, file segmentation, partial recovery, text files.**

1. INTRODUCTION

1.1. Research Motives

Ever since the dawn of human civilizations, people have been accumulating knowledge. Before the era of internet, most of the knowledge is stored in paper forms, that is, books. But books are very hard to sustain over long periods of time, not to mention that they are vulnerable to disastrous destructions from natural or man-made causes. Entering the cloud era, more and more human knowledge is stored electronically in databases on cloud hard drives. Most of the time, this is a very secure way of information storage. However, if any global disaster occurs, it may destroy the infrastructure and hardware systems of modern society, then how will humanity recover the essence of our civilizations [2]?

In the event of global destruction, whether it is the Third World War or deep impact of meteoroids, the human society may be destroyed and possibly the human population will be decimated. However, as long as there are some human survivors with most of the knowledge of modern civilization intact, then people may be able to quickly recover from the disaster and rebuild our civilization. Due to the huge quantity of our knowledge, the only sensible choice of storage will be the digital storage. There are some hardware technologies capable of storing data almost eternally [3],[10],. Due to the sheer quantity of stored knowledge, compression on files is inevitable. Currently, most of the compression schemes are focused on minimizing the sizes of compressed files so that they will take less bandwidth to be transmitted online. If any errors occur during the transmission, thanks to the fascinating speed of internet, it only requires a re-transmission to recover from errors. However, these compression schemes are not suitable for eternally storage because it only takes few erroneous bits to corrupt the whole file and almost impossible to recover the original file. Therefore, we are motivated to find a compression scheme not only reducing the size of the compressed file but also can recover most of its content in the case of errors.

1.2. Research Objectives

There are two major types of compression schemes, lossless compress [6], and lossy compression [7]. However, all these compression

A Modified Digital Level System

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Abstract **— In the previous work, a simple digital level was designed. At first, a simple USB camera is fixed perpendicularly to the bubble level to catch the image of the bubble. The captured color image is transferred into gray-level image through simple color transformation. Sobel operator is utilized to measure the edge information of the bubble image. The edge image is then binarized for further processing. After thinning and bubble's edge detection, the center of the bubble image can be evaluated to calculate the distance of the bubble's center and the level's center. From the distance we can determine the horizontal condition of the surface with the bubble level.**

In this paper, a modified thinning technique is proposed, and the RCD (Randomized Algorithm for Detecting Circles) algorithm is utilized to detect the bubble position.

Keywords— **RCD algorithm, digital level, digital image processing.**

1. INTRODUCTION

The information of an image are usually applied to camera instruments and distance measurements in robot vision. We applied image processing techniques, using several laser projectors to measure the distance between the surface and the camera, and the tilt angle of the surface. This novel technique is suitable for interior design or object distance estimation in robot vision [1-2]. To measure the tilt angle, we must at first make sure that the instrument machine is on the condition of horizontal level. Thus, this paper proposes using image processing as the foundation for image-based digital level design.

The simple and usual method of measuring horizontal tilt is using bubble level, placing the bubble level on the machine that needs adjustment; wait for the bubble to come to full stop, and then read off the location of the bubble. This method uses our raw eyesight. But it becomes a challenge when there is only a slight tilt, as our eyes are not sensitive enough.

We had proposed a simple digital level based on digital image processing techniques[3]. At first, a simple USB camera is fixed perpendicularly to the bubble level to catch the image of the bubble. The captured color image is transferred into gray-level image through simple color transformation. Sobel operator is utilized to measure the edge information of the bubble image. The edge image is then binarized for further processing. After thinning and bubble's edge detection, the center of the bubble image can be evaluated to calculate the distance of the bubble's center and the level's center. From the distance we can determine the horizontal condition of the surface with the bubble level.

The main problem is how to detect the position of the bubble from captured image. In this paper, we utilize the Randomized Algorithm for Detecting Circles (RCD algorithm) [4,5] to detect the bubble.

From experimental results, we have found that the RCD algorithm as an excellent tool to detect the bubble's position.

2. SYSTEM ARCHITECTURE

The architecture of the image-based digital level proposed in this paper is shown in Figure 1.The CCD camera and bubble level tool are simultaneously fixed on the same surface, and placed directly above bubble level. And make an effort to make the imaged bubble level center corresponds to the center of the image to reduce measurement error.

When in use, place the apparatus on the target surface, as show in Figure 2. Through the image-capture device, observe whether the bubble center and the bubble level center overlap or not to determine the horizontal condition. If not a

Project evaluation under competitive environment

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***Abstract*— This paper proposes a methodology for project portfolio managers (PPM) to identify key risk factors and to estimate value in managing projects. The methodology described in this paper view fuzzy theory in depth. We improved the literature in two ways: 1) we as can as possible to preclude the subjective bias in risk assessment to estimate expected value hidden in the project. 2) The key risk factor can be identified through top-down management process in most hierarchy organization structure. The proposed methodology synergizes the subjective uncertainty into objective risk and provides the project portfolio manager (PPM) with a consolidated view of the fuzzy uncertain risk within the projects.**

***Keywords*—AHP, Fuzzy Theory, Risk Assessment, Uncertainty**

1. INTRODUCTION

Uncertainty management on project evaluation has been widely studied in the literature. The project complexity is more complicated, involved and intricate, has made the uncertainty increasing to hazard the opportunity of project success [1]. Two issues of success in controlling uncertainty on project are critical [2-4]. One is organizations must utilize and balance internal limited resources effectively to pursue competitiveness advantages [5, 6]. The other is more external constraints should be considered to managing projects, such as futuristic scope, strategic fit and stakeholder involvement [6-8]. These two issues can help organization transform uncertainty into specific risk for evaluation; prolong the opportunity of success within project and keep organization being competitiveness.

To date, how to quantify uncertainty rigorously within projects has rarely studied, not to mention approachable method existed for practitioner to adopt in practical. In real cases, only partial information and limited time are available for managers to make the decisions[6, 9]. Uncertainty management is mostly based on the experienced project managers, directors and executives intuitively balance project risk and opportunities[10]. Most of methods may provide an inadequate treatment of uncertainty, and require too many information to be considered input data. Eventually, managers fail to recognize uncertainty and interrelated risk criteria, especially when they lack of the information described in methods. Thus, how to avoid subjective bias in project evaluation and accurately measure uncertainty rapidly attracted a lot attention [11, 12].

This study proposes a comprehensive method to fill the gap of objectively transforming uncertainty in the process of project evaluation. This method rigorous analyse the risk criteria first, and using them to evaluate potential expected value in individual projects. In addition, fuzzy uncertainty and hierarchical organization structure prevent the objective goals and fluctuated constraints lead to huge deviation between manager's subjective evaluations within project portfolio management. The consensus is established comply with organization strategy among all of the project managers, helping project portfolio manager to manage uncertain risk.

Organizations tend to run several projects concurrently to maintain flexibility and efficiency [6, 13, 14]. Thus, starting from project portfolio view, we develop a novel approach to make project complex being simple. Ease the pressure of subjective risk occurred in decision making, facilitate the process of project evaluation.

This paper is structured as follows: In Theoretical Background, we briefly review project uncertainties, and discuss fuzzy theory in literature review. In Methodology, methods are discussed in detailed. In Conclusion, major findings and management implication are

A Multimodal Human-Computer Integrated System for Facilitating Water Leak Detection

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Abstract— **Water is one of our most precious resource. Water leakage in pipelines and water distribution systems in the underground is a serious problem in many countries of the world. Automatic leak detection technology has been used to detect water leakage of pipes. However, while many studies have focused on improving the technologies for detecting water leakage, how human workers and systems interact and collaborate to complete the water leak detection task rarely is studied. In this paper, we propose a water pipeline leak detection system that incorporate the concept of man-machine integration allowing people to work with water pipeline leak detection device to complete the task of leak detection together. This system takes full advantage of the strengths of machines and humans and reduce the load on machine and human information processing. Our system also provides a multimodal interface that allows people to remotely obtain leak sound of the underground pipe through tapping on the suspicious areas displayed on the interface to easily identify leaks as true or false, to determine the severity of the leak and to predict the exact location of the leak. Compared with the fully automated system, the simpler, cheaper technology and more vigilant worker in our system together can have better performance in the water leak detection task. Our system is also more viable and feasible to be implemented by the government to deal with the problem of water leakage.**

Keywords— **Internet-of-Thing (IoT), Leak detection, Multimodal Interaction, Human Computer Integration, Vigilance**

1. INTRODUCTION

Water is one of our most precious resource. In daily life, people need a lot of fresh water to live. Convenient fresh water depends on the efficient water distribution system. However, due to aging, stress and other reasons, the water pipeline will eventually start to leak. The leakage of water pipes leads to an increase in water loss. This not only lost valuable water resources, but also increased operating and maintenance costs. In Taiwan, nearly 519 million m3 of water supply is lost to leakages every year. This resulted in an annual loss of approximately $ 63 billion NTD (approximately $ 200 million USD). Water leakage is also a serious problem for many other countries. According to the Green Cities Index conducted by Economists in 2012, the EU has an average leakage rate of 23%, 13% in the US and Canada, 22% in Asia, 35% in Latin America and 30% in Africa [1]. Water leakage causes most of the world's water loss of about 48.6 billion cubic meters [2]. In order to avoid wasting water in the water distribution system, global cities face many challenges [3].

Because the water pipeline is usually buried in underground, when the water pipeline burst, it is impossible to directly find the water leak with the bare eyes. Therefore, when people see the water pipeline leaks, the water has leaked to the surface of the ground. At this point, the water leakage has been very serious. Not to mention a lot of the situation, the water is constantly lost in the

Affective Computing Tutoring Platform Apply to Flip Classroom

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***Abstract*—Since 1990 e-Learning, from the computer-assisted teaching to the application of intelligent tutor system, most of the system can be based on the goals of learners to adjust the learning content, but they still cannot support face to face interaction, for example learner's emotion detection, dialog response etc. This study combined with affective computing and flow theory, through the emotional button to understand the learners' emotions. The agent to trigger an event and adjust the learners negative emotions to the positive learning mood. In order to , improve student learning motivation. This research offer different interface tools for flip teaching and general e-learning platform, and divided into two groups: experimental group and control group. The results show that experimental groups performed better than control group in academic achievement and behaviour of all classroom activities.**

***Keywords*— Affective computing, Agent, Flow, flip classroom, Calculus**

1. INTRODUCTION

Through a substantial amount of research and studies examining student's emotions (e.g., confusion, enjoyment, hope, excitement, anxiety, fear, and boredom) during different situation (exams, in class, etc.), it demonstrated that emotions could have an effect on student's learning outcome [1], [2]. As a result, the role of emotions in learning and their realistic use in education technology has lead attention to affective computing.

Today, intelligent tutoring systems (ITS) are gradually enhanced with emotion awareness (detect emotions and respond affectively) features [3]-[5]. By using affective computing, the emotion agent tutor "Alice" studied by Mao and Li [6] detects the affective state of students while learning. Above systems, provide learning feedback and interactions of expression through emotion agent on behalf of a human tutor to improve the learning interest of learners.

Despite these technological advancements, there was a lack of rich-expressive, usable, and above all, customizable multimedia interfaces for users to report their emotional state in an unobtrusive and non-invasive way. Moreover, we are far from adequately proving strategies to address the presence of emotions in learning [1], [7].

Mathematics is an important foundation of scientific development, and through Calculus it is then possible to develop higher level of scientific knowledge. The challenge for most students studying technology in university is that they often encounter logical reasoning difficulties, and thus producing anxiety and exclusion of the psychological.

Therefore, this research develops an interactive system by detecting the affective state of students and providing them with flexible learning process to enhance their learning interest, ultimately increasing their learning motivation. The system provides to graphical icons of different emotional expressions and through affective computing, text analysis to obtain student's learning mood. Assuming that the student's emotions are negative, the agent triggers the event to adjust the student's flow and try to turn the negative emotions toward positive emotions.

NoSQL Database Selection - A Case Study of an Enterprise

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***Abstract*—From the past till now, some different data models of database have been developed while relational data model is the most used one by businesses today. With the popularization of big data collection technology and application fields, the storage of enterprise data is more and more, and users expect the database to access data as fast as possible. More and more enterprises have changed to use NoSQL database to store data. However, there are more than 200 kinds of NoSQL databases. How to choose an appropriate NoSQL database to use is an important issue because it will affect the performance of the enterprise operations. In this paper, we will analyze some of the NoSQL data models. Besides, we will propose some principles for enterprise to choose a suitable NoSQL database.**

***Keywords*—Big Data, Database, RDB, NoSQL databases, Data Model**

1. INTRODUCTION

From the 1940s to the present, Databases (DBs) had developed different kinds of data models such as File System, Hierarchical, Network, Relational and Object-Oriented. In particular, Relational Data Model (RDM) has the advantages of data consistency, minimal data repetition and powerful RDBMS, and is therefore the most widely used for enterprises [1].

With the popularization of big data collection technology and application fields, enterprises need to store more and more data. Users expect application programs to access data as soon as possible. In addition, the formats of storage data are also more and more multivariate, for example, key-value pairs, document-oriented, time series, so more and more enterprises use NoSQL databases to store data [2][4][12] ◦ However, the NoSQL database is a general term rather than a specific one, with more than 225 species [2]. How to choose an appropriate NoSQL database to use is an important issue for the enterprise because changing the database can affect the original performance of the business operations.

This paper provides a basic introduction to each NoSQL data model, compares the data formats and characteristics of each data model, and lists the actual products of NoSQL databases for each model. In addition, the paper also proposed a set of principles for enterprises to choose an appropriate NoSQL database to improve the business problems and challenges. Finally, a business case, according to the characteristics of the enterprise and the amount of data size, indicates that the NoSQL database HBase is the best choice for the enterprise.

2. RELATED WORK

This section describes the development history of data models and the basic concepts of NoSQL databases.

2.1. The Development History of Data Models

A wide variety of database models have been developed since the 1940s. Here the development process is described below [1].

(1) File Processing System was developed from the 1940s to the 1950s. Data is stored in punched cards or magnetic tapes in the File Processing System. The File Processing System cannot manage and process the data efficiently because of data duplication and inconsistence in the File Processing System. Besides, the File Processing System cannot deal with appropriate access control to users.
(2) The Hierarchical Data Model was developed from the 1960s to the 1970s. Each record in the Hierarchical Data Model is considered as

Recent technology and application in industrial design education

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***Abstract*—Product design must take into consideration form, technology, and user requirements. The designer need understand core technologies and their advantages so that he or she can develop an appropriate application. The IoT and relative application expend self-made trend through Arduino's open architecture. "Maker's Choice for Industrial Design" indicate today's design education must include enhancement and scale up. Using prototype tools in the conceptual phase extend the scope of the concept development. Non-information background student learning program requires different teaching materials and teaching methods, yet to construct. Progressive learning approach can reduce the initial obstacles.**

***Keywords*—**Product design, technology requirements, Progressive learning

1. INTRODUCTION

Product design is determined by the design task to identify the product structure and a series of technical work preparation. Product design must take into consideration form, technology, and user's requirements. The designer usually lacks technology knowledge; some of them learned core technology through self-study or teamwork so that he or she can develop an appropriate concept and form to show the value of design by user's satisfaction and product value differentiation.

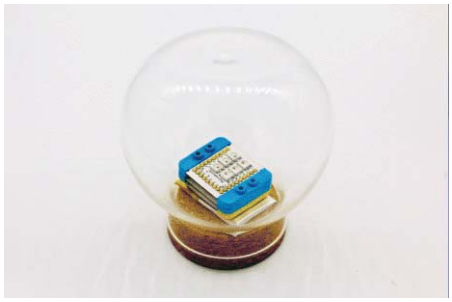
In recent years, mobile communications have grown by leaps and bounds, linking products and many new digital applications. Designers cannot exclude from this wave to fully reveal the creativity. Beside through self-study approach, the new cross-disciplinary curriculum needs to be added to reflect this trend. Owing to most of the design student are from an art background. Usually, they do not have the fundamental knowledge of electronics, programming, and science. The teaching experience indicates that the feasibility curriculum needs develop to adapt the students with different disciplinary.

A. American teaching

The society is rapidly changing by technology, and both educators and business leaders agree that computer science has become "new basic skills" in new economic opportunities [1]. Computer science gradually becomes a general skill. In the United States, 90% of parents hope children can learn computer skills, but limited student can access those classes.

Computer science extends downwards and more broadening with APP inventor and Arduino. Mitch Media, chief executive of MIT Media Lab, shows a learning site that lets children learn computer programs. The goal is not to train all young people like programmers, but to broaden ability and extend the learning curve.

The IDEA competition is the most important industrial design event in the US. Part of design items was using Arduino [2] (Figure 1).



(a)

(b)

Fig 1 IDEA competition winner [3], (a) mCookie, (b) extension module

Emotion Awareness from Facial Expression by Convolutional Neural Network

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***Abstract*—Emotion Awareness are very useful in many different application. The convolution neural network in deep learning that can efficiently identify emotions from the facial expression such as happy, anger, sad, surprise, fear, disgust and natural. In this research, we propose a post-processing approach based on convolution neural network to recognize facial expressions and evaluate the Emotion. Experimental results show that our approach is outperformed other methods with the accuracy of 87.13%.**

***Keywords*— Deep learning, Internet of Things, Convolutional Neural Network**

1. INTRODUCTION

The rapid development of the Internet of Things (IoT) technology[1] has had a significant impact on human life, such as the establishment of the smart home, e-finance business and so on. It can provide more diversified services through the Internet connection. But perhaps the most obvious benefit for companies is about the customer data. The more a business understands about its customers, the more its leaders can make informed decisions, adapt to market conditions, and provide a positive client experience. The IoT devices are equipped with sensors and processing power that enable them to be deployed in many environments. So that they can collect much useful information about customers, such as individual's behaviors and emotion. In this study, we recognize the facial expression to aware of emotion. When customers face the product and watch, customers` facial expression will reveal the favorability of this product. We can find out the favorability by analyzing the customers' emotion from facial images which collected by the IoT devices. In [2] Zhentao et al. They use a human-computer interaction system for facial expression applications.

Facial expressions can be classified as anger, happiness, disgust, fear, sadness, and surprise. There are many studies work on the recognition of Facial expression in the recently [3]. These techniques used for facial expression recognition can be divided into two categories. The first is to use traditional methods to find facial features and use machine learning to recognize them. In [4] Abhinav et al. They use PHOG and LPQ methods to obtain facial feature. Then use SVM for classification. In [5] Junkai et al. They use HOG (Histogram of Oriented Gradients) method to get features. Then use SVM for classification. The second is deep learning which can learn features automatically. In [6] Justus et al. They modified the VGG-Face architecture and trained the model. And recognition the application in real time. In [7] Kaihao et al. They use multi-neural network models and depth layers. Which Space Network (MSCNN) uses Convolutional Neural Network (CNN) to get features. The Convolutional Neural Network(CNN) is one of the techniques of deep learning and very useful in image recognition. The CNN is a neural network requires a great deal of data for training to obtain better results. Whereas this training set cannot cover all kind of possible facial expression, besides it is possible that some human facial expression shows angry but in fact it is happiness. In this paper, we propose a novel approach to recognize the implicit facial expression.

The remainders of this paper are organized as follows. Section 2 is our proposed method, and the experimental results are given in Section 3. Finally, the conclusions are listed in Section 4.

A Compact Multiband Planar Monopole Antenna for LTE, GSM, and UMTS Applications

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***Abstract*—In this paper, the simulation and measurement results of eight bands planar monopole antenna for application in GSM850/900/1800/1900,UMTS1700/1800/1900 /2100, LTE700/1500/2300/2500 bands were presented. The planar monopole antenna was fabricated on a FR4 substrate in a small area of 87.5×13.5 mm^2. This proposed antenna can provide two separate impedance bandwidths of 39.9 % at 900 MHz band and 82.1 % at 1900 MHz band. The bandwidth of the proposed triple-band monopole antenna covered the GSM/UMTS/LTE bands simultaneously.**

***Keywords*—Monopole antenna, Long Term Evolution (LTE)**

1. INTRODUCTION

Since monopole antenna is reasonably compact, good in efficiency, and simple in manufacturing, there are many commercial applications, such as mobile radio and wireless communications that use monopole antenna. Recently, monopole antenna for applications in Global System for Mobile Communications (GSM-850/900/1800/1900) and Universal Mobile Telecommunications System (UMTS) (1700/ 1800/ 1900) operations applied have been implemented. On the other hand, associating with the rapid development of the long term evolution (LTE) system with three operating bands in the LTE (700/1500/2300/2500) [1] has developmented rapidly, associating with the data rate is significant higher than that of 3G wireless wide area network (WWAN) operations for mobile broadband services. There is an increasing demand for antennas suitable for LTE/GSM/UMTS simultaneously.

The bandwidth of a single radiating element is narrow to cover the whole desired band. Multiband monopole antenna is one of the promising means of providing commercial LTE/GSM/UMTS bands. However, antennas with sufficient bandwidths generally with a considerable size or thickness. This will make them difficult to be integrated within mobile devices or portable wireless modules [2]-[4]. In general, compact multiband monopole antenna was realized by employing electromagnetic coupling or two resonating elements [5]-[7].

In this paper, we present the design of a triple-band monopole antenna with three open strips on FR4 substrate, operated in the LTE/GSM/UMTS bands simultaneously. The proposed antenna was simple in manufacturing because of single dielectric substrate, single metal layer, and without via holes, which is an attractive advantage for mass production. The design considerations and experimental results for the proposed triple-band monopole antenna, such as return loss, radiation pattern, and efficiency were presented and discussed.

2. ANTENNA DESIGN

Fig. 1 shows the geometry of the proposed eight bands monopole antenna for application in the LTE/GSM/UMTS bands with four open strips and the photograph of the manufactured antenna. A FR4 substrate is used as the system circuit board with permittivity and loss tangent of FR4 substrate are 4.4 and 0.014, respectively. The overall dimension of the proposed eight bands monopole antenna with a thickness of 0.8 mm is 87.5 13.5, which is small enough to be built in practical devices such as laptop. Four monopole-type branches are printed on the front side of the substrate. The proposed eight bands planar monopole antenna is fed by using a 50 Ω microstrip line, with its central conductor connected to the feeding point A. Branch #1 (from point A to the open end at point J with

A Novel Low Power True Signal Phase Flip-Flop Design Using 23-Transistor

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***Abstract*— A novel low power true-single-phase flip-flop (FF) design with 23-transistor only is proposed. It is adapted from a recently presented true signal phase clocking based FF design and achieves circuit simplification. The optimization measure leads to a new design featuring better performances. Based on simulation results using the TSMC CMOS 40nm technology, our design outperforms the conventional TGFF by 49.1% in energy (at 0% data activity) with the same layout area.**

***Keywords*— VLSI, low power, flip-flop, true-signal phase clocking.**

1. INTRODUCTION

Digital designs often employ extensive FF for data buffering or pipelining, and the circuit efficiency of FF designs largely affects the overall area and power consumption [1]. New FF designs evolve constantly with the advances of new process technology as well as the target applications, e.g. high speed, low power, and low voltage [2-6]. In this paper, we revisit the basic FF problem. A transmission gate based FF (TGFF) is the most widely used one. The major drawback of this FF design is the excessive work load to the clock signal which leads to a higher dynamic power even when the input data switching activity is low or zero. Recently, true-single-phase clock operation FF designs are presented to overcome this problem [2-5]. The major idea is to reduce clock signal loading via circuit reduction. In this paper, we present a novel TSPC based FF using footless scheme. It also features a true-single-phase clock operation, which greatly alleviates the clock signal loading. The design also exhibits a lowest area and a shorter critical path when compared with previous designs.

2. PROPOSED DESIGN

The design idea starts with three low power FFs, ACFF [2], TCFF [3] and S2CFF design [4] as shown in Fig. 1. In the ACFF design, the data contention problem encountered by slave-latch and the advantage of power saving diminishes as the rise of the switching activity. Meanwhile, the level restoring pair of the master-latch also causes a longer setup time [5]. Similar problem also prevents in TCFF and S^{2}CFF design, where the critical path consists of 3 pMOS/nMOS in series. Although this problem can be reduced by enlarging the transistor size, low power and low transistor-count (layout area) advantages of the FF design will be impaired.

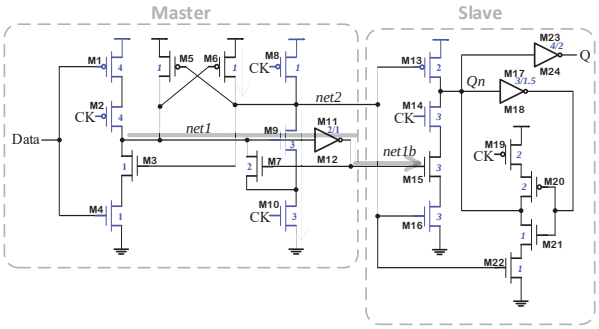
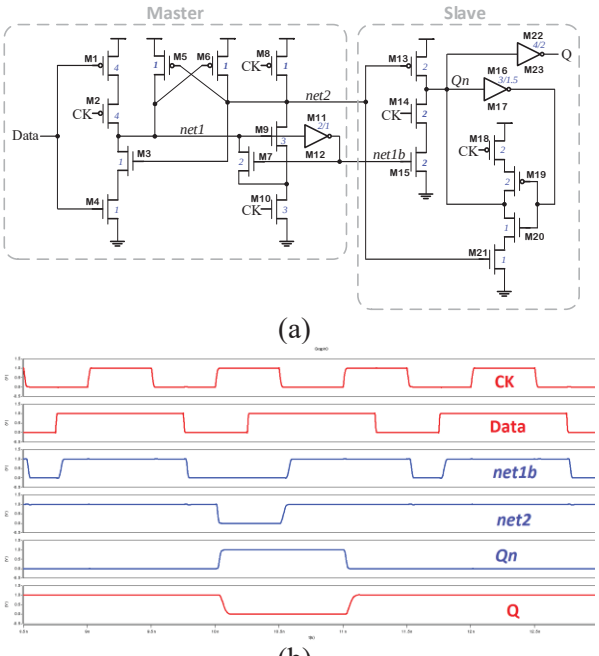


Fig.1 S2CFF design [5].



(a)

(b)

Fig.2 Proposed FF design. (a)MOS schematic. (b)Simulation Waveforms.

The Study on the New Transformation and Position of the Farmers' Association in Taiwan-- Dali District Farmers' Association as an Example

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Abstract—**After monumental developments and changes in the economic structure, agriculture is no longer a primary industry in Taiwan. Consequently, groups that are mainly composed of famer associations have recently pursued transformation to diversify operations and have begun to focus on service innovation. In addition, the farmers' associations in Taiwan for developing rural economy, and improving farmers' living standards, have to deliberate about the problems, such as how to change the traditional perspectives, how to advance the operation model, and where to position themselves on the markets. Therefore, in this study, the challenges and challenges of the farmer association in Dali District will be explored. At the same time, the future development trend of the farmer association will also be reflected and provided to other farmer associations in different regions for reference.**

Keywords—**Farmer Association； Quality of Service; Environmental Variable; Position Strategy; Transformation Strategy**

1. INTRODUCTION

The first farmers' association, founded in September 1900, is a folk organization that emerged during the Japanese colonial period in Taiwan and named "Taibei Sanjiaoyong Union", previously founded for the major purpose of protecting rights and interests of farmers and reducing burden of land rent [8]. In 1907, the Governor-General of Taiwan announced "Taiwan Rules for Farmers' Associations and Detailed Rules for Implementation", transforming farmers' associations into body corporate in 1908 to formally establish a system for managing farmers' associations, through which farmers embarked on agricultural extension and business activities [8].

Agricultural development is considered as the basis of industrial development in Taiwan's economic development. Although the share of agricultural production in GDP (gross domestic product) has plummeted following economic growth, agriculture remains a key industry, as in many other industrialized countries, due to political, food safety and ecological environmental protection. In order to maintain agricultural production and continuously improve rural social welfare, rural finance is still one of the important means to promote agricultural development [5].

Farmers' associations in Taiwan are non-profit organizations with credit, extension, insurance, and marketing departments. The credit department of farmers' associations (CDFA) provides membership deposits and loans, thereby reducing the cost of production and promoting agriculture, social welfare, and rural culture. According to the Taiwan farmers' association yearbook, CDFAs account for 95% of the total profits in farmers' associations. The law stipulates that at least 62% of these profits be allocated to agricultural extension, training, culture, and welfare [9].

Although the ratio of Taiwan's agricultural production in GDP dropped from 7.33% in the 1980s to 1.81% in 2011, agriculture remains a key industry due to political concerns, food safety and ecological issues. The establishment of peasant associations is to protect the rights and

IoT-type Tea Bag Brewing Machine

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***Abstract*— The proposed IoT-type tea bag brewing machine was mainly implemented in an Altera Field-Programmable Gate Array (FPGA), which is attached to a system development board. Additionally combined with a 6-degree three-dimensional rotating mechanical arm, a thermos bottle, a water injection control circuit, and the system development board, the proposed system was realized. According to different requirements, user can choose alternative tea bags and desired water volume. By using a cell-phone to send control messages to the implemented system through Wi-Fi remotely, the mechanical arm can be controlled to execute the process of brewing up tea automatically to save time for users.**

***Keywords*— Field-Programmable Gate Array, Servo Motor, Mechanical Arm, Internet of Things, Cell-Phone, Tea Bag Brewing**

1. INTRODUCTION

Recently, cell-phone (i.e., smart-phone) is popular and quite commonly used by people. Consequently, applying wireless network and telecommunication technology such as WiFi and LTE (Long Term Evolution) to IoT (Internet of Things) network system is a necessary technology. The proposed IoT-type tea bag brewing machine was mainly controlled by a basic 6-degree three-dimensional rotating mechanical arm, which is low-cost compared to some mechanical arms that can operate with fast speed and high precision. However, the applied mechanical arm can work fine to be controlled to brew up a cup of tea automatically.

Recently, IEEE [1] and 3GPP [2] have started to face of the rise of different IoT applications such as Machine-type [3] and M2M (Machine-to-Machine) communication requirements [4]. The mentioned efforts show that the need of further development of electronic appliances to fit various requirements of IoT applications.

Besides, Industry 4.0 is a hit subject. In which, mechanical arm is popularly used in applications including manufactures of mechanisms, semiconductors, and other electronic components. As the tea brewing robot [5], manual operations are still required, thus a mechanical arm should be applied to make it being a real robot.

With advances in technology, smart phone becomes a basic and even necessary equipment carried by people. Besides, we found that there are some coffee makers can be controlled by cell-phone [6]. Accordingly, if the proposed bag brewing machine can be remotely controlled by issuing a "start" command by smart phone, which can be more convenient for a people is busy at work and require a cup of tea.

Control functions of the IoT-type tea bag brewing machine was implemented by an Altera Field-Programmable Gate Array (FPGA) [7][8]. In which, a Nios II microprocessor [9] is programmed to control related controllers such as network and motor to receive command and execute operation to the applied mechanical arm. The main functions were designed by C code and Verilog Hardware Description Language (HDL) and programmed into the FPGA chip.

The rest of this paper is organized as follows. In Section 2, we will first introduce the system architecture of the proposed IoT-type tea bag brewing machine. Section 3 will provide an introduction to the applied hardware components. Section 4 demonstrate the implemented product. Finally, Section 5 will draw a conclusion.

2. SYSTEM ARCHITECTURE

The system architecture of the implemented IoT-type tea bag brewing machine is composed of (1) Software (user interface and network function), (2) Firmware (controller setting and data access), and (3) Hardware (thermos bottle

Elder Care Implemented with Augmented Reality

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***Abstract*—The purpose of this paper is to find a way which efficiently alleviates the problems of Taiwan's aging society. To fulfil the goal, we combine augmented reality and image recognition to help elder people remind their memory of some specific view from the photos which has been uploaded to the App. By aiming the mobile device's camera lens to a target such as a postcard, then the App will show the paired 3D-Model. The 3D-Model and the target both can be set in the App's user interface. Through the family's upload photos or to make the elderly impressive landscape photo to meet the needs of the elderly memories.**

***Keywords*—Augmented Reality, Elder Care, Image Recognition, Internet of Thing, Situational Application**

1. Introduction

In Technology Enhanced Learning (TEL) research, ubiquitous and mobile technologies and serious games, Augmented Reality (AR) and Learning Analytics (LA) provide a means of improving users' experiences and satisfaction in enriched, multimodal learning environments. AR technologies refer to the inclusion of virtual elements in views of actual physical environments, to create a mixed reality in real time. It supplies and enhances the perceptions humans gain through their senses in the real world. AR provides various degrees of immersion and interaction, which can help to engage students in e-learning activities.

However, even science and technologies become more and more advanced; there are still many places in the community in need of care. There is an ethnic group in the world that has a high demand for care and medical help the aged. Traditionally, family play important roles in long-term care services. However, family structure in Taiwan has undergone significant changes from 1976 to 2010[1].

According to the statistics of the Ministry of the Interior, the percentage of single-occupant households in Taiwan has risen from 3.16% to 27.9%. In particular, the percentage of single elder households has risen from 0.39% to 9.2% and the percentage of elderly couple households have risen from 0.76% to 15.6%. In addition, the population of individual households in Taiwan has decreased from 5.57 people per household in 1961 to 2.96 people per household in 2010[2]. Based on the above-mentioned problem of Taiwan's aging population, the demand for elder care in Taiwan is on the rise. Therefore, this study proposes an App that can help the elder to meet the elderly's memories by reminding them of their memory of the scenery or their family or friends.

2. Related Works

This study supports this research mainly through the unity engine build an App and the collection of the literature on elder care needs and dementia. There are some tools to create the system as follows.

2.1. Unity

Unity is a cross-platform game engine developed by Unity Technologies, which is primarily used to develop both three-dimensional and two-dimensional video games and simulations for computers, consoles, and mobile devices. First, Unity announced only for OS X at Apple's Worldwide Developers Conference in 2005. It has been extended to target 27 platforms. Six significant versions of Unity have been released. For a list of games made with Unity visiting List of Unity games[3].

Unity supports building on 27 different platforms and it also formerly supported seven other platforms including its Unity Web Player. Unity Web Player was a browser plugin that was

The study of LoRa physical layer characteristics

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***Abstract*—More and more wireless sensor network(WSN) technologies have made low-power wireless communication possible in recent years. For example, Sigfox, Weightless-N, NB-IoT and other ultra-narrowband technology. Spread spectrum technology such as LoRaWAN allow transmission distance up to tens of kilometers. The establishment of LPWAN(Low Power Wide Area Network) [4] has no need for complex network topology. One of the key technologies of LPWAN is to select the sensitivity by fine tuning the settings of the physical layer and obtain the reception success rate at a lower receiving rate. This allows the arrangement of nodes to be adapted to different distances for transmission. This characteristic attracts many IoT developers. They observe the reliability and effectiveness of its communications by tuning the physical layer parameters. In this article we actually tested the LoRa transmission distance ,loss measurment and observed the impact of various parameters.**

***Keywords*—WSN ,Loss measurement, LoRaWAN, LPWAN, LoRa**

1. INTRODUCTION

With the development of technology, the IoT is extended more and more. Among them, the requirements of the terminal node include the low power consumption, the low data transmission and the low cost, and more long-distance transmission. Therefore, LPWAN [1] includes the above features. The advantages of long-haul transmission are more and more obvious. Currently, various technologies work in the Sub-G frequency band and are divided into licensed and non-licensed frequency bands. Technologies such as LoRa [2] and SigFox [3] work in unlicensed bands, but because of the anti-jamming effect of CSS(Chirp Spread Spectrum) [4] technology in the former, there is a great advantage in building low-cost LPWAN.

Due to the long transmission distance in the network topology, the star topology is mainly used and relayed when necessary. In LoRa, different nodes such as receiver sensitivty can be used to adjust the best data rate and optimize the battery efficiency. It has a clear agreement in LoRaWAN [5] for reference. We use Single-Channel Gateway[6] to do the test, that is, gateway only set fixed frequency, SF, bandwidth and other parameters.

This article aims to explore LoRa in the adjustment of the various terrain and different parameters on the transmission distance and the correct impact of the packet acceptance rate. Although it claims that the transmission distance can reach 22km. However, the test results show that it is more affected by the terrain than the imagination, and observe the influence of its receiving sensitivity [7] on the correct receiving rate

2. CONFIGURABLE SETTINGS OF LORA

LoRa's performance can be fine-tuned by various settings in physical layer. Including bandwidth, code rate, spreading factor, transmission power and carrier frequency, as summarized in Table 1. We explain next in detail the impact of each physical layer parameters on data rate, receiver sensitivity (including resilience to interference),

Acceptability Study of Technological-based Acceptability Model with the Tainan City Government's Promotion of Electronic Attendance Management System as Example

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***Abstract*— This study is conducted to understand the acceptability behavior of the employees working at government institutions toward the electronic attendance management system by examining the key factors that affect users' acceptability and usage. The research participants of this study are all the employees who work for the Tainan City Government and its affiliated departments. This study focused on the process of implementing the electronic attendance management system when the government of the City and County of Tainan merged together in 2010. The study collected data through questionnaire surveys. A total of 364 surveys were distributed and a total of 299 effective surveys were returned, which equates to a return rate of 82%. The research framework adopted in this study is based on the Technology Acceptance Model (TAM), with an objective that focused on the understanding of the convenience, usability, and usefulness of the electronic attendance management system based on its usage by the employees working at the Tainan City Government and its affiliated departments. This study helps to understand users' satisfaction level of the electronic attendance management system that has been implemented in the entire city since the merger in 2010.**

***Keywords*— electronic attendance management system; electronic form; task fit; technology acceptance model**

1. INTRODUCTION

The electronic attendance management system is used by the Department of Personnel to manage employees' attendance record and leaves. Employees can request for leaves through various forms on the electronic attendance management system via Internet, while department executives can approve employees' leave requests online. The Department of Personnel can also manage employees' attendance record and leaves online, thus providing some reference for department executives with regard to their management decisions of the employees.

The City of Tainan and the County of Tainan merged at the end of 2010. Due to the fact that the number of employees had increased from the merger, managing employees' attendance record became difficult for the Department of Personnel. Originally, Tainan City and Tainan County each had a separate electronic attendance management system and attendance management policy. The Department of Personnel of the Tainan City Government ultimately decided to abandon both systems that were in place and design a brand new electronic attendance management system that would include every employee from all the departments of the Tainan City Government for easier management. However, we want to investigate topics regarding the new electronic attendance management system such as whether it fits the needs, whether the user interface and the operating procedure can be accepted, whether the system can easily be used, and whether the system has enough stability.

There are many ways to analyze the user satisfaction level, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), the Theory of Reasoned Action (TRA), the Technology Acceptance Model (TAM), the Theory of Information System Success Model, and the Task-Technology Fit Theory (TTF). This

A Framework of Heart-Rate Monitoring and Prediction

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***Abstract*— Cardiovascular disease is the number one death toll in the world. In 2015, an estimated 17.7 million people died of CVD, accounting for 31% of global deaths. Of these deaths, an estimated 740 million are coronary heart disease and 6.7 million are due to stroke. Now we use the smart bracelet-based heart rate monitoring system and smart phone APP connection, by the bracelet to receive heartbeat data to the phone, and then by the phone to transfer data to the MYSQL database, the database for comparison and then back to the phone, Real-time alert heart rate conditions, predict possible heart disease. Through the proposed framework, the intelligent system can be further constructed and examined.**

***Keywords*— CVD (Cardiovascular disease), Heart rate monitoring, Heart rate condition, QRS, ECG (Electrocardiography), Prediction**

1. INTRODUCTION

1.1. Preface

According to the World Health Organization, about 16.5 million people die of cardiovascular disease each year in the world, and the second is cardiovascular disease in Taiwan, with about 1.45 million people currently suffering from CVD Although cardiovascular diseases and cardiovascular diseases are not as good as cancers, cardiovascular disease has ranked third in the top 25 causes of death by 2011, up to 2011. Because there is no obvious characteristics of the disease, it is often overlooked by the public, until the discovery, often has caused harm. The causes of cardiovascular disease often lead to aging, smoking, high blood pressure, diabetes, hyperlipidemia, family history and lack of exercise.

1.2. Research motivation

The original question was chosen because our team's father, who has not woken up to now because of a stroke, does not want every family to be the same because of the sudden onset of these cardiovascular diseases. In the future, if this technology can be developed, it will surely reduce the accidents caused by cardiovascular diseases. Of course, it is not enough to rely solely on the monitoring system. In general, we must maintain our health through proper exercise and diet control.[1]

Fig. 1 Chaoyang University Elderly care

2. Research Background

2.1. ECG Introduction

The ECG we use today is improved by the analysis of the theory of the 1903 era, and in recent years there has been slight progress in the field of electrocardiography. For example, ECG recording devices have evolved from bulky devices to portable devices today, and computerized ECG analysis is also involved.

Electrocardiogram can be traced by electrocardiogram capture by capturing and magnifying the ECG with a small electrical change on the surface of the skin during each heartbeat of myocardial cell depolarization.

Case Study on Visual Measurement Method of Precision Industry

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***Abstract*— The precise measurement is a common need in industrial manufacturing and visual measurement is one of the common practices. Therefore, this study aimed to discuss the application of industrial vision library (Euresys Open eVision) to the measurement system and the computer visual technology of Euresys Open eVision was used to measure the distance of the object to be measured from the left to the right. First of all, in the visual measurement, the calibration grid was used to calculate the resolution relationship between image pixel and real distance; then Point Gauge function in the library was applied to look for sub-pixel edge, so as to determine the edge of the object to be measured; in the end, the length was calculated according to the edge point measured. In the experimental results of case study, the actual length of object to be measured is 85.6933 mm, and the maximum error measured by this study can be less than 0.02 mm.**

***Keywords*—Automatic computer vision inspection, Edge detection, Sub-pixel edge detection, computer vision, Euresys Open eVision**

1. INTRODUCTION

At present, the applications of machine vision in industrial process mainly include four applications of Gauge, Inspection, Guide and Identification (GIGI). With the production line motion as the example, the machine vision can help the production line to detect the dimension and angle [1-2]. Traditionally, the quality management and control and the check of specifications are usually achieved by visual inspection by the quality control personnel. People can often do this job well, but the job burnout or physical limitation will cause the inconsistent accuracy to the detection results[3]; at the same time, the quality control personnel need to be trained and the inspection takes the longer time. In some higher precision inspections, information obtained by the highly-trained quality control personnel as well as their speed is far less than computer and visual image technology.

In the edge detection technology, although Sobel operator, Canny operator, Laplace of Gaussian operator, etc. have the simple form, they are realized easier [4-7] and have the faster detection speed, the detection precision is not ideal and can only reach the level of single pixel; meanwhile they are very sensitive to the noise and easily produce false edge. In order to achieve the high-precision detection, only the single-pixel edge detection is not enough. However, sub-pixel edge detection applies orthogonal polynomials and least square method to gain the fitting function according to mathematical characteristics of pixel greyscale distribution and then the fitting function is used to determine the precise position of image edge point and its detection precision is very high and reach 0.1 pixels[8-9]. Thus, this method can effectively determine the accuracy of edge position.

The purpose of this research is to make the measurement of length and specifications become more precise in industrial measurement. Aimed at the characteristic position to be measured of the object to be measured, the sub-pixel edge detection technology in the industrial vision library is applied to complete a method and only a camera is used to complete the measurement action, which is used to inspect whether the products in manufacturing industry conform to the specifications.

2. EXPERIMENTAL METHOD

The goal of this research is to use the computer vision technology to measure the actual distance of the object to be measured from the

Predicting the Bus Routes Need to Be Adjusted by Using Machine Learning Techniques - A Case Study of Taichung City Bus Big Data

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***Abstract*— Taichung City is currently the only county in Taiwan that implements full-scale bus billing and must use electronic tickets while take or get off the bus. Since taking a bus by electronic ticket is free, many passengers are attracted to take bus by using e-tickets. From the user's point of view, in addition to the dense bus network, intensive shuttle bus or cheap fares, users also expect convenient ride decisions such as accurate bus dynamic information system or route planning. This research will analyze the data of "Taichung City Smart Transportation Big Data" provided by the Taichung City Government Transportation Bureau based on machine learning technology. With the acquisition of the massive bus e-ticket take-over record and the machine learning analysis technology, the bus routes need to be adjusted in the future may be predicted. These bus routes that need to be adjusted may require additional trips or sub-routes to cope with the continuous growth of passenger traffic, or to be adjusted because the volume of bus routes is reduced. This study expects to analysis the big data by using Microsoft Azure machine learning tools and huge computing resources in cloud and provides the Taichung City Government as one of the references for bus route adjusting in the future.**

***Keywords*— Intelligent Transportation, Big Data, Machine Learning, Microsoft Azure**

1. INTRODUCTION

The government using big data to make decisions is more and more popular. The Taichung City Government is currently the only county in Taiwan that must use electronic tickets while take or get off the bus. At present, it has more than 200 million records with bus trips. Beside this, the Taichung City Government not only uses data to analyze difficult traffic accidents, but also uses data to optimize the planning of public transport. By analyzing bus passengers getting on and off time, starting and ending stations, boarding numbers and other information, there are a lot of useful reference to re-plan the bus route, such as the top 30 stations and the peak time of bus takes. Therefore, the Taichung City Government started to build a big data database for bus take records from 2015, and the "Taichung City Smart Transportation Big Data Research Center" was established with the Asia University and National Chung Hsing University to analyze the data and further serve as a reference for improving the city's bus routes.

In the past, most bus routes were planned by living density and social development. For example, department stores, markets, hospitals, schools and other places, so that the bus stations is intensively. Although it is convenient for most people, and the bus company also has a good profit. However, after analyzing the bus ride records, the Taichung City Government found that only a few bus stops had more passengers and few passengers took the bus at other stations. Taichung City Government will re-route about 70

The Discrimination of Alpha Wave Music

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***Abstract*—Many people listen music to refresh, relax or help sleep. While humans are in various states of minds, there are different frequencies of brain waves detected. Some music can resonate with human brain waves to achieve the better effect on someone's state of mind. The alpha wave predominantly appears when people are in wakeful relaxation with closed eyes. There has been several medical reports demonstrated that some specific music, called alpha wave music, can resonate with the alpha wave and strengthen it. Therefore, when people take the rest and listen to the alpha wave music at the same time, it can be very helpful to achieve better relaxing. However, the alpha wave music album is rare on the market because it only can be classified manually by expertise. This research analyses the music features and expects to help the discrimination of alpha wave music.**

Keywords— **music classification, alpha wave music, neural network, BPN**

1. INTRODUCTION

Now is a time of fully-competition. Many people have too many pressures which can lead to unintended consequences. Such as anxiety, panic, melancholy, manic depression and other mental illness which may come to the door and even affect the physical health. There are also a numerous regrettable cases in the society caused by excessive pressure. Therefore, it is very important to relieve stress appropriately. People usually listen music to relieve stress and to relax. Some even treat patients with mental or physical illness by music. That is because some music can resonate with human brain waves to achieve the better effect on relaxation [6].

While humans are in various states of minds, there are different frequencies of brain waves detected. Among these diverse frequencies, there are four major types of brain waves existed discovered, including Beta (β) wave, Alpha (α) wave, theta (θ) wave, and delta (δ) wave [3]. Measured by EEG (Electroencephalography), the frequency between 8Hz and 13Hz of alpha wave was detected when people close their eyes for a short rest [15]. There has been several medical reports demonstrated that some specific music, called alpha wave music, can resonate with the alpha wave and strengthen it [3][6]. Therefore, when people take the rest and listen to the alpha wave music at the same time to enhance the brain wave, it can be very helpful to achieve better relaxing.

Until now, the alpha wave music album is rare on the market because it only can be classified manually by expertise. Due to time-consuming and laborious in classification, it cannot be widespread. In this digital era, this study analyse the music features and expects to help the discrimination of alpha wave music.

2. RELATED WORKS

2.1. Categories of Brain Waves

In 1925, Dr. Hans Beck found that there were four major types of human brain waves from the human brain, including Beta (β) wave, Alpha (α) wave, theta (θ) wave, and delta (δ) wave [3]. Usually, one of these brain waves will be relatively stronger presence when people in different situations.

Beta wave (>12.5Hz): The beta wave is more intensely presented, when the person is awake in concentration, thinking, and stress. The frequency of beta brain wave measured by EEG (Electroencephalography) is shown in Figure 1.

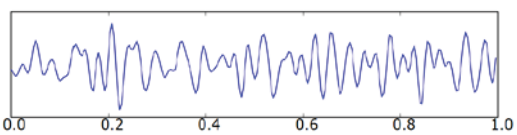

Figure 1. Frequency of beta brain waves detected by EEG[14]

A Fault Detection and Identification Scheme for Ion Implanter

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***Abstract* — Ion implanter is a bottleneck machine in the semiconductor manufacturing process because of its expensiveness, and ion implantation is a critical operation to the yield rate. Above all, the wafer is not reusable if there are faulty operations either due to the machine or the operator. Thus, the real-time fault detection and identification for minimizing the possible down time of the ion implanter is a crucial issue in semiconductor manufacturing. This paper proposed a fault detection and identification scheme based on a newly developed Fuzzy Tree Classification Systems (FTCS) for ion implanter. We have tested our FTCS on two different sets of real data, the 26-recipe and the 42-recipe cases. Test result demonstrates that our FTCS can work real-time for fault detection and identification.**

***Keywords*—Ion implanter, fuzzy tree classification, fault detection, fault identification, fuzzy rule.**

1. INTRODUCTION

Ion implanter [1]-[3] is a bottleneck machine in the semiconductor manufacturing process because of its expensiveness, and ion implantation is a critical operation to the yield rate. Above all, the wafer is not reusable if there are faulty operations either due to the machine or the operator. Thus, the real-time fault detection and identification for minimizing the possible down time of the ion implanter is a crucial issue in semiconductor manufacturing. In general, the equipment supplier will provide a digital scan system to inform the operator of the proper operation of the scanning system of the machine. However, there are other major component systems, such as the filament source, extraction electrode, arc chamber, mass analysis system, and acceleration system, also require monitoring. Although the well-trained engineers can investigate the statistical process control (SPC) [4]-[5] charts of individual component to monitor its operation, there does not exist any human-error free, automatic and effective tool to monitor all the component systems as a whole and taking their interactions into account. To fulfill this purpose, we propose, in this paper, a fault detection and identification scheme [6]-[7] based on a newly developed Fuzzy Tree Classification Systems (FTCS) [8]-[10]. The work completed here is the result of a project incorporated with a renowned wafer foundry in Taiwan; the employed Eaton NV6200 ion implanter is a field machine, and the collected data of all recipes are of a wafer foundry's practical products. The structure of an Eaton NV6200 AV ion implanter is shown in Fig. 1. The Eaton NV-6200AV is a medium current Ion Implanter capable of implanting dopants at beam energies from 10 to 190 KEV. Currently Arsine, Phosphine, Boron Trifluoride, Carbon Dioxide, Argon and Helium are available for implant. The implanter is configured for 6" wafers but carrier wafers are available for implanting 4" wafers or pieces.

The Eaton NV6200A/AV Ion Implanter is a well-known and widely used Medium Current Ion-Implanter. Although quite old (since the mid 1980's), this tool is still very popular in 150mm and 200mm fabs worldwide. With its many superb features, this implanter suffers of one major drawback: It is equipped with only one load and one unload cassette, which means that at the end of each cassette processing completion the tool is idling, waiting for operator intervention. Even if an operator is present, it still takes some time to replace both the load and the unload cassettes, and to resume processing. Tadin offers a relatively

The Hamiltonian and Hamiltonian Connected Properties of N- and Y-Alphabet Supergrid Graphs

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***Abstract*—A Hamiltonian path (cycle) of a graph is a simple path (cycle) in which each vertex of the graph is visited exactly once. The Hamiltonian path (cycle) problem is to determine whether a graph contains a Hamiltonian path (cycle). A graph is called to be Hamiltonian if it contains a Hamiltonian cycle. A graph is said to be Hamiltonian connected if there exists a Hamiltonian path between any two distinct vertices. Supergrid graphs were first introduced by us and contain grid graphs and triangular grid graphs as their subgraphs. The Hamiltonian path and cycle problems on supergrid graphs were known to be NP-complete. Thus, an important line of investigation is to discover their complexities when the input is restricted to be in special classes of supergrid graphs. In this paper, we will study the Hamiltonicity and Hamiltonian connectivity of alphabet supergrid graphs. There are 26 types of alphabet supergrid graphs in which every capital letter is represented by a type of alphabet supergrid graphs. We will verify the Hamiltonicity and Hamiltonian connectivity of N- and Y-alphabet supergrid graphs. The other types of alphabet supergrid graphs can be verified to be Hamiltonian and Hamiltonian connected similarly. The Hamiltonicity and Hamiltonian connectivity of alphabet supergrid graphs can be applied to compute the optimal stitching trace of computer sewing machines while a string is sewed into an object.**

***Keywords*-Hamiltonian connectivity; Hamiltonicity; N- and Y-alphabet supergrid graphs; rectangular supergrid graphs; shaped supergrid graphs; computer sewing machines**

I. Introduction

A *Hamiltonian path* of a graph is a simple path in which each vertex of the graph appears exactly once. A *Hamiltonian cycle* in a graph is a simple cycle with the same property. The *Hamiltonian path* (resp., *cycle*) *problem* involves deciding whether or not a graph contains a Hamiltonian path (resp., cycle). A graph is called *Hamiltonian* if it contains a Hamiltonian cycle. A graph G is said to be *Hamiltonian connected* if for every pair of distinct vertices u and v in G, there exists a Hamiltonian path between u and v in G. It is well known that the Hamiltonian path and cycle problems are NP-complete for general graphs [6], [17]. The same holds true for bipartite graphs [19], circle graphs [4], undirected path graphs [1], grid graphs [16], triangular grid graphs [7], supergrid graphs [12], and so on. In the literature, there are many studies in verifying the Hamiltonian connectivity of interconnection networks [3], [5], [8], [9], [10], [11], [18], [20], [21]. Recently, we have proved that rectangular supergrid graphs are Hamiltonian connected except one trivial condition [14].

The *two-dimensional integer grid graph* G^∞ is an infinite graph whose vertex set consists of all points of the Euclidean plane with integer coordinates and in which two vertices are adjacent if and only if the (Euclidean) distance between them is equal to 1. The *two-dimensional triangular grid graph* T^∞ is an infinite graph obtained from G^∞ by adding all edges on the lines traced from up-left to down-right. A *grid graph* is a finite, vertex-induced subgraph of G^∞. For a node v in the plane with integer coordinates, let v_x and v_y represent the x and y *coordinates* of node v, respectively, denoted by $v = (v_x, v_y)$. If v is a vertex in a grid graph, then its possible adjacent vertices include $(v_x, v_y - 1)$, $(v_x - 1, v_y)$, $(v_x + 1, v_y)$, and $(v_x, v_y + 1)$. A *triangular grid graph* is a finite, vertex-induced subgraph of T^∞. If v is a vertex in a triangular grid graph, then its possible neighboring vertices include $(v_x, v_y - 1)$, $(v_x - 1, v_y)$, $(v_x + 1, v_y)$, $(v_x, v_y + 1)$, $(v_x - 1, v_y - 1)$, and $(v_x + 1, v_y + 1)$. Thus, triangular grid graphs contain grid graphs as subgraphs. For example, Fig. 1(a) and Fig. 1(b) depict a grid graph and a triangular graph, respectively. The triangular grid graphs defined above are isomorphic to the original triangular grid graphs in [7] but these graphs are different when considered as geometric graphs. By the same construction of triangular grid graphs obtained from grid graphs, we introduced a new class of graphs, namely *supergrid graphs*, in [12]. The *two-dimensional supergrid graph* S^∞ is an infinite graph obtained from T^∞ by adding all edges on the lines traced from up-right to down-left. A *supergrid graph* is a finite, vertex-induced subgraph of S^∞. The possible adjacent vertices of a vertex $v = (v_x, v_y)$ in a supergrid graph include $(v_x, v_y - 1)$, $(v_x - 1, v_y)$, $(v_x + 1, v_y)$, $(v_x, v_y + 1)$, $(v_x - 1, v_y - 1)$, $(v_x + 1, v_y + 1)$, $(v_x + 1, v_y - 1)$, and $(v_x - 1, v_y + 1)$. Then, supergrid graphs contain grid graphs and triangular grid graphs as subgraphs. For instance, Fig. 1(c) depicts a supergrid graph. Notice that grid and triangular grid graphs are not subclasses of supergrid graphs, and the converse is also true: these classes of graphs have common elements (points) but in general they are distinct since the edge sets of these graphs are different. Obviously, all grid graphs are

Prototype of IoT Picking System

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***Abstract*— Usually manufacturers have a parts warehouse, preparation in the manufacturing process is where workers take out components one by one from the warehouse, because the components are not the same shape, human work cannot be avoided, it will spend a lot of time to perform the job. Therefore, this paper proposes a new prototype of picking system, to help worker's picking operations more efficient. This paper proposes to use IoT technology development prototype of picking system, The system electronically picks up information, and provide materials and picking list management system, the system can be transmitted to the terminal through the router information devices, including Arduino terminal devices to achieve, the router to achieve Raspberry Pi, the terminal installed in each counter Display the name of the material and the remaining quantity, the router is installed in each row of counters, responsible for the information forwarding when the counters. Besides, the location of materials which should be picked, will light signal, worker can follow the prompts pick up the location of materials, improve the efficiency of the worker picking.**

***Keywords*— Raspberry Pi, Arduino, RS-485, picking system, IoT**

1. INTRODUCTION

Nowadays, the popularization of high-tech products leads to the rapid development of manufacturing industry. Automated factories are a good example. Many manufacturing industries no longer produce single products. Many types of products and even different types of products can be produced in the same factory. Parts and materials are also very diverse, and as the factory expands in size, the material warehouse becomes larger and larger, making it harder to carry out picks and jobs, and the parts of different shapes and sizes are difficult to avoid manually Picking operations, and how to increase the efficiency of picking operations is a very important issue, Peter Baker, Marco Canessa[1] targeting this topic, Put forward the method of warehouse structure design. The basic factory material warehouse structure shown in Fig. 1, the traditional picking process is as follows:

(1) The worker receives picking list.
(2) Record picking start time.
(3) According to picking list, the worker picks up the materials in sequence.
(4) picking up a single material to be marked on the picking list once.
(5) pick up the completion of the need to re-mark the completion time.
(6) Return the picking list, and record the picking information.

Need to record picking information in the above process to facilitate the management of production time and the number of materials, many factories now electronic part of this to save time, However, the aforementioned third step is the most time-consuming, and picking operations due to the material volume Different shapes, it is difficult to avoid manual work, so this paper proposes a more efficient way to use Internet of Things technology to overcome the problem of picking efficiency.

Raspberry Pi and Arduino are common in IoT technology, low cost and scalability, as A.J.Lewis etc.[2] system and Sheikh Ferdoush etc.[3] use Raspberry Pi and Arduino with sensors to make environmental detection system, This is a very typical example, Raspberry Pi and Arduino also has some computing power and networking capabilities, Xuejun Yue etc.[4] also used these features to present the Industrial Cloud IoT system, this shows that these devices are suitable for use in the context of the IoT. This paper is also based on Raspberry Pi and Arduino, Fig. 1 is a schematic diagram of the warehouse shelf configuration. The system proposed in this paper needs to configure a Raspberry Pi as a router in each shelf, Each counter will be equipped with Arduino as a terminal, RS-485[5] between the

A Knowledge Management System to Support Engineering Design of Highway Construction Projects

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Abstract—**Construction engineering design is highly dependenton previous experiences and lessons. Former practice usually relies on experienced engineers in conducting thesetasks. Such a practice suffers not only in the leaks of knowledge due to leaves of experienced engineers, but also in the waste of cost and time required for the design work. The current research presents a knowledge management system (KMS) based approach, namely Engineering Design Assistant for Roads (EDA-Road), to support the engineering design work. A text mining technique using Vector Space Model (VSM) was adopted for document retrieval. Nine historical design cases with totally 1,683 engineering documents were collected as the knowledge base for conducting engineering design. A real world express highway design project was selected to test the feasibility of the proposed method. Finally, a questionnaire survey was conducted to evaluate the proposed EDA-Road. The approval rate reached 88% for system correctness and 86% for time benefit.**

Keywords— **Engineering design, highway construction projects, knowledge management system.**

1. INTRODUCTION

Engineering design of construction structures (including highways, bridges, tunnels, dams, airports, and buildings) plays the most critical role in building and civil engineering projects[1]. According to the prevailing practice in most consulting firms in Taiwan, there are 10 primary steps for conducting the engineering design work: (1) a principal department (PD) and a project manager (PM) is assigned to be responsible by the project sponsor; (2) the PM assigns a principal engineer (PE, usually a senior and experienced engineer) to take charge of the design work; (3) the assigned PE breaks down the work into design tasks for the associated departments (ADs) and the associated engineers (AEs) in ADs; (4) the managers of ADs assign the principal engineers of the ADs (PEAD) for the project; (5) the PEAD breaks down the assigned tasks for the associated engineers (AEs) in their department (AEAD); (6) the AEADs complete assigned design tasksand deliver outcomes to the PEAD; (7) the PEADs collect, verify the design results and wrap up the assigned design tasks, then deliver the finished works to the PE; (8) the AEs finish their assignments and deliver the finished works to the PE; (9) the PE wraps up the finished work and report to the PM; (10) the PM reports to the sponsor (or client) with the finished design work.

The aforementioned procedure for engineering design relies heavily on the experienced senior engineers both in the PD and ADs[2]. The design engineers (either the PEs or AEs in the PD and ADs) usually refer to previous design cases while they are performing the design tasks.Modifications are made to the preliminary design alternative according to the specific characteristics of the new project if necessary. If the new project is out of the scope of the historical cases, the design engineers have to find

Enhance the Competitiveness of Enterprises Using Product Segmentation Associations

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***Abstract*—With the development of science and technology, people will leave a lot of data unconsciously and form the environment of big data. As enterprises have to face many competitors and steep business models, in order to have more benefits, so the trend of big data has been caught. To extract the appropriate information from a pile of seemingly useless information to be analyzed and processed to form a value for the enterprise data has become the trend of enterprises to enhance competitiveness. In this study, the most valuable customers in the business will be identified through data analysis first of all. Then, the past transactions information of customers will be used, then the associations between the products will be found. Finally, a more accurate business marketing strategy will be provided.**

***Keywords*—E- commerce, marketing strategy, data mining, RFM, FP-growth, association rule**

1. INTRODUCTION

In recent years, with the development of science and technology, people will leave a lot of data unknowingly, forming a big data environment. Therefore, from a large pile of seemingly useless information, find suitable data for analysis, the formation of data that is beneficial to the enterprise, as a reference for enterprises to enhance competitiveness, it must be considered [6]. Especially, in the past few years, an explosion of interest in big data has occurred from both academia and the e-commerce industry [1].

According to the research of Wyner, 80% of the firm's profits come from 20% of its customers. And, to retain 5% of existing customers, the profits will be increase from 25% to 85% [18,29].

However, in today's society, it is impossible for enterprises to meet the requirements of each customer with limited resources. Only limited resources can be used to satisfy more valuable customers for the enterprise [28]. Therefore, the RFM (Recency, Frequency, and Monetary) data analysis technique is used by many enterprises. According to the score of RFM, customers are divided into different values, and different methods are used to analyze and give different marketing strategies.

However, in the past related researches, the RFM data analysis technique is used in different categories of products. However, because of the different nature of the products, the difference in the total value of the RFMs can be quite different. Such as Monetary will be higher and Frequency will be lower when buying and selling motorcycles. At this point if the sale of motorcycles is compared to consumables, then the total value of the sale of motorcycles will be ignored, but the sale of motorcycles is also important to the business. So, if RFM data analysis is performed only, messages from many important customers will be missed, resulting in less accurate follow-up analysis.

In this study, the product will be fragmented and clustered with products of the same nature. Next, RFM data analysis will be conducted to solve the above problem. Finally, the more valuable customers are analyzed, and the past transaction data are used to find out the association between the products. Finally, a more accurate business marketing strategy will be provided.

The remainder of this paper is arranged as follows: Section 2 illustrates the related works of this study. Our proposed research method is given in Section 3. The research steps are shown

Integration of Cultural Art and Technology – Using the National Taiwan Symphony Orchestra as an Example

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Abstract **–** Cultural art is a type of soft power, while technology is a type of hard power. The function of technology in the cultural arts is not to innovate, but rather to expand cultural art experiences using existing matured technologies in a digital era. For example, the development of virtual reality (VR), augmented reality (AR), 3D technology, artificial intelligence (AI), and other emerging technologies have provided new methods of interpreting and applying cultural arts. The integration of technology and culture has also revolutionized the cultural and creative industries. As a result, cultural competent authorities across the world have formulated national technology-led cultural development policies and adopted these policies as key governance objectives. Technology can be applied to reinforce cultural connotations, provide more opportunities for art education, and boost the cultural and creative economy. Taiwan's Ministry of Culture is actively collecting literature and trend strategies concerning the development contexts of culture-technology integration to formulate mid- and long-term directions and prospects for the development of cultural technologies.

The National Taiwan Symphony Orchestra (NTSO) completed the construction of the National Taiwan Music and Cultural Park in 2009 and opened its doors to the public. The NTSO has been responsible for music education and promotion for numerous years. To enable technologies to continue to expand in the field of cultural arts, the NTSO proposed a four-year technology plan focusing on classical music and using different technologies as auxiliary tools. The NTSO anticipates promoting classical music knowledge by providing interactive experiences, thereby highlighting the value of culture-technology integration.

Keywords – **Augmented reality, virtual reality, 3D instruments, somatosensory interaction device, cultural technology**

1. INTRODUCTION

The National Taiwan Symphony Orchestra (NTSO) was founded in 1945. It is Taiwan's oldest national symphony orchestra and the only orchestra affiliated to the central government (Ministry of Culture). In addition to touring Taiwan and providing high-quality performances, the NTSO is also involved in promoting Taiwan's musical and cultural arts, fostering musical talents, preserving music data, and providing music education. To promote music and cultural education, the NTSO announced the construction of the National Taiwan Music and Cultural Park based on Tanglewood in Boston, United States, in 2007. The park was officially opened for business in 2009. The facilities and spaces controlled by the NTSO were effectively modified and applied to provide a variety of musical experiences and lower the bar for learning classical music. The park transformed fine arts into everyday recreational and consumer activities and integrated these activities into people's leisure lifestyles. The National Taiwan Music and Cultural Park – a park that integrates music, culture, education, and recreation – has the only free music museum in Taiwan. The museum contains various instruments and video/audio facilities. Over time, the museum has become an essential venue for music education of elementary schools and junior high schools. Therefore, the museum is tasked with promoting and providing music education.

In recent years, the NTSO has digitized over 70 years of classical music materials. However, digital archiving is only the beginning. The broader objective is to create opportunities for people that have never set foot inside a concert

Use the Improved Extended Constellation Scheme to Reduce the Peak-to-Average Power Ratio of the MPSK-OFDM System

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***Abstract*— In recent years, orthogonal frequency division multiplexing (OFDM) systems have been widely used in communication systems due to their characteristics of high bandwidth efficiency and receptors with low complexity. High PAPR is a major deficiency of the OFDM technique, which not only generates out of band interference but also reduces the performance of high power amplifiers. Therefore, the constellation extension scheme (CES) and iterative flipping algorithm were combined in this paper (referred to as CES-Flipping), which reduced the high PAPR of the OFDM signals with M-ary phase shift keying (PSK) modulation. This paper also studied the five 8-point PSK signal constellations with CES to analyz their PAPR performance. By analyzing the simulation results of 100,000 randomly generated input data, the third 8-point PSK signal constellation with CES has better PAPR reduction performance than the others.**

***Keywords*—** M-ary PSK, OFDM, PAPR, CES, iterative flipping algorithm.

1. INTRODUCTION

In recent years, OFDM systems represented by multi-carrier systems have been widely used in communication systems because of their anti-frequency selective fading and bandwidth saving features, and the problem of high PAPR which led to the decreasing of radio frequency (RF) power amplifier performance and the increasing complexity problem of digital to analog converter (D/A) have also been explored several times and there are some relevant technologies have been proposed, such as block codes [1], partial transmit sequences (PTS) [2], selected mapping (SLM) [3], tone reservation (TR) [4] and tone injection (TI) [5] appear in an attempt to improve these problem. The block code encodes input information so that the codeword PAPR can be maintained within a limited range and error correction capability. Multiple signal representation (MSR) is a method of mapping input data into multiple candidate signals and selecting the signal with the lowest PAPR as the transmitted signal to improve the possible phenomenon of high PAPR for the transmitted signal. Both PTS and SLM are all belong to the MSR. TR divides the transmission subcarriers into two parts. One part of the subcarriers is used to transmit input data while another part is used to generate peak cancellation signals without (w/o) data transmission. TR uses the synthesis of the two parts of signals to generate a plurality of candidate signals and selects the signals with the lowest PAPR from the candidate signals as the transmission signals. As for the extended constellation scheme, the input data is transformed into a plurality of different constellation points to form multiple candidate signals, and then the signal with the lowest PAPR is selected from the candidate signals to be the transmitted signal.

This paper mainly aims at the reducing of high PAPR for Orthogonal Frequency Division Multiplexing (OFDM) system, and uses the improved CES technique and iterative flipping algorithm to simultaneously maintain the performance of improving high PAPR and low computational complexity specialty.

2. CONSTELLATION EXTENSION SCHEME

CES technique is a signal modulated by mapping in the constellation, the constellation symbol can be divided into two sets, one set without extended constellation points and another set with extended constellation points, named the

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Aquaculture Monitoring System Based on Internet of Things by Mesh Wi-Fi Access

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***Abstract*- In the age of Internet of Things, systems constructed from wireless sensing modules that measure environmental data have become the trend. It is not only accurate and timely, significantly reducing the cost of human resources. In this paper, we use Mesh Wi-Fi to build a wide range of high-speed wireless network environments. It offers a wide range of wireless sensing modules using Wi-Fi for data transfer. Whether it is low-volume sensing data or audio, pictures, video and other high-volume files, can have a high-speed Wi-Fi environment transmission. It meets the network needs of various monitoring systems. We actually set up this water quality monitoring system in a crawfish farm. The water measurement capabilities of this monitoring system include dissolved oxygen, ORP, pH and video surveillance. The system also provides a responsive web page for users to monitor data and video instantly.**

Keywords- Internet of Things, Mesh Wi-Fi, Wireless sensor, Aquaculture, Surveillance, Crawfish

1. INTRODUCTION

The Internet of Things (IoT) has been a topic of concern throughout the world in recent years, and the term "Internet of Things" was proposed by Kevin Ashton of the Massachusetts Institute of Technology's Automatic Identification Center in 1999. Because of the limited development of science and technology, the IoT has never been popularized. The concept of IoT: "Things" can communicate with the computer via the Internet, and things can communicate with each other. The European Commission even promoted the establishment of the "Alliance for IoT Innovation (AIOTI)" to support the innovation and growth of IoT.

The development of aquaculture industry in Taiwan so far, its key aquaculture technology recognized by the international community and attention. According to the statistics provided by the “Fisheries Agency, Council of Agriculture, Executive Yuan, (Taiwan, ROC)”, the output of Taiwan's aquaculture industry in 2016 totalled NT $ 33,975,945,000, which is one of Taiwan's major economic lifelines.

Among aquaculture technologies, the most important is the control of water quality. At present, white spot disease is a serious hazard to Taiwan's shrimp farming. Reference [1] shows As the temperature rises from 15 ℃ to 29 ℃, the latent mortality of white spot disease shrimp is 100%, so we can clearly see that the temperature change will cause the occurrence of white spot disease； Another example of a journal article in [2] shows that in the seawater of different temperature and same salinity, the common white shrimp seedlings were taken as the research object, the instantaneous oxygen consumption rate was measured, and the dissolved oxygen content was analysed. The results showed that temperature had an effect on the instantaneous oxygen consumption rate of white shrimp, and the dissolved oxygen content was not less than 3 mg / L.

Most aquaculture areas are large. Based on the demand for instant video surveillance, we adopted the Mesh Wi-Fi network architecture to meet the needs of high- volume and long-distance transmission. In the water quality monitoring section, the industrial-grade sensors are placed in water for a long time for precise dissolved oxygen, ORP, pH analysis. This study can make good use of IoT technology to replace the cost of human resources and to enhance the overall economic benefits of aquaculture.

2. RELATED TECHNOLOGIES

Developing Intelligent Physical Workload Evaluation System Based on Heart Rate Analysis

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Abstract—**Wearable devices application on developing ambient intelligence systems is a new trend of prospective study. This study combines Ergonomics and Ambient Intelligence in order to develop an intelligent workload evaluation system. This study currently focused on evaluating the workload of whole body physical tasks. The heart rate measurement device was applied to continuously collect the worker's physiological response during the work shift, and then the automatic evaluation program for judging whole body physical workload was tried to develop. The developed programs could read heart rate data, and then output: work time, rest time, average heart rate of work, relative heart rate of work, maximal acceptable work time, workload level, and suggested rest time. The real heart rate data in three work shifts were used to test the validity of the Methods 1, 2 and 3. Test results showed that Method 3 was more valid than Methods 1 and 2. The intelligent workload evaluation system developed with Method 3 will be able to save manpower and time cost for traditional field workload evaluation.**

Keywords—**Intelligent monitoring, cloud-computing, big data, physical workload**

1. INTRODUCTION

In the past, workers' oxygen consumption or heart rate at work was measured to assess physical load. First, the workers' average daily oxygen consumption or heart rate was estimated through work sampling, and next the experts interpreted the meaning of the data and put forward an assessment result. However, it takes a considerable number of experts and time to collect the data and assess the load. Wearable technology has become more mature gradually, and it now seems possible to solve the above-mentioned problems. Therefore, this research aims to adopt wearable technology as the device for monitoring and recording physical load continuously for a long time and to further develop the automation assessment technique of physical load. An illustration of the concept design was shown in Fig. 1. If this system is successful, it will be a brand-new breakthrough to prevent workers' accumulative occupational disease from occurring. Moreover, enterprises can understand the working load level in each operation area through this system, so as to adjust manpower allocation and make an effective use of human resources.

Fig. 1 An illustration of the concept design

2. METHODS

The important regulations and standards related to physical work have been described in the previous literature ([1]–[3]). Heart rate and RHR are considered as the indices, because they are easy to be measured; the sensing device is quite portable and is suitable for being worn a long time. In terms of assessment method, the wearable device was used to continuously collect the data of laborers' heart rate. The data were

PAPR Reduction of OFDM Systems Using Heuristic Optimization Algorithms-Based Segmentation Scheme of PTS Technique

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Abstract—To reduce the computation complexity while still obtaining the desirable peak-to-average-power-ratio (PAPR) reduction in orthogonal frequency division multiplexing (OFDM) systems, we introduce the harmony search algorithm (HS), an effective algorithm that solves various combinatorial optimization problems, to search the over all combinations of possible permutations of the subblocks with low complexity. In this work we present a novel convex optimization approach to numerically determine the partial transmit sequence (PTS) solution based on harmony search algorithm (HS-PTS) for PAPR reduction. Computer simulation results show that the proposed HSTI algorithm obtains the keeping good PAPR reduction with low computational complexity and processing time.

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Keywords—**Orthogonal frequency division multiplexing, Harmony search algorithm, Peak-to-average power ratio reduction, partial transmit sequence**

1. INTRODUCTION

Recently, 5G wireless communications [1-2] are attracting considerable attention worldwide. In the developing of 5G transmission techniques, Multicarrier faster-than-Nyquist (MFTN), also known as time-frequency packing (TFP), is a spectral efficient transmission scheme for future communication systems. While orthogonal frequency division multiplexing (OFDM) is a widely adopted MCM, it has certain limitations such as high signal peak-to- average power ratios (PAPRs), high spectral side lobes due to the use of rectangular time windows, and the need of complex multiplications even for applications using real signals. The major disadvantage of OFDM wireless systems is the high PAPR at the transmitter's output signal on different antennas. Furthermore, the high PAPR requires large dynamic range of the transmit power amplifier and reduces the power efficiency, and thus the cost of transmitter is increased and the battery life time is decreased [3].

In the paper, several algorithms of the subblock schemes have been recommended to tackle the high PAPR value. Recently, several types of the subblock partitioning schemes has been proposed to improve the PAPR lessening performance [4]. However, most of the previous studies do not take into account the computational complexity of the proposed algorithms. This paper introduces a new type of the subblock segmentation schemes for the PTS method to upgrade the PAPR decreasing performance with low computational complexity. The proposed algorithm can accomplish PAPR lessening capacity higher than two of the well-known segmentation schemes; adjacent and interleaving algorithms. Furthermore, the proposed algorithm has mathematical calculations lower than that of the pseudorandom and adjacent schemes [5].

This scheme is one of the most promising ones because it is simple to implement, introduces no distortion in the transmitted signal, and can achieve significant PAPR reduction. In this paper, we propose a novel solutions reduced-complexity PTS scheme for PAPR reduction and a novel method is developed to solve a close approximation of the optimum tone injection problem in OFDM systems. This approach is computationally efficient based on harmony search algorithm (HS) [6-8] solution through relaxation. This method can effectively reduce

Improvement on a blind signcryption scheme

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***Abstract*— Digital Signature can resolve the problem of messages and identities being tampered and feigned in digital communication, while the blind signature can further protect the users' anonymity under this basis. It makes people to convey their messages precisely accurate and anonymously through the Internet and to develop a variety of applications by this skill. Such as electronic commerce and electronic voting system, etc. The encryption of the blind signature technology combine the traditional PKI and the blind signature technology, it provides the blind signature further protection. After researching a previously encryption scheme of the blind signature, this paper discovers that the signer can find out the signature requester's identity through the data which was verified in public. That is to say, the signature requester's anonymity will be broken. In this manner, it won't achieve the features which the blind signature demands. In addition to indicate the deficiency of the anonymity of the blind signcryption scheme, the paper also proposes the technology to improve the weakness.**

***Keywords*— Signcryption, Blind signatures, E-cash systems, Public key infrastructure, Discrete logarithm problem.**

1. INTRODUCTION

The quick development of the digital communication made the way people convey messages gradually developed from initial paper to the internet. It has greatly reduced some costs of time and distance; however, it also brought some worries of security. No matter is the contents be stolen or be tampered during the communication. It may cause huge loss. Because of this, Whitfield Diffie and Martin Hellman proposed the concept of Public key cryptography [1] in 1976, which made people have a direction of design secret communication, then, they also proposed a variety of digital signature scheme by this concept [2-3].

With many commercial transaction become electronic, users value more and more on the demand of anonymity. Because of this, D. Chaum proposed the concept of the blind signature [4]. This form of digital signature demands signer to sign on the messages while he or she doesn't understand the specific content. That is to say, user has to blind the messages before he or she send the messages to the signers, then let them sign on it. During this process, the signer has no ideas about the content he or she has signed. By doing so, it can effectively protect the anonymity of the messages. Hence, a variety of the blind signature schemes have been proposed continuously [5-9].

The encryption of the blind signature technology [10-11] combine the traditional PKI (public key infrastructure) and the blind signature technology, it can provide the blind signature further protection because only receivers can decrypt it; therefore, obtain the blind signature and verify the authenticity. After researching Yasmine Abouelseoud's encryption of the blind signature technology [10], we can found that if we verified the blind signature in public, these outgiving data will make the signer to find out the signature requester's identity, which makes the blind signature scheme lost its anonymity that it supposed to have. In addition to indicate the deficiency of the anonymity of the blind signcryption schemes, I also propose the method to improve it in this article.

The arrangements of this article are below: chapter two is to analyze the features which the blind signature scheme demands and to introduce the encryption of the blind signature technology [10]; chapter three is to indicate how to break the anonymity of this scheme; chapter four is to propose the way to improve its mistake of the anonymity and to analyze the security of the blind

ERP Post-adoption: A case study of the factors influencing ERP System Benefits

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***Abstract*—Enterprise Resource Planning (ERP) has almost become the byword of enterprises informatization and integration in recent years. It takes high cost of an enterprise in ERP integration, and it is highly correlated to the enterprise operation procedures. Therefore, the influence on the operation of an enterprise after ERP integration into the operation procedure has become a critical issue concerned by the enterprises and the software service providers. However, rare studies focus on the possible benefits or derived problems after the ERP integration into an enterprise so far. This study, based on case-study method, mainly aims to explore the influence on the enterprise operation during and after the ERP system integration into a renowned enterprise in Taiwan. The study results show, during the ERP integration, the internal support from all operation levels, the departmental communication, coordination and participation of different business clusters, the employees' seniority and ERP study attitude, will all influence the ERP integration efficacy. Moreover, ERP integration will also derive many problems such as the subsequent maintenance agreement, authorization and system upgrade. All these problems will show significant influence on the ERP benefits. Finally, the study proposes related suggestions for the problems derived after ERP integration, with the aim to improve the ERP benefits for the enterprise.**

***Keywords*— ERP, ERP Related Research, System Integration**

1. INTRODUCTION

According to 2014 Annual Report on the Digital Content Industry released by Institute for Information Industry (III), the proportion of enterprise integrated with ERP system reached as high as 94%. also lists the ERP system construction in three industries, in which 94% of the responding enterprises have constructed ERP system. Condition and intention of adopting ERP system among industries in Taiwan integrated 94%, planning integrated 0.3%, and not consider 5.6%. Other also show the condition and intention of adopting IT solution in the wholesale industry if employees in the community from 25 to 99 people then integrated 91.9% and not consider 8.1%. or employees is greater than 100 people then integrated 92.9% and not consider 7.1% , the condition and intention of adopting IT solution in the retail industry if employees in the community from 25 to 99 then integrated 83.3%, planning integrated 7.1%, and not consider 9.5%. or employees greater than 100 people then integrated 88.3%, planning integrated 3.3%, and not consider 8.3%, and the condition and intention of adopting IT solution in the warehousing industry if employees in the community from 25 to 99 then integrated 63.2% and not consider 36.8% or employees greater than 100 people then integrated 82.1%, planning integrated 10.7%, and not consider 7.1%. [8]. Even if the ERP system are integrated into most industries, according to the "2017 ERP System and Enterprise Software Report" released by Panorama, 37% of the enterprises in 2016 still considered the benefits that ERP can bring is less than 50%. Moreover, 57% of companies indicated that they experienced the problems of operational disruptions. Shoe in table 1. [12]. As shown in the survey results of CIO journal during 2017-2018, the requirements for expansion of other systems based on ERP valued by the enterprises after ERP integration include: 17% for Business Intelligence(BI), 28% for customization, 12% for Customer Relationship Management and 32% for data analysis. [13]. All these imply it is necessary to explore the problems that might be possibly generated and derived after ERP integration into an enterprise,

Creating Sharing Economy of the Long-term Care from the Personal Side

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***Abstract*—The sharing economy of the long-term care from the personal side will create new commercial and social situations that would not have been thought of a generation ago. The operational definition for the long-term care is that requires a period of physical, mental and social care, it covers all age groups and includes self-care and caring for others. The purpose of this study is to discuss the main problems of the long-term care on three aspects, including practitioners, suppliers, and users. Then, some suggestions will be given through an innovative sharing economy model of the long-term care. This study hopes to offer a person-oriented for persons about the long-term care so that they will be able to apply their knowledge and skills to create sharing economy in the long-term care.**

***Keywords*—sharing economy, long-term care, personal side, knowledge and skills, creating**

1. INTRODUCTION

The rapid increase in sharing economy over the past three years has created commercial and social situations that would not have been thought of a generation ago. Currently, there are some sharing platforms for food, clothing, live, traffic and the technical services, especially the car, such as EatWith, Feastly, Traveling Spoon, love feast; clothing has RenttheRunway, PoshMark; living with Airbnb, short piglet Rent, DogVacay, Easynest; there are Uber, FlightCar, Lyft, Sidecar, Zipcar, Wheelz, Getaround, Netjets, PROP. Other technical services include TaskRabbit, ShareDesk, WeWork, SkillShare, Handybook, Instacart, ClassPass, Bitcoin Wi-Fi, Plenry, cloud-computing resource sharing and so on. From the above, there is little few sharing in the long-term care. Demiris said that "the sharing economy will introduce new opportunities and challenges" in the *Consumer Health Informatics* [6].

With the elder of the population and the globalization of the industrial development, the global economy has become an inevitable trend and, consequently, the demands of international personnel will increase year by year, especially for the long-term care. For example, in Taiwan, many foreign carers are needed from the other countries to assist the long-term care in the nursing institutions or at home. Some researchers have indicated that communicating with foreign caregivers is more important than communicating with foreign patients [3]. In some Nursing researchers, the contents of basic nursing education are needed to be a rethink, as well as the training of teachers who work in hospitals or schools [8]. From the above, the cross-culture communication is very important in the long-term care.

The operational definition for the long-term care is that requires a period of physical, mental and social care, it covers all age groups and includes self-care and caring for others. The purpose of this study is to discuss the main problems of the long-term care on three aspects, including practitioners, suppliers, and users. Then, some suggestions are given through an innovative sharing economy model of the long-term care.

The remainder of this paper is arranged as follows: Section 2 illustrates the sharing economy. The problems in the long-term care and suggestion are given in Section 3. Finally, conclusions are presented in Section 4.

2. WHAT IS SHARING ECONOMY

The sharing economy definition of the Oxford English Dictionary is "an economic system in which assets or services are shared between private individuals, either for free or for a fee, typically by means of the internet. [20]" The sharing economy comes in many forms, such as using information technology to share in goods

Research on the Dollar Value Averaging Investment Strategy Based on the Concentration of the Main Stock Market Chips of the Month- Taking the Top 10 of Taiwan's Stock Market as an Example

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***Abstract*—Based on the investment in Taiwan's stock market, the concentration of the main stock market chips of the month is used to make the research of dollar value averaging investment in this study. The top 10 Taiwan stock rights data from 2011 to June 2017 will be used as the basis for this study. And, net worth data at the close of the first business day of each month will be used. In the research, the simulated investment transaction will be analyzed and the investment strategy model will be constructed. Using the results of this study, the use of investment strategies by Taiwanese investors can be provided as a reference.**

Keywords—stock investment, investment strategy, dollar cost averaging, dollar value averaging, investment performance, stock market chips

1. INTRODUCTION

Personal spending predictions are sometimes optimistically biased because predictors focus on their current savings goals. Financial planning policies are compact rules of decision making that can be used as a guideline for personal financial management and allow quick decisions in the face of changing circumstances [5].

In this era, deposit rates are very low, if the money earned from work is only stored in banks and other financial institutions, personal wealth will be less and less in such a financial management. Deposit rates have been declining. The one-year time deposit rate was 9.25% in 1990, but only 1.035% was left until 2017 [8]. However, prices have been constantly rising, but the salary increase is far behind the skyrocketing prices. Making better use of earned money must be considered. Therefore, the choice of a good way to manage money is something that modern people must think in detail.

The "dollar value averaging investment strategy based on the concentration of the main stock market chips of the month (DVAMC)" is proposed in this study. The concentration of stock market chips is subdivided into ±0% ~ ±25% in the DVAMC. And, the principle of the same strategy and non-stop profit investment is simulated separately. Finally, the DVAMC is compared with the "dollar cost averaging" investment strategy to find a simple and relatively high return on investment strategy.

The remainder of this paper is arranged as follows: Section 2 illustrates the related works of this study. Our proposed research method DVAMC is given in Section 3. The research design is shown in Section 4. The research result is given in Section 5. Finally, conclusions are presented in Section 6.

2. RELATED WORKS

In this section, the dollar cost averaging, dollar value averaging, and the concentration of stock market chips investment strategies are illustrated.

Emotional expression of E-stickers and choosing intention

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Abstract

The purpose of this study aims to realize the emotional expression of E-stickers and choosing intention between the user groups. An on-line questionnaire was designed to collect relevant information. A total of 208 valid questionnaires were recorded (58.76% response rate) with 35.1% from men and 64.9% from women. The age distribution was 49.5% of 20-44 years old; 39.9% of them was above 45 years old and 33.6% was between 13 and 19 years old respectively. The results of this study indicated that age group have significant differences in emotional expression of happiness, anger, sad, fear, disgust, surprise and shame ($p<.05$). Gender effect affects the emotion expression in sad and fear ($p< .05$). It demonstrates that men don't use to present their sad and fear emotion by E-stickers than women. Moreover, there were significant differences between age groups to choosing intention ($p< .05$). Gender factors don't affect the choosing intention ($p> .05$). Age group between 20 to 44 years have higher E-stickers choosing intention than younger and older age groups. The primary findings of this study revealed that emotional expression of E-stickers and choosing intention between the user groups. These findings could provide useful information for further E-sticker and instant message software design.

Keywords: E-stickers, intention, instant message, emotion

1. INTRODUCTION

As the widespread use of Smartphone, the instant messaging and mobile instant messaging have become a major means of computer-mediated communication (CMC). Emoticon composing with punctuation marks, numbers and letters usually use to express a person's feelings or mood. The E-stickers which come from Emoticon animated and colour images express not only user's emotions but also display the emotional text, social situation, and social relationship. The purpose of this study aims to realize the relationship between E-stickers features and user's choosing intension.

Online interaction is common to transmit and receive information, thinking and feeling in daily life via a range of digital platforms. Scott Fahlman (1982) was the first user who posted the emoticon to express subjective emotion. Emoticons usually composing with punctuation marks, numbers and letters are used to express a person's feelings or mood.

For primary emotion, Goleman (1995) distinguishes eight primary emotions (happiness, anger, sadness, fear, disgust, surprise, shame and love) and indicates the different forms in which they can manifest in behaviour and interaction with others. Many studies assume that emoticons could compensate for the lack of nonverbal communication, such as facial expressions, intonation, gestures, and other context indicators (Krohn, 2004). However, the effects of characteristics of E-stickers influence choosing intension are still unclear. Therefore, this study aims to realize the relationship between E-stickers features (only facial or facial with gesture or facial with gesture and text information) and user's choosing intension.

2. METHODOLOGY

An on-line questionnaire (Survey monkey platform) were designed and applied to collect relevant information. Forty free E-stickers which extract from Line mobile messaging applications (Moon, James, Brown & Cony) were divided in to eight emotion including happiness, anger, sadness, fear, disgust, surprise, shame and love which was according to Goleman's classification. For each emotion, the relevant feelings were expanding as table 1. For happiness emotion

Determinants of Online Purchase Behavior: Integrating Perceived Website Complexity and Trust

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***Abstract*—The rapid development of the Internet has increased the number of users shopping online. Many sellers thus switch their focus from physical markets to online shopping environment. In this competitive environment, managers must understand factors that affect the online behavior of customers to increase and maintain their competitive. Therefore, this study aims to explore antecedents that affect online purchasing behavior. An online survey was conducted. 226 valid questionnaires from purchasers were collected. Analysis of the sample data showed that perceived component complexity and perceived dynamic complexity negatively affect trust; perceived coordinate complexity positively affects trust. However, online purchasing behavior does not affect by trust. These research results can be seen as references by future scholars and practical suggestions for platform managers to improve their business.**

***Keywords*—Online purchasing behavior; Trust; Perceived website complexity**

1. INTRODUCTION

The number of online shoppers has increased in recent years. Urhausen and Seybert [24] showed that in the past 12 months, more than 70% German and Finnish consumers have used the Internet to shop, and over 80% English users shop online. Clemes, Gan, and Zhang [2] indicated the Internet enables companies and consumers to interact with each other through electronic commerce. In the wake of the enormously profitable online market, the competition among shopping websites is keen. For shopping website managers, understanding the antecedents of online purchasing behavior is a pressing issue. Thus, the purpose of this paper is to explore antecedents that affect online purchasing behavior.

2. LITERATURE

2.1. Perceived Website Complexity

Perceived website complexity includes perceived component complexity, perceived coordinative complexity, and perceived dynamic complexity [17]. Perceived component complexity refers to the density and dissimilarity of information cues a user perceives in the task stimulus [17]. Perceived coordinative complexity refers to the interdependencies and range among different information groups a user perceives in the task stimulus [17]. Perceived dynamic complexity describes the ambiguity (number of different possible explanations of the same information cue) and uncertainty (clarity of action-outcome relationships) that individuals experience when executing a task [17].

2.2. Trust

Trust is the tendency to believe in others [21]. Hong and Cho [8] proposed that trust means the trustors are willing risk being hurt by the trustees. Hong and Cho [8] also indicated that with or without the ability to supervise the trustees, the trustors expect the trustees will not hurt them [8]. Ratnasingam [20] indicated that, due to the temporal and spatial distance between the sellers and buyers, trust plays an important role in purchasing decisions. Besides, Chiu, Hsu, Lai, and Chang [1] and Kim [10] argued that trust is an antecedent of purchasing intention and continuous usage of shopping websites.

3. HYPOTHESES

If a website has unclear shopping rules and excessive texts or pictures populating the website interface, users may have difficulty finding

License Plate Recognition for Moving Motorcycles

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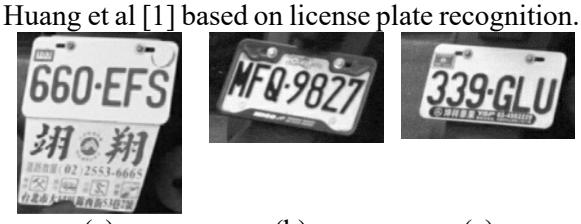
***Abstract*—Currently the license plate recognition technology has been widely used in daily life. It mainly detects the license plate characters by computer vision technology and identifies license plate characters. Common application scenarios such as parking lots and the like. The object of license plate recognition is usually stationary vehicles, a few are for the recognition of moving vehicles, and its application is subject to a certain degree of restrictions. Motorcycles in Taiwan occupy a relatively high proportion of vehicles, and motorcycle stability is far less than that of vehicles when moving, resulting in a more unfixed motorcycle license plate's sight angle when moving. Therefore, motorcycle license plates are more difficult to identify than vehicle license plates. In view of this, this study designed a license plate recognition system for a moving motorcycle. The system can be divided into three stages: The first stage of license plate detection In order to extract the license plate location in the image. The second phase license plate calibration is to deal with the moving license plate has not fixed tilt angle, as well as different location size and other issues. The third stage of character recognition is to extract the license plate characters, and the characters accurately identified. In order to achieve high accuracy and stability of the system, Euresys Open Evision, a computer vision library for industrial applications, was introduced to realize system functions. At present, the accuracy of system identification reaches above 95.5% with an average identification time of 73.4 ms, which achieves the purpose of identifying motorcycle license plates in progress.**

***Keywords*—Automatic license plate recognition, Euresys Open eVision, Edge detection, Image correction, OCR.**

1. INTRODUCTION

License plate recognition system is often used in parking lots or community vehicle management and other places, but its identification is mainly for stationary vehicles, it is difficult to identify the vehicle in motion. Motorcycles are one of the common modes of transport in Taiwan. However, stability of motorcycle is far less than that of automobiles when moving. Therefore, it is more difficult to identify the moving license plate numbers of motorcycles than cars. However, the following problems are identified: first, the advertisement under the license plate of the motorcycle will cause the incorrect license plate to be obtained as shown in Fig. 1 (a). The irregular license plate frame may not be able to obtain the accurate license plate edge as Fig. 1 As shown. The sticker on the license plate is connected with the license plate character, which will affect the result of the character recognition as shown in Fig. 1 (c). The problem of the unfixed position of the license plate, the unfixed position of the vehicle, the distance of different vehicles, etc. Recognition of the accuracy rate, resulting in the market for the moving motorcycle license plate recognition system is relatively rare, mostly still in the stationary license plate identification, Like Y.P. Huang et al [1] based on license plate recognition.



(a) (b) (c)

Fig. 1(a) Advertising under the license plate (b) Irregular license plate frame (c) License plate stickers and license plate font connected

Preliminary Survey of IoT Security

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***Abstract*— As Internet-of-Things(IoT) becomes more and more popular, the security issues follow behind and need to be settled urgently. This paper list some common security issues, and sort out the solutions of existing research to the security issues. In addition, the security of IoT framework will be evaluated according to the current application of IoT. The purpose of this paper is to point out the security issues of the existing IoT application, and introduce an assessment method of IoT framework**.

Keywords— IoT, authentication, security, threats.

1. INTRODUCTION

Internet-of-Things(IoT) is composed of the "Things" which have the ability to connect the Internet. They would be heterogeneous like sensors, controllers, smart phones, PC/NB, etc. The development of IoT is progressing with the wireless technologies and the semiconductor manufacturing process. The functions and the computing capability of IoT devices are increasing. Due to the limited of the market scale at the early stage of IoT development, most of the communication protocols are the existing Internet operation standard. However, the components of the Internet are the powerful server and the PC/NBs which are operated by humans. Under the environment, the operation benchmarks are formulated by human behaviors. For IoT devices which are limited by size, power, and computing capability, the operating discipline cannot be followed. The primary concern for constrained IoT devices is operating time, hence, the high computing requirement or high energy-consuming algorithms might be abandoned in many cases. However, the information security is based on the encryption technologies and algorithm which are difficult to crack and complicated. The compromise of the security technology at the early development of IoT caused these deployments lack of security protection, and incur lots of security crisis of IoT applications today.

2. ARCHITECTURE OF IOT

In this section, we describe the IoT architecture and the reference model of IoT architecture.

2.1 IoT Architecture

Typically, IoT is comprised of three basic layers as shown in Fig. 1, it consists of perception layer, network layer, and application layer.

Perception Layer

It is also known as the sensor layer. The major work in this layer is gathering, measuring and processing the data through the sensors. It senses the physical parameters and transmit the processed data to the upper layer.

Network Layer

It is also known as the transmission layer. The network layer receives the processed data from the device layer. And it decides the routes to transmit the data to devices, IoT hubs and applications.

Application Layer

It is also known as the business layer. The application layer receives the data from the network layer. It is responsible for analyzing data and providing the services according to the analyzed data.

2.2 IoT Reference Model

Despite IoT is comprised of the three basic layer mentioned above, there is still no standard model of IoT. Because IoT is an extension of the current technologies and the three-layer architecture is a simple classification from the existing technologies and there are too many

The Key Factors of Increasing the Number of Viewers in Live Streaming

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Abstract— **Live-streaming has become one of the most important audio-visual acts of users in Taiwan, and it has gradually become popular to enable people to interact with each other. According to available literatures, it is found that the audience's satisfaction, participation and consumption motivations can directly influence the audience's watching intention. However, most of related literatures still use qualitative models, questionnaires, and hypotheses to do study. Only few works attempt to find key factors of increasing the number of the audience. Therefore, this study aims to define the factors influencing watching intention of live-streaming by using text mining techniques and feature selection methods, including Decision Trees (DT) and Neural Network Pruning (NNP) to discover the key factors influencing users' watching live-streaming programs and help live-streamers to attract more viewers and keep watching. Support vector machines (SVM) will be employed to evaluate the performances of two feature selection methods.**

Keywords— **Live-streaming, Feature selection, Decision trees, Neural network pruning, Support vector machines.**

1. INTRODUCTION

Different from the traditional television programs of the past, live-streaming brings new interactions and viewing experiences. With the reduction of technical restrictions, the online live streaming program has a large amount of user generated content (UGC). The live-streaming program content is diverse and rich, and has gradually become one of the mainstream for audience watching. According to the FIND survey of the Institute of Information Technology Association, live-streaming has become one of the most important audio-visual acts of users in Taiwan. Mobile devices have also become one of the most important webcast media [1]. Among them, the earliest and most popular live-streaming is about games. Since 2011, Twitch has become one of the world's largest platforms of live streaming in games. In the United States, Twitch is now the fourth largest source of network traffic [2].

Webcasts based on user-generated content are services that allow anyone to broadcast a live video on the web. In recent years, many people have joined live-streaming. Under such circumstances, the live-streaming has gradually become popular to enable people to interact with each other [31]. Different views can be obtained by watching live streaming. For example, Sjöblom and Hamari [22] tried to explore and measure why so many people choose to watch others play games online, using five relevant and relevant factors. Sjöblom et al. [23] looked at how to get satisfaction from watching live online games related to the type of live games and types of live games.

In addition, during the live-streaming, viewers can choose whether or not to donate to the live-streamers at any time. They can also choose whether to subscribe to this live-streamer to increase the functionality on the platform, and the live-streamers can obtain additional revenue through live streaming which has also formed a new business model. Wan et al. [14] investigated social impact and technological factors on users' donate behaviours based on the social technology framework and dependency theory. Laeeq Khan [19] uses the U & G framework to analyse user motivation for engagement and spending on YouTube.

As with many of the above researches, it is found that the audience's satisfaction, participation and consumption motivations can

Proposing the Direct-Solution Versions of Fuzzy Yield Learning Models

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Abstract— **Forecasting the future yield of a product is a critical task to semiconductor manufacturing. However, the existing methods for yield forecasting are suffering from a common problem – the logarithmic or log-sigmoid value, rather than the original value, or yield is dealt with to simplify the computation. To address problem, in this study, the polynomial fitting technique is applied to approximate some fuzzy yield learning models with polynomial functions. As a result, the direct-solve (DS) versions of these fuzzy yield learning models are derived. The proposed methodology were applied to a real DRAM case to evaluate its effectiveness.**

Keywords— **yield; forecasting; direct-solve; chemical process**

1. INTRODUCTION

"Yield" is the percentage of jobs that were not scrapped owing to quality problems after manufacturing. Yield is a critical performance measure to many chemical processes. For this reason, a lot of researchers and practitioners have been endeavoring to improve yield in some way. Such endeavors were usually based on precise and accurate yield analyses. So far, statistics, simulation, mathematical programming (MP), fuzzy logic, and artificial neural networks (ANNs) have been the most prevalently applied yield analysis techniques. For example, Yang and Tjia (2010) tried to improve the yield of purifying an active pharmaceutical ingredient (API) using batch distillation modeling and engineering principles that were basically applications of statistics. Chen (2013) proposed a fuzzy collaborative intelligence (FCI) approach to forecast the yield of a semiconductor product, in which some experts configured fuzzy feed-forward neural networks to forecast yield. Subsequently, the maximal-consensus and radial basis function network approach was proposed to aggregate experts' forecasts. Eberle et al. (2016) established a four-step procedure to improve the yield of a pharmaceutical batch production process, in which statistical analyses were performed to fit the relationship between (loss) factors that detriment yield and yield. John et al. (2017) simulated the operation of the fluid catalytic cracking (FCC) riser of a modern refinery with various diameters to find out the diameter that optimized yield. In studying the reverse water-gas shift reaction, Parra et al. (2018) found that the moving-bed configuration was better than the fixed-bed operation in elevating the space-time-yield (STY). They also formulated a bi-objective MP model to find out the way to optimize STY and the adsorbent loading simultaneously.

As time goes by, an operator becomes more and more experienced. At the same time, a quality control engineer becomes more and more familiar with quality problems and possible ways to solve them. An equipment engineer eventually finds out the optimal setting of a machine. All these phenomena contribute to the improvement in yield that is usually described with a yield learning model. However, since the aforementioned activities all involve some extent of human intervention, there are considerable uncertainty associated with a yield improvement process, which calls for a probabilistic, stochastic, or fuzzy yield learning model that can handle such uncertainty. Among them, a fuzzy yield learning model has been widely adopted because of its easiness to compute or communicate and ability to incorporate in subjective judgments (Gruber, 1994; Chen and Lin, 2008; Chen, 2013).

Deep Learning Approach for SDN-based DDoS Intrusion Detection System

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***Abstract*— Software-defined networking (SDN) technology has emerged as a novel network architecture through the use of a managed software between the control plane and data plane. Researchers have proposed many solutions to enhance SDN for network security. Thus, how to detect the Distributed Denial-of-Services (DDoS) attack in more efficiency method is a challenging issue in SDN. In this paper, we present a deep learning approach for SDN-based DDoS intrusion detection system (IDS) to detect DDoS attacks based on the frequency of received packet-in messages in the SDN controller. Through simulations we demonstrate that the SAE+NN IDS deep learning model has the highest accuracy and shortest learning time.**

Keywords—SDN*、*Deep learning*、*IDS

1. INTRODUCTION

The intrusion detection system (IDS) of Distributed Denial of Service (DDoS)[1] for the software defined networks (SDN) is one of the most important challenge in nowadays. The main purpose of DDoS attacks is paralyzed the SDN controller by sending a large of junk packets or fake request packets in SDN which failing to complete other normal networks request.

The issue of the DDoS attack detection in the traditional network, it is difficult to detect the source IP from the large number of junk packets during the DDoS attacks. Usually, the source IP in the packet is spoofed, which make IDS difficult to trace the origin source IP from attack packets. On the other hand, the large number of junk packets with spoofed source IP address will causing the packet-in message request flood was sending from SDN switches to the SDN controller in the SDN, which will causing network performance degradation.

Therefore, a deep learning [2] approach for SDN-based DDoS detection system has been proposed in this paper to solve the DDoS issue in SDN. The SDN switch forwards the packet according to the flow table, and the flow table is controlled by the SDN Controller through the packet-in message mechanism. By extracting the packet information in the packet-in message, the collected information is sent to the proposed deep learning system to determine whether a DDoS attack occurs.

Most of traditional DDoS detection approaches focus on protecting the data plane were judged by the statistical values in the flow. However, the proposed SDN-based DDoS detection system in this paper will detect the DDoS attack in the beginning to make sure the attack packets has blocked before the flow was forwarded to the victim host.

This paper is organized as follows. In Section 2, we compare approaches similar to our method and briefly describe SDN and Deep learning. Section 3 describes how our detection method works. Section 4 presents our experiments and Section5 is our results. Section 6 concludes the paper and discusses future work.

2. RELATED WORK

2.1. Ryu/OpenFlow Overview

Software Defined Networks (SDN) uses the centralized management approach by divided the network into Control Planes and Data Planes for the network. The OpenFlow is one of network management protocols in SDN, which allows the SDN Controller to manage the SDN switch to change the network packet travel path.

Computer Vision Technologies Applied to Flaw Inspection of Optical Lenses

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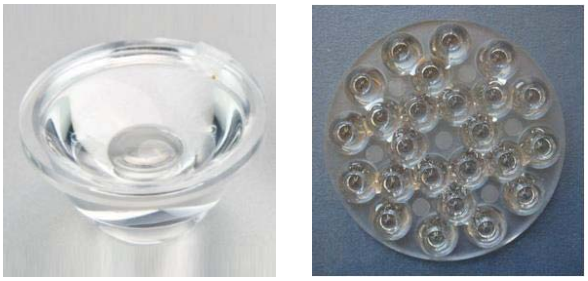
***Abstract* —An LED (Light-Emitting Diode) is a semiconductor device that emits visible light when an electric current passes through the semiconductor chip. The purpose of this study is to apply the block discrete cosine transform (BDCT), Hotelling T^2 statistic, and grey clustering method to detect visual flaws of LED lenses. An image with equal sized blocks is converted to DCT domain and some representative energy features of each DCT block are extracted. These energy features of each block are integrated by the T^2 statistic and the suspected flaw blocks can be determined by the multivariate statistical method. Then, the grey clustering algorithm is conducted to further confirm the block locations of the real flaws. Finally, a simple segmentation method is applied to separate the flaw areas. Experimental results demonstrate the flaw detection rate of the proposed method is better than those of current techniques.**

***Keywords* — Computer vision technology; flaw inspection; optical lens; discrete cosine transform; Hotelling statistic.**

1. INTRODUCTION

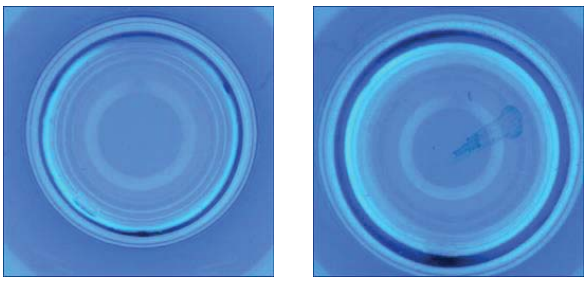
Compared with incandescent and fluorescent illuminating devices, LEDs have lower power requirement, higher efficiency, and longer lifetime. Typical applications of LED components include indicator lights, LCD panel backlighting, fiber optic data transmission, etc. To meet consumer and industry needs, LED products are being made in smaller sizes, which increase difficulties of product inspection. The functions of LED lenses include focusing, beauty, and protection to avoid the waste of light and light pollution. An LED without the assistance of lens focus function cannot project light to far distance. Therefore, LED lenses are invented to improve the light scattering problems of LEDs and they are widely applied to hand flashlights and traffic lights applications. Figure 1 shows the common LED lens and the LED lens array of car lamps.



(a) (b)

Figure 1 (a) A LED lens; (b) A LED lens array.

The lenses are round and transparent; the flaw to be inspected could be located on the external surface of the lenses or inside. A lens presents a certain thickness and a certain curvature, both of which vary. At times, lenses provide the same perceptive result as a magnifying glass, and the flaws are all the more difficult to track down and to locate in the area of the lens. The majority of flaws are not only very small but also they are extremely diverse and can assume various forms. Figure 2 shows LED lens images without and with visual flaws.



(a) (b)

Figure 2 (a) Flawless LED lens image; (b) LED lens image with flaw.

Currently, the most common detection methods for LED lens flaws are human visual inspection. Human visual inspection is tedious, time-consuming and highly dependent on the