

# PROGRAMME BOOK



**2019**


**IC2SE**

International Conference on Computer Science and Engineering

**Proceedings International Conference  
on Computer Science and Engineering**

**INDUSTRIAL REVOLUTION 4.0  
OPPORTUNITIES & CHALLENGES**

**26-27 April 2019  
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Padang, Indonesia**

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<b>CONTENTS</b>	<b>PAGE</b>
-----------------	-------------

ORGANIZING COMMITTEE OF IC2SE 2019 .....	1
--	---

**WELCOME MESSAGES & PROFILE**

President Of Universitas Putra Indonesia YPTK Padang .....	4
--	---

Rector Of Universitas Putra Indonesia YPTK Padang .....	5
---	---

Conference General Chair.....	6
-------------------------------	---

**ABSTRACTS**

Keynote Speaker 1 (IC2SE 2019).....	7
-------------------------------------	---

Keynote Speaker 2 (IC2SE 2019).....	8
-------------------------------------	---

Conference Schedule .....	10
---------------------------	----

Details Session Programme .....	11
---------------------------------	----

List Of Abstracts .....	20
-------------------------	----

## DETAILS SESSION PROGRAMME

**Friday, 26<sup>th</sup> April 2019**

Session 1, 1.30 – 03.30 pm Room 1, Ground Floor Session Chair: Dr. Mohd Khalit Othman		
Paper ID	Title of Paper	Author
2	Exploring the interaction's quality attributes of Mobile Government services	Abdulla Jaafar Mohamed, Mohd Khalit Bin Othman, Suraya Binti Hamid
6	Design of Bicycle's Speed Measurement System Using Hall Effect Sensor	Ratna Aisuwarya, Muhammad Azmi Riyan, Rahmi Eka Putri
54	Prediction of Corn Productivity in Indonesia as Anticipation Efforts to Import Using Backpropagation Neural Network	Anjar Wanto, Dedy Hartama, Risma Nurhaini Munthe, Pawan Darasa Panjaitan, Elfina Okto Posmaida Damanik, Agus Perdana Windarto
22	The Framework Accommodation of Systems Recommendation Via Social Media	Doni Ariyanto, Lukito Edi Nugroho, Adhistya Erna Permanasari
37	Practicality of E-Learning as Learning Media in Digital Simulation Subjects at Vocational School in Padang	Monica Fransisca, Yuliawati Yunus, Aminda Dewi Sutiasih, Renny Permata Saputri
Session 2, 04.00 – 05.30 pm Room 1, Ground Floor Session Chair : Billy Hendrik		
Paper ID	Title of Paper	Author
58	Designing a Multimodal Graph System to Support Non-Visual Interpretation of Graphical Information	Deni Setiawan, Bagus Priambodo, Mila Desi Anasanti, Al Hamidy Hazidar, Emil Naf'an, Inge Handriani, Asama Kudr Nseaf, Zico Pratama Putra
42	Breast cancer classification using digital biopsy histopathology images through transfer learning	Ghulam Murtaza, Liyana Shuib, Ainuddin Wahid Abdul Wahab, Ghulam Mujtaba, Ghulam Mujtaba, Ghulam Raza, Nor Aniza Azmi
49	Enhancement of OTP Stream Cipher Algorithm Based on Bit Separation	Arisman, Mahyuddin K M Nasution, Syahril Efendi
53	Online Management System of Praktik Lapangan Kerja (PLK) UPI YPTK Padang	Astri Indah Juwita, Muhammad Ikhlas
60	Implementation and Design User Interface Layout Use Leap Motion Controller with Hand Gesture Recognition	Billy Hendrik, Fauziah, Mardhiah Masril, Yunan Fauzi Wijaya, Silfia Andini.

Session 1, 1.30 – 03.30 pm Room 2, Ground Floor Session Chair : Associate Professor Dr. Maizatul Akmar Ismail		
Paper ID	Title of Paper	Author
12	Supplier Selection by Using Analytical Hierarchy Process (AHP) and Techniques for Order Preference Methods with Similarities to Ideal Solutions (TOPSIS)	Ikhsan Siregar
39	Prediction of Canal Erosion on Tidal Swamp Delta Telang I, Banyuasin Regency, South Sumatra	Achmad Syarifudin, Henggar Risa Destania, Yunan Hamdani
64	Disaster risk management strategy in the environment and disaster mitigation-based school (SWALIBA)	Sindhung Wardana , Herdis Herdiansyah , Adam Wicaksono
68	Smart IoT Flood Monitoring System	Shahirah Binti Zahir, Phaklen Ehkan, Thennarasan Sabapathy, Muzammil Jusoh and Mohd Nasrun Osman, Mohd Najib Yasin, Yasmin Abdul Wahab, Hambali and N. Ali, A.S. Bakhit, F. Husin, M.K.Md.Kamil and R. Jamaludin
73	Shallow Well Water Salinity Viewed from Distance Of Well To CoastLine And Ground Water Level Elevation In Purus Padang Village	M Chairi, W Purba, W Boy, R Imani, J Melasari
54	A Flexible UWB Antenna for 5G Applications	Syuhaimi Kassim, Hasliza A Rahim, MohammedFareq AbdulMalek, Soh Ping Jack, Muzammil Jusoh, Wee Fwen Hoon, Nur Syahidah Sabil, Nurulisma Ismail
Session 2, 04.00 – 05.30 pm Room 2, Ground Floor Session Chair : Rima Liana Gema		
Paper ID	Title of Paper	Author
75	Face Recognition and Age Estimation Implications of Changes in Facial Features: A Critical Review Study	Rasha Ragheb Atallah, Amirrudin Kamsin, Maizatul Akmar Ismail
81	Standard Operational Procedure Fund Distribution System of Zakat Infaq and Shodaqah for Zakat Foundations	Inge Handriani, Bagus Priambodo, Al Hamidy Hazidar , Mardhiah Masril, Zico Pratama Putra , Asama Kudr Nseaf, Emil Naf'an
77	Automatic System to Fish Feeder and Water Turbidity Detector Using Arduino Mega	H Hendri , S Enggari , Mardison , M R Putra, L N

<b>67</b>	The Application of Data Mining in Determining Patterns of Interest of High School Graduates	Dedy Hartama, Agus Perdana Windarto, Anjar Wanto
<b>36</b>	Model Development Measurement of Interests Based on Expert System	Erdisna, Ganefri, Ridwan, Rice Novita, Wanayumini

**Session 1, 1.30 – 03.30 pm**  
**Room 3, Ground Floor**  
**Session Chair : Halifia Hendri**

<b>Paper ID</b>	<b>Title of Paper</b>	<b>Author</b>
<b>43</b>	Bandit algorithms in information retrieval evaluation and ranking	Sinyinda Muwanei, Hoo Wai Lam, Sri Devi Ravana, Douglas Kunda
<b>38</b>	Analysis of Multiple Channel Multiple Phase System for Priorities Queuing Model (N-P) with Simple Adaptive Weighting	Herman Putra Rajagukguk, Muhammad Zarlis, Sutarmam
<b>28</b>	Application Of Ahp Analysis To Increase Employee Career Paths In Decision Support Systems	Julius Santony, Faisal Amir, Sumijan, Rice Novita
<b>23</b>	Text Mining For Hotel Classification Using Naïve Bayes Algorithm	Ahmad Afif, Lukito Edi Nugroho , Adhistya Erna Permatasari
<b>79</b>	Design Of Expert System For Diagnosis Damage Computer Hardware	Retno Devita, Eva Rianti , Sri Rahmawati

**Session 2, 04.00 – 05.30 pm**  
**Room 3 Ground Floor**  
**Session Chair : Dr. Azah Anir Norman**

<b>Paper ID</b>	<b>Title of Paper</b>	<b>Author</b>
<b>19</b>	Electronic Health Cloud as Service to Improve Collaboration in Healthcare Organizations	Shady Gomaa Abdulaziz, Norizan Mohd Yasin, Zeinab AlGamal, Asmaa Hateem and Kalaimagal Ramakrishnan
<b>35</b>	Expert Systems Diagnosing Of Banana Pests And Diseases Use Case-Based Reasoning Method With Android	Hezy Kurnia, Vicky Ariandi, Heriyanto, Yesri Elva
<b>11</b>	Technology Acceptance Among Older Adults With Mild Cognitive Impairment	Nita Rosa Damayanti, Nazlena Mohamad Ali, Ely Salwana Mat Surin



1	Decision Support System In Determining Structural Position Mutations Using The Simple Additive Weighting (Saw) Method	Aulia Fitrul Hadi, Randy Permana, Havid Syafwan
21	Design Chipless Textile Tag For RFID Application	Mirza Anuar, Lee Yeng Seng, M. S. Shakhirul, F.H. Wee, Hong Seng Gan, Muzammil Jusoh, Thennarasan Sabapathy, M.N. Osman

Session 1, 1.30 – 03.30 pm Room 4, Ground Floor Session Chair : Dr. Norizan Mohd Yasin		
Paper ID	Title of Paper	Author
03	A comparative analysis of detection mechanisms for emotion detection	Vimala , Marian Cynthia Martin, Wandeep Kaur, Amir Javed
55	Determination of the Shortest Route Towards the Tourist Destination Area Using the Ant Algorithm	Ni Luh Wiwik Sri Rahayu Ginantra , T , Gita Widi Bhawika , Ida Bagus Ary Indra Iswara , Anjar Wanto
18	Multiple Thresholding Methods For Extracting & Measuring Human Brain And 3d Reconstruction	Sumijan , Pradani Ayu Widya Purnama , Syafri Arlis
44	A Comparative Review of ISMS Implementation Based on ISO 27000 Series in Organizations of Different Business Sectors	Zaidatulnajla Hamdi , Azah Anir Norman , Nurul Nuha Abdul Molok
85	Improving the modelling of Robot Bunker with camera	Emil Naf'an , Riza Sulaiman , Nazlena Mohamad Ali , Bagus Priambodo , Al Hamidy Hazidar , Asama Kudr Nseaf , Zico Pratama Putra , Harry Theozard Fikri, Inge Handriani
Session 2, 04.00 – 05.30 pm Room 4 Ground Floor Session Chair : Rahmatul Husna Arsyah		
Paper ID	Title of Paper	Author
66	The Impact Analysis Of Flood Disaster In DKI Jakarta: Prevention And Control Perspective	Adam Wicaksono, Herdis Herdiansyah
08	Minimization of Palm Oil Losses on Sterilization Process by Optimization Boiling Pressure and Boiling time	Wetri Febrina , Yusrizal

13	Application of Theory of Constraints in Bottleneck Work Stations Optimization	Ikhsan Siregar
30	Designing Engineering Data Management System in Research and Development Company	Muhammad Nur, Luciana Andrawina
31	Risk Assesment of Housing Reconstruction Project Community-Based Construction after The Earthquake	Wendi Boy, Rafki Imani , Mayozi Chari
48	Industrial Revolution 4.2 Oppourtunity Challenges and Way Forward	Erry Yulian T. Adesta, Rudi Kurniawan Arief

**Session 1, 1.30 – 03.30 pm**  
**Room 5, Ground Floor**  
**Session Chair : Dr. Nor Liyana Shuib**

Paper ID	Title of Paper	Author
46	How Online Media and Technology Inovation Influence Consumer's Purchase Intention	Sitti Rizki Mulyani , Larissa Navia Rani , Dharma Syahrullah Ekajaya , Marta Widian Sari , Vivi Nila Sari
47	Development Database E-Costal For Fishermen's Assistance Program At Terengganu	Dara Aisyah Ali Puteh, Al Hamidy Hazidar , Muhammad Sontang Sihotang
52	Assessment for Seismic Activities in Pesisir Selatan West Sumatra in 2018	R Imani , W Boy , U Dewi , A Sari , W Purba , M Chairi, J Melasari
41	Interactive Map Model of Flat Design for Istano Basa Pagaruyung Tourism Development	T Wiraseptya , R Imani , H Yanto
29	Behavioural Intention to Use MYOB Accounting Aplication Among Accounting Students	Dwi Fitri Puspa, Desi Ilona, Zaitul

**Session 2, 04.00 – 05.30 pm**  
**Room 5 Ground Floor**  
**Session Chair : Dr. Vimala Balakrishnan**

Paper ID	Title of Paper	Author
17	The utilization of learning analytics to develop student engagement model in learning management system	Shahrul Nizam, Suraya Hamid , Haruna Chiroma

57	Backpropagation Neural Network Prediction For Cryptocurrency Bitcoin Prices	Rini Sovia, Musli Yanto ,Arif Budiman
62	Control System Of Microcontroller Based Automatic Milk Coffe Drink	Nofriadi ,Herman Saputra ,Juna Eska , Adi Prijuna , Nuriadi Manurung
24	Factors Influencing The Use Of M-Government Services From The Citizens' Perspective: Examining The Characteristics Of Adopters And Non-Adopters	J. Al-awj , N. Yasin , M. Khalit , S. Al-ammari ,N Kassim
98	Expert System For Disease Diagnosis In Cocoa Plant Using Android-Based Forward Chaining Method	Vicky Ariandi, Hezy Kurnia, Heriyanto, Hilda Mary
20	The Design of Sharia Housing Application In Padang City with CRM Concept	Hadi Syahputra, Raja Ayu Mahessya, Annisak Izzaty Jamhur, Ikhsan

Session 1, 1.30 – 03.30 pm Room 6, Ground Floor Session Chair: Dr. Suraya Hamid		
Paper ID	Title of Paper	Author
27	Social Entrepreneurship Learning Model in Higher Education using Social Network Analysis	Muhammad Hamirul Hamizan Roslan, Suraya Hamid, Mohamad Taha Ijab, Sarah Bukhari
14	Media Effectivity e- module Of Object-Oriented Programming II Based On Problem Based Instruction (PBI) Informatics Engineering Education Program, University Of Putra Indonesia YPTK Padang	Yulawati Yunus, Silky Safira, Monica Fransisca, Renny Permata Saputri, Aminda Dewi Sutiasih
61	Towards Data-driven Education with Learning Analytics for Educator 4.0	Salimah Mokhtar, Jawad A. Q., Ghassan O. A. Shahin
76	The Understanding of Lecturers about The New Literacy in Industrial Revolution Era 4.0: A Study case of University of Putra Indonesia YPTK Padang	Muharika Dewi, Yulia Retno Sari, Shally Amna, Rasmita, Rina Susanti
80	Impact of Learning Motivation, Cognitive and Self-Efficacy in Improving the Quality of Online Learning in the Industrial Age 4.0	Ramdani Bayu Putra, Elfiswandi, Muhammad, Sitti Rizki Mulyani , Dharma Syahrullah Ekajaya, Rio Andhika Putra

Session 2, 04.00 – 05.30 pm Room 6 Ground Floor Session Chair: Dr. Hoo Wai Lam		
Paper ID	Title of Paper	Author
26	The Impact of Age, Gender, and Educational level on the Cybersecurity Behaviors of Tertiary Institution Students: An Empirical investigation on Malaysian Universities	F B Fatokun, Suraya Hamid, Azah Anir Norman, J O Fatokun
77	Automatic System to Fish Feeder and Water Turbidity Detector Using Arduino Mega	Halifia Hendri, Sofika Enggari, Mardison, Muhammad Reza Putra Larissa N Rani
32	Digital Medical data protection compliance among medical staffs	Uning Pratimaratri, Desi Ilona, Zaitul
16	Internet of Things in Monitoring and Notification of Industrial Security Systems	Alkhairunas Riyuska, Julius Santony, Sumijan
15	Identification of Variables in Predicting Trends in Social Entrepreneurship	Nur Azreen Zulkefly, Norjihhan Abdul Ghani, Wajdi Alquliti
Session 1, 1.30 – 03.30 pm Room 7, Ground Floor Session Chair : Dr. Azah Anir Norman		
Paper ID	Title of Paper	Author
25	A Socio-Technical Mitigation Effort to Combat Cyber Propaganda: A Systematic Literature Mapping	Aimi Nadrah Maseri, Azah Anir Norman
70	Application Of Promotion, Map And Existing Tourism Information Systems In Solok Selatan District Using Androidjava Programming Language	Hari Marfalino, Larissa Navia Rani, Mardison, Ichsan Pribadi
10	The Kindness Behavior Management in Kindness Service Application Using Tree Structure	Luxfy Roya , Lukito Edi Nugroho , Adhistya Erna Permatasari
82	Expert System and Rule-Based Knowledge Based in Analyzing Vitamin Deficiency in the Human Body	Ruri Hartika Zain, Elmi Rahmawati
59	Predicting GDP of Indonesia Using K-Nearest Neighbour Regression	Bagus Priambodo, Sarwati Rahayu , Ahmad , Al Hamidy Hazidar , Emil , Mardhiah masril , Inge , Zico Pratama Putra , Asama Kudr Nseaf , Deni Setiawan
Session 2, 04.00 – 05.30 pm Room 7 Ground Floor Session Chair : Dr. Suraya Hamid		

Paper ID	Title of Paper	Author
5	Prediction of Malaysian stock market movement using sentiment analysis	Low Cheng Kuan ,Maizatul Akmar Ismail , Tasnim M. A. Zayet , Shuhaida Mohamed
56	Decision Support System For Mapping Types Of Timber And Number Of Products For Furniture Handling In The Main Work Service Using Ahp (Analytical Hierarki Process) Method In Increasing The Profits Of Production	Firdaus , Ade Saputra , Mondra Neldi , Ritna ,Novia Yolanda , Usman
80	Impact of Learning Motivation, Cognitive and Self-Efficacy in Improving Learning Quality Elearning in Industrial Era 4.0	Ramdani Bayu Putra, Elfiswandi , Muhammad Ridwan , Sitti Rizki Mulyani , Dharma Syahrullah Ekajaya , Rio Andhika Putra
50	Convergence Analysis of Acceleration and Generalization of E-Learning in the Manifestation of Globalization Education Readiness 4.0	Sitti Rizki Mulyani, Agung Ramadhanu , Desi Permata Sari , Rahmatul Husna Arsyah , Neni Sri Wahyuni Nengsih
97	Expert System Of Intrauterine Insemination	Firna Yenila, Yogi Wiyandra

**Session 1, 1.30 – 03.30 pm**  
**Room 8, Ground Floor**  
**Session Chair : Suparmi**

Paper ID	Title of Paper	Author
7	Exploring Topic Difficulty in Information Retrieval Systems Evaluation	Wei Ting Pang , Prabha Rajagopal , Mengjia Wang , Shuxiang Zhang , Sri Devi Ravana
71	The Effect of Lego Mindstorms as innovative educational tool: To develop students' creativity skills for Creative Society.	Mardhiah Masril , Billy Hendrik , Harry Theozard Fikri, Al Hamidy Hazidar , Bagus Priambodo , Emil Naf'an , Inge Handriani, Zico Pratama Putra , Asama Kudr Nseaf
78	Learning Satisfaction Analysis of Online Learning Readiness with Learning Culture and Character Strength as Antecedent Variables	Agung Ramadhanu , Ramdani Bayu Putra, Hadi, Rahmatul Husna Arsyah , Desi Permata Sari
33	Technology Context and Social Media Adoption Among Small-Medium Enterprise	Desi Ilona, Zerni Melmusi , Hanna Pratiwi, Padang, Indonesia), Zaitul
34	Statistical Software Adoption Behaviour Among Undergraduate Students	Zaitul , Sitti Rizki Mulyani , Muhammad Ridwan , Desi Ilona

Session 2, 04.00 – 05.30 pm Room 8 Ground Floor Session Chair : Associate Professor Dr. Sri Devi Ravana		
Paper ID	Title of Paper	Author
04	Startup Learning Path (SLP): A Learning Model for Startup Employees Using Agile Learning Approach	Egi Endeska Putra, Ridi Ferdiana, Rudy Hartanto
84	Fuzzy Logic Applications To Predict Total Production PKO (Palm Kernel Oil) In PT AAI Pasaman Method Using Web Based Tsukamoto	Devia Kartika, Mutiana Pratiwi, Rima Liana Gema
51	Strengthening Character Education with the Implementation of Machine Learning in the Millennial Era Industrial Revolution 4.0	Ulya Ilhami Arsyah , Rahmatul Husna Arsyah , Mutiana Pratiwi , Novia Lestari
83	Analysis of the Factors Affecting the Quality of Palm Oil Using the Analytical Hierarchy Process Method	Nugraha Rahmansyah , Shary Armonitha Lusinia, Rima Liana Gema
95	Analysis Of Electronically Reconfigurable Beam Steering Antenna Array Using Phase Shifter Technique	Soh Jen Neei, Muzammil Jusoh, Thennarasan Sabapathy, Samir Salem Al-Bawri, M.N. Yaasin, Tariq Abd Latif, Mahmud A. M. Albreem
Session 1, 1.30 – 03.30 pm Room 9, Second Floor Session Chair : Abulwafa Muhammad		
Paper ID	Title of Paper	Author
86	A Compact MIMO Planar Inverted-F Antenna	Najwa , Mohamed Nasrun Osman , Muzammil , Thennarasan Sabapathy, Thennarasan Sabapathy , M.M. Azizan, Tarmizi Ali
87	Transparent Encryption Technique for Trusted Computing	Gushelmi, Abdullah Mohd Zin
89	University Student Satisfaction Analysis on Academic Services by Using Decision Tree C4.5 Algorithm (Case Study : Universitas Putra Indonesia “YPTK” Padang)	Febri Aldi, Anita Ade Rahma
90	Analysis System of Occupational Health and Safety In coal Underground Mining	Heri Prabowo, I Prengki, A Amran
91	OLAP Approach in Searching Manufacturing Industries in West Sumatera	Eka Praja Wiyata Mandal, Dewi Eka Putri, Dede Wira Trise Putra, Dio Prima Mulya
Session 2, 04.00 – 05.30 pm Room 9 Second Floor Session Chair : Aggy Permana Gusman		

<b>Paper ID</b>	<b>Title of Paper</b>	<b>Author</b>
<b>92</b>	Setiment Analysis And Opinion Mining On Tax	Nurul Misyani Binti Mohd Rafie, Kasturi Dewi Varathan, Mohammad Shafenoor Amin
<b>93</b>	Model Of Artificial Neural Networks In Predictions Of Corn Productivity In An Effort To Overcome Imports In Indonesia	Anjar Wanto, Dedy Hartama, Gita Widi Bhawika, Deswidya Sukrisna Hutauruk, Pinondang Hotria Siregar, Ricard Fredrik Marpaung, Salim Efendi, Rusmin Saragih, Imeldawaty Gultom, Agus Perdana Windarto
<b>94</b>	Radiation Pattern Reconfigurable Fm Antenna	Barath, Thennarasan Sabapathy, Muzammil Jusoh, Samir Al-Bawri, M.N. Yaasin, Mohamed Nasrun Osman, Hasliza Abd Rahim
<b>96</b>	Expert System Delayed Walking In The Toddler	Yogi Wiyandra, Firna Yenila, Hezy Kurnia, Suci Wahyuni, Ratih Purwasih
<b>99</b>	Smart Irrigation System Based On Internet Of Things (Iot)	Nurulisma Ismail, Sheegillshah Rajendran, Wong Chee Tak, Tham Ker Xin, Nur Shazatushima Shahril Anuar, Fadhil Aiman Zakaria, Yahya Mohammed Salleh Al Quhaif, Hussein Amer M. Hasan Karakhan, and Hasliza A. Rahim
<b>45</b>	Analisy of the Health Service Quality Improvement Toward Patient Satisfaction Member of BPJS Grade III at Regional Public Hospital (RSUD) Pariaman by Using Importance Performance Analysis and Quality Fuction Deployment Quality	Vicky Brama Kumbara, Fitri Yeni, Rio Andika Putra, Dori Mitra Cendana, robbly Dharma

## Hybrid cryptography and steganography method to embed encrypted text message within image

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**Abstract.** The businesses in various fields use the online communication application to gather their data and information with local and global sources. The gathered data may sensitive such as the financial and businesses development information. The hackers or online thief try to stole the valuable data i.e. credit card numbers. The organizations looking for secure online channels in order to transfer their data efficiently and avoid the data thieving. One of the most applicable methods that developed to secure the online transferred data is the cryptography which transfers the original data or information to encrypted formulation. Cryptography still has many drawbacks such as stole and decrypts the original texts using automatic decryption counter. The main aim of this research is to improve the cryptography securing level using supportive method which is Steganography. The Steganography is the processes of hide the data or information in media files such as video, images and audio files. There are four stages represent the methodology of this paper; (1) encrypt the original texts using RSA algorithm, (2) hide the encrypted texts in Image files, (3) extract the encrypted texts from Image files, and (4) decrypt the original texts using decryption key of RSA algorithm. It is expected to improve the security level of the online transferred textual data. The performance of the final results will be evaluated through compare the Image files quality before and after hide the data in these files. The quality of the original and stego Image files need to be same or near in order to maximize the difficulty of detect that there data hide in these files.



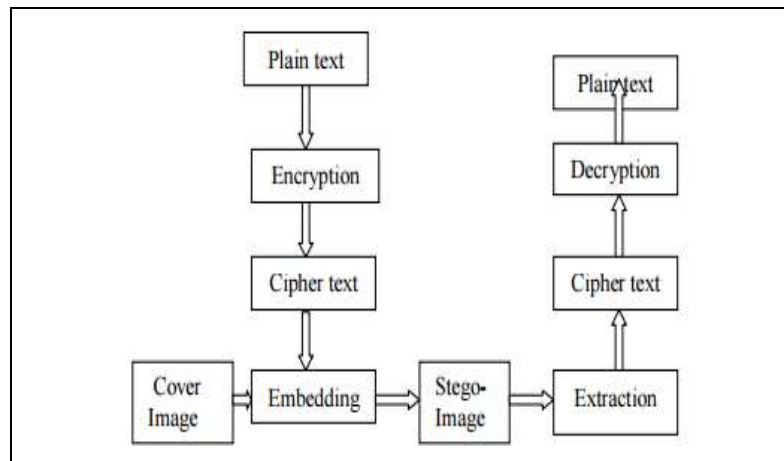


## 1. Introduction

This Nowadays, the internet and communication applications provide many advantages such as transfer the data and information at real time and online conferences [11;21]. This wide increasing in the online applications in various fields such as financial, government and social fields maximize the importance of secure the channels that used to transfer the data through internet network [20; 17]. Therefore, these applications are necessary to improve the businesses of various fields. However, the data and information security is one from the most challenges that face the organizations that need to transfer sensitive or private data online. According to [13;22;23], the number of hackers or online data thief increased rapidly in the last years. The hackers focus on stole the sensitive data such as credit cards numbers and organizations secrets. Thus, the organizations always afraid from the security level of data transferring channels.

Cryptography is playing a major role in data protection in applications running in a network environment that used to secure the online transferred data [18; 2]. The cryptography allows people to do business electronically without worries of deceit and deception in addition to ensuring the integrity of the message and authenticity of the sender [12]. It has become more critical to our day-to day life because thousands of people interact electronically every day; through e mail, e-commerce, ATM machines, cellular phones, etc. This geometric increase of information transmitted electronically has made increased reliance on cryptography and authentication by users [9].

The main weakness of cryptography method is that the hackers can detect the encrypted messages and try to decrypt these messages through many ways such as automatic counters or random tests based on mathematic calculations [4]. Therefore, the cryptography method still has security drawbacks i.e. only depend on decryption keys. The main question is how to improve the cryptography security level of the online transferred texts? According to [7], cryptography method could be improved using supportive another security method such as Steganography method. The Steganography method is one form the most supportive methods that can improve the security level of cryptography method. Both of these methods can be integrated efficiently to provide high level of online data security [7]. The Steganography can be defined as the method of hide the data and information in media files such as images, audio files, or video files [1; 26]. The main aim of Steganography is to maximize the difficulty of detect the encrypted data that transferred online [1]. Therefore, the encrypted data can be hidden in media file before send this file through online application [24]. The receiver can extract the encrypted data from the media file and decrypt the data using the secret keys. Thus, the hackers will face difficulty to discover encrypted data the transferred online. Cryptography and Steganography are well known and widely used techniques that manipulate information in order to cipher or hide their existence respectively [27]. Steganography is the art of communicating in a way which hides the existence of the communication. Cryptography scrambles a message so it can't be understood; the Steganography hides the message so it can't be seen. Even though both cryptography and steganography methods provide security, but combine cryptography and steganography in to one system for better security and confidentiality [25].

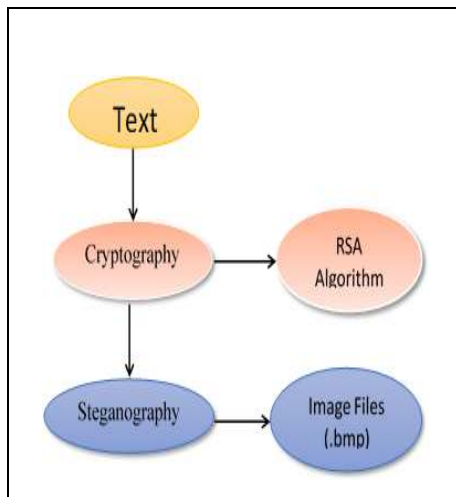


**Figure 1.** Combination of Cryptography and Steganography.

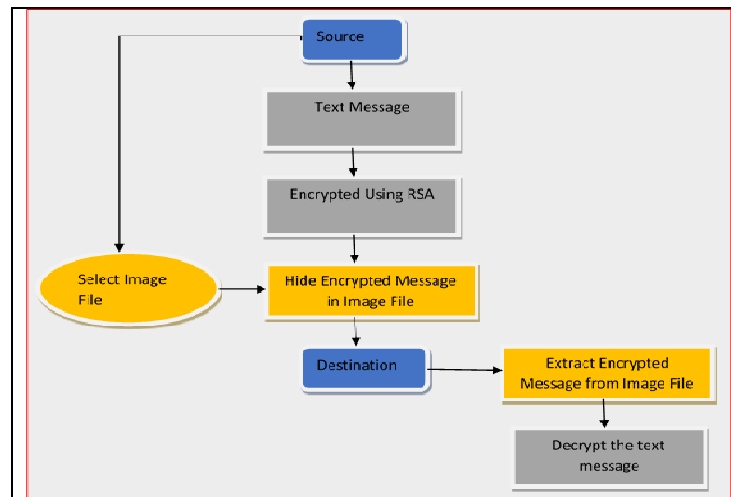
Therefore, the main objective of this research is to develop hybrid security system using cryptography and Steganography methods through hide the encrypted texts data in Image files that transferred online between two points.

## 2. Methodology

The main scope of this paper is securing the texts data using cryptography and Steganography methods. The data will be encrypted using RSA Algorithm. On the other hand, the encrypted data will be hidden in Image files of (.bmp) extension. Figure 2 illustrates the research paper scope. While, Figure 3 illustrates the research paper model. There are four main stages of the methodology which are as the following (1) Encrypt the text data using RSA through and generate the encryption keys. (2) Hide the encrypted data using Image files. (3) Extract the encrypted data from the Image files. (4) Decrypt the text data using the decryption key.



**Figure 2.** Research Scope.



**Figure 3.** Research paper methodology.

### 2.1. Cryptography

According [16; 1], cryptography is the method of writing using secret styles or codes. The original text can have transferred to cipher-text using secret keys or codes. Thus the original texts structure and representation will be changed to ambiguous texts. The processes of transfer the original text to cipher-text called encryption. The decryption is the processes of transferring from cipher-text to original texts. Also, the decryption needs secret code or keys to extract the original texts.

### 2.1.1. RSA Algorithm.

[14] mentioned that, RSA is one from the most popular encryption algorithms. RSA considered as asymmetric cryptography method [14]. Thus, the encryption and decryption processes need independent keys based on RSA. The RSA algorithm can be used for both key exchange and digital signatures. Although employed with numbers using hundreds of digits, the mathematics behind RSA is relatively straight-forward. To create an RSA public and private key pair, the following steps can be used:

- Choose two prime numbers,  $p$  and  $q$ . From these numbers we can calculate the modulus,  $n = p * q$
- Select a third number,  $e$ , that is relatively prime to (i.e. it does not divide evenly into) the product  $(p - 1) * (q - 1)$ , the number  $e$  is the public exponent.
- Calculate an integer  $d$  from the quotient  $\frac{(ed-1)}{((p-1)(q-1))}$ . The number  $d$  is the private exponent.
- The public key is the number pair  $(n, e)$ . Although these values are publicly known, it is computationally infeasible to determine  $d$  from  $n$  and  $e$  if  $p$  and  $q$  are large enough.
- To encrypt a message,  $M$ , with the public key, creates the cipher text,  $C$ , using the equation:  $C = M^e \text{ Mod } n$
- The receiver then decrypts the cipher-text with the private key using the equation:  $M = C^d \text{ Mod } n$

### 2.2. Steganography

Steganography is the art of hiding the fact that communication is taking place, by hiding information in other information. It is the art of concealing a message in a cover without leaving a remarkable track on the original message [15; 3; 19]. Currently, Steganography is the processes of hide the digital data and information in media files such as video, audio, and images files [5]. The sender hide the data using media files and the receiver can extract this data using stego applications to import and export the data in/from the media files [6; 10] Image files lend themselves to exploitation particularly well, which we will explore throughout this project. Focus will primarily be on bitmap formatted images.

#### 2.2.1. Least Significant Bit.

One A digital image consists of a matrix of color and intensity values. In a typical gray scale image, 8 bits/pixel are used. In a typical full-color image, there are 24 bits/pixel, 8 bits assigned to each color components. Least significant bit (LSB) insertion is a common, simple approach to embedding information in a cover image. The least significant bit in other words, the 8th bit of some or all of the bytes inside an image is changed to a bit of the secret message. When using a 24-bit image, a bit of each of the red, green and blue color components can be used, since they are each represented by a byte. In other words, one can store 3 bits in each pixel. An  $800 \times 600$ -pixel image, can thus store a total amount of 1,440,000 bits or 180,000 bytes of embedded data. For example, a grid for 3 pixels of a 24-bit image can be as follows:

```
(00101101 00011100 11011100)
(10100110 11000100 00001100)
(11010010 10101101 01100011)
```

When the number 200, which binary representation is 11001000, is embedded into the least significant bits of this part of the image, the resulting grid is as follows:

```
(00101101 00011101 11011100)
(10100110 11000101 00001100)
(11010010 10101100 01100011)
```

Although the number was embedded into the first 8 bytes of the grid, only the 3 underlined bits needed to be changed according to the embedded message. On average, only half of the bits in an image will need to be modified to hide a secret message using the maximum cover size. Since there are 256 possible intensities of each primary color, changing the LSB

of a pixel results in small changes in the intensity of the colors. These changes cannot be perceived by the human eye - thus the message is successfully hid-den. With a well-chosen image, one can even hide the message in the least as well as second to least significant bit and still not see the difference [8].

### 3. Model Validation/Verification using software

Using hybrid encryption and steganography, provides the user a convenient way to transmit and exchange data from one place to another in a safe manner that prevent an attacker from accessing on the secret information. This software typically makes the task of encrypting/decrypting and data hiding smoothly and reliably, compared to the traditional ways. The software should ease the encryption and data hiding activities. It should be user friendly and highly secured. The software will respond to the user commands depending on the types of commands issued by the user. We believe that the developed software will be more reliable, more secured, more robust, attractive and easy for the users. The figure below describes the architecture of the software. This figure is divided into two parts. The first one Figure 4 defines the process from the sender side, which includes specifying the secret message to encrypt and hide within the cover file. The second part Figure 5 represents the recipient side where the recipient attempts to retract and decrypt the secret message.

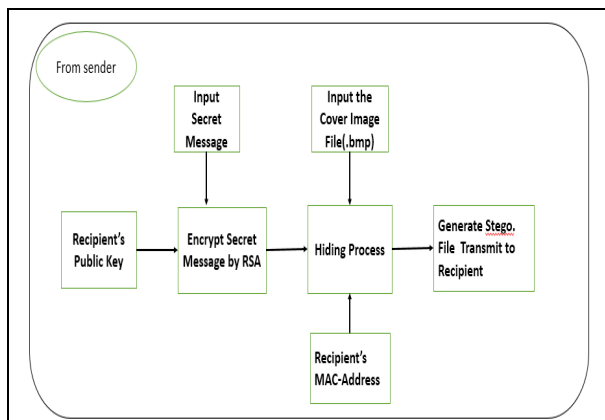


Figure 4. Architecture of the Software at a sender.

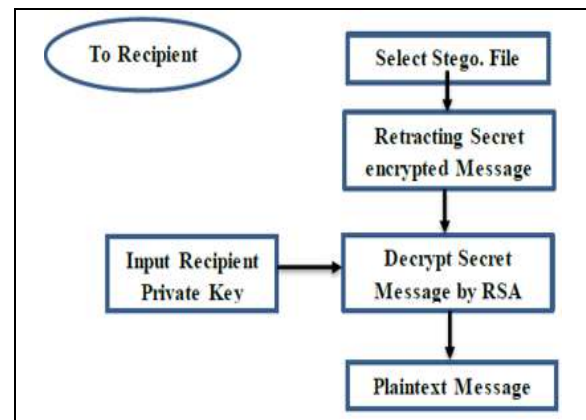


Figure 5. Architecture of the Software at a recipient.

### 4. Experimental Results

Brief results of the implementation of the various phases of the software: There are two keys that important in this process, namely: public  $e$  and private  $d$  keys. These created keys depend on the following variable  $p$  and  $q$ , where the values of these variables consist of prime numbers. The values of  $p$  and  $q$  have chosen randomly with no need to be entered by the user to be easy and more secure. Generally, through the value of  $p$  and  $q$ , the system will compute and show the value of  $n$ , where this value comes from  $(p \times q)$  and represent the part of the public key. On the other hand, also calculates the value of  $\phi$  through  $(p-1) \times (q-1)$ , where this value represents the number of integers less than  $n$  and relatively prime to  $(n)$ . For example, suppose the values of a recipient will be getting after he click on the button of generate keys as illustrated in Figure 6. Where we see the recipient got the values which are; *public key* = 18A1,  $n$  = 4ED, *MAC-address*= 904CE53E2897 and *private key* = 8DEC9. After the sender receives the public key,  $n$  value and MAC address from the recipient becomes able to manage the encrypting and hiding process through available selection Encrypt button on the interface that is prepared for this purpose The sender will determine many inputs that are needed to perform this process by insert the public key  $e$ , value  $n$  and MAC-Address of the recipient. The both public key  $e$  and value  $n$  of the recipient using to encrypt message by RSA algorithm, but the MAC-Address of the recipient hide in the cover file to verify from the Recipient. After the termination

of insert keys, insert the secret message to encrypt, sender will click on *encrypt button* to execute encrypting of the secret message and can see the cipher text in the encrypted message list box, as shown in Figure 7.



Figure 6. Generation Key Process.

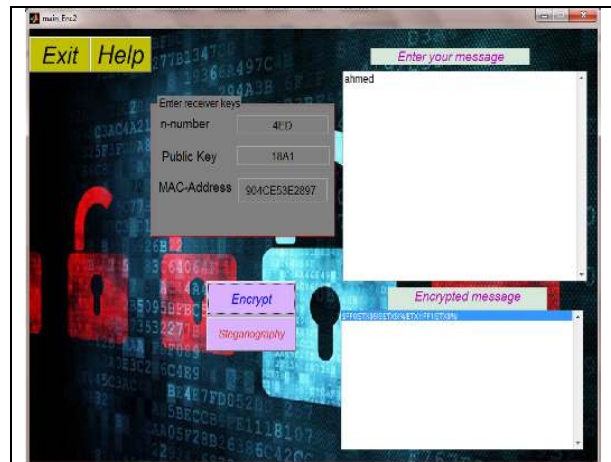


Figure 7. Encrypt Process at a sender.

However, Determine Image file; through the browse option. After the termination of all the above steps, sender will click on steganography button to execute hide cipher text inside the cover file (Image file) after the progress of the processes is completed, a message will be viewed to indicate the success of this process, as shown in Figure 8 describes selecting Image file to hide encrypted message; Figure 9 steganography was completed.

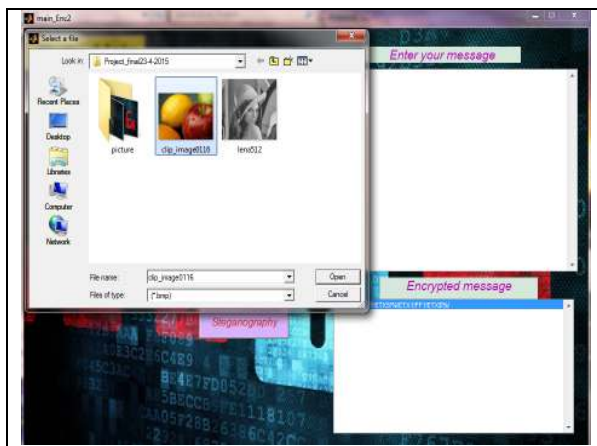


Figure 8. Selecting image file.

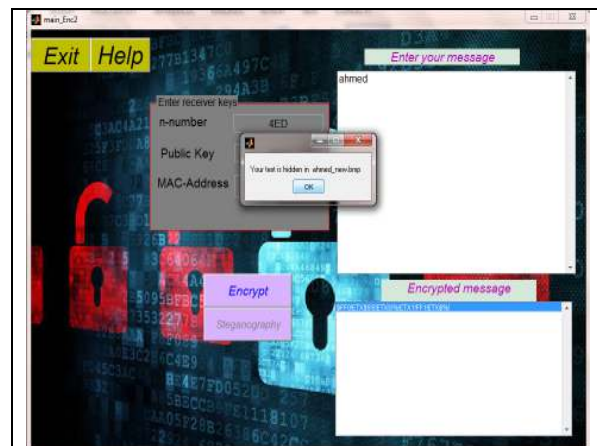


Figure 9. Embedding Process Completed.

Finally, the stego file that is produced which includes the cipher text became ready to be sent to recipient via transmitted channels. How-ever, implement of retracting and decrypting processes at the recipient site after received encrypt-stego file from the sender. The recipient will select decrypt and retract interface that is prepared for this purpose the recipient will determine many inputs to perform this operation, through determining the stego file is by clicking recover text button to choose the desired file, as shown in Figure 10. The software automatically check on the MAC-Address for receiver, if it is true continue process, if not true will be display message no hide message. After that, Insert the private key d to use for decryption the secret message through the use of RSA algorithm, as shown in Figure 11. After the process progress is completed, we will see the secret message after clicking decrypt button.

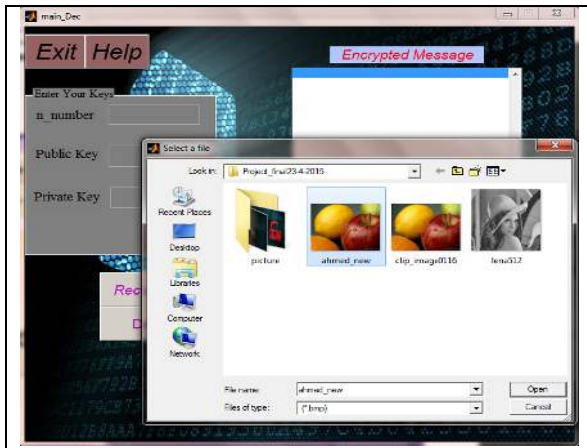


Figure 10. Specify the Stego File.

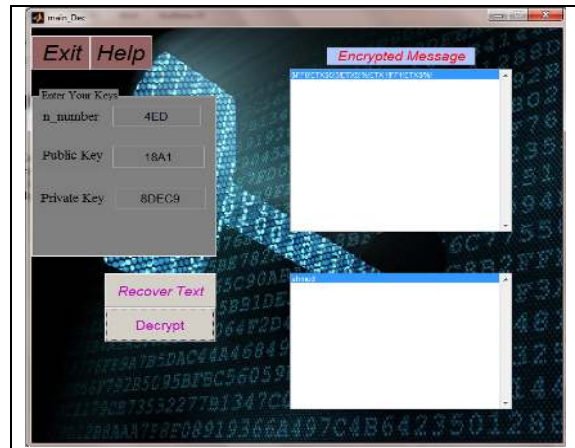


Figure 11. Complete the Decrypt process.

### 5. Result Discussion

The Mean Square Error (MSE) and the Peak Signal to Noise Ratio (PSNR) are the two error metrics used to compare image compression quality. The MSE represents the cumulative squared error between the stego Image and the original image, whereas PSNR represents a measure of the peak error. result discussion The lower the value of MSE, the lower the error.

$$MSE = \frac{\sum_{M,N} [I_1(M,N) - I_2(M,N)]^2}{M * N} \tag{1}$$

To compute the PSNR, the block first calculates the mean-squared error using the following equation: In the previous equation, M and N are the number of rows and columns in the input images, respectively. Then the block computes the PSNR using the following equation:

$$PSNR = 10 \log_{10} \frac{R^2}{MSE} \tag{2}$$

In the previous equation, R is the maximum fluctuation in the input image data type. For example, if the input image has a double-precision floating point data type, then R is 1. If it has an 8-bit un-signed integer data type, R is 255, etc.



Figure 12. original image.



Figure 13. steganographic image.

The result of PSNR between original image and steganography image is equal 83.2591. So, the LSB method has been successfully implemented & results are delivered. From the result it is clear that PSNR is high and MSE is low in LSB based steganography.

## 6. Conclusion

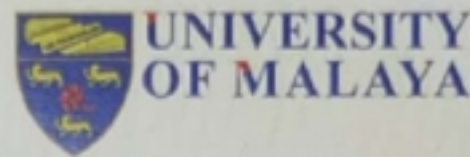
The Cryptography methods are used widely to secure the online transferred data. However, the Cryptography approaches still have many drawbacks. Thus, the supported security methods are necessary to improve the efficiency of Cryptography. The Steganography approach could be effective method to improve the Cryptography approach. In this our paper, we using hybrid RSA and LSB algorithms the integration between these methods are applicable and reliable. As we are using image as a cover file, high amount of data can be embedded and also provides resistance from external attacks.

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# CERTIFICATE

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