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## Journal of Theoretical and Applied Information Technology

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<b>Title:</b>	RANDOM LINEAR NETWORK CODING BASED MULTIPATH TRAFFICS OVER HETEROGENEOUS CLOUD RADIO ACCESS NETWORK
<b>Author:</b>	DHAWA SANG DONG, KARISHMA KHATRI, MOHAMMED B. MAJED, ANAND GACHHADAR
<b>Abstract:</b>	Bringing relays near to the user equipments enhances the network capacity and robust to the transmission erasure. So the dense deployment of Remote Radio Heads (RRHs) with higher frequency operation and lower transmission power within the coverage area of Micro Base Stations (MBSs) with higher transmission power compared to RRH consists of Heterogeneous Network. When the most of the computing algorithms are executed at computationally powerful shared nodes, the network is heterogeneous cloud radio access network (H-CRAN). Further area network capacity can be enhanced with multipath transmission with the availability of radio resources and security issues can be addressed with network coded transmission over the unlicensed channel or high frequency channels. Use of better channel for network coded transmission can enhance the network throughput compared to traditional transmission. Further network coding scheme deployed for multi hop network is robust to erasure channel. In this research work further enhancement of network throughput is carried out with random network coding for multi-hop network which enhances the resilience of the transmission over erasure network channel and transmission of network coded packets over different transmission links ensures security over the data transmission.
<b>Keywords:</b>	Random Network Coding, Multipath Transmission, Secure Transmission, H-CRAN, Robustness
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	AMAP: ADAPTIVE MULTILEVEL AUTHENTICATION PROTOCOL ON CLOUD ENVIRONMENT
<b>Author:</b>	BHARATI AINAPURE, DEVEN SHAH , A. ANANDA RAO
<b>Abstract:</b>	Cloud computing is an emerging technology that allows users to access the computational data through virtual machines on a cloud. Since the technology is based on the sharing of resources, lack of security is a major issue. This paper proposes a new authentication protocol, with an intention to provide secure access to computational data through virtual machines. The proposed protocol works on mutual and multi-level authentication between the user and the server in a cloud environment. This multi-level authentication protocol provides security, considering multiple parameters like OTP, session password, and so on. The protocol includes two phases: Registration and Authentication. At first, the cloud user and the server are registered under Authorization Centre (AC), which authenticates the user and the server using four different messages. The verification of the user is on the basis of hashing function and EC, following a six level authentication process to allocate the virtual machines to access the computational data in the cloud. This protocol provides resistance against Server spoofing attack, stolen verifier attack, Password guessing attack, Impersonation attack and replay attack. Thus, the protocol allows the cloud user to gain a secured access offering robustness with the utilization of Elliptic Curve Cryptography (ECC) and hashing function. The experimental results show that the proposed protocol could provide 75.58% genuine user details, 78.49% attacker details, and 77.03% accuracy, in the comparative analysis made with the approach of Vanga Odelu et al. This comparison shows that it had better performance in providing authentication than the considered existing technique.
<b>Keywords:</b>	Authentication, OTP, Session password, ECC, Hashing, Registration, Protocol, Cloud.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	USING DRIFT INTENSITY AS A BASIS FOR HANDLING CONCEPT DRIFT IN CLASSIFICATION SYSTEMS
<b>Author:</b>	HISHAM OGBAH, ABDALLAH ALASHQUR
<b>Abstract:</b>	Concept drift is a known problem that can occur in classifier systems. Detecting and handling concept drift is an active area of research. Once a concept drift is detected, it has to be handled by updating or re-generating the classification model. In this paper, a new approach is introduced for handling concept drift, where a drift intensity measure is used to quantify the intensity of a concept drift. The model generation process uses the drift intensity measure while generating a new model. If the drift intensity is high, the model generation process discards old data (data before the drift occurrence) and builds a new model solely based on the new data after drift. On the other hand, if the drift intensity is low or moderate, the model generation process takes into account both old data and new data but it gives more weight (proportional to the drift intensity) to the new data as compared to old data.
<b>Keywords:</b>	Data Mining, Classification, Concept Drift, Drift Handling, Big Data.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	A HYBRID TEXT - IMAGE SECURITY TECHNIQUE
<b>Author:</b>	SALEH SARAIREH, JAAFER AL-SARAIREH, YAZEED AL-SBOU, MOHAMMAD SARAIREH
<b>Abstract:</b>	<p>The transmission of a secret message or secret image over public networks may be affected by several types of security attacks. This problem triggered the researcher to implement secure algorithms that provide the security services, and at the same time to protect the transmitted data through the communication channel.</p> <p>There are many applications that involve the transmission of secret text messages and secret image, such as, medical images with radiologist reports, exam, questions that involve text and images and government applications that require images and text. This paper comes to address the security of such applications, so a security technique is proposed. It involves the embedding of secret text message over a secret image using wavelet and genetic algorithm based steganography, and then the generated stego image is encrypted using a filter bank cryptographic algorithm, also hashing algorithm is used to ensure data integrity.</p> <p>Security performance metrics are used to assess the proposed technique; this involves normalized correlation, PSNR, histogram analysis, and entropy. Based on the proposed algorithm, the obtained results showed that a high level of security has been achieved.</p>
<b>Keywords:</b>	Image Encryption, Hashing, Steganography, Entropy, Correlation
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	EDGE DETECTION WITH LAPLACIAN FOR RADIOGRAPHIC IMAGING AND IMPLEMENTATION ON FPGA
<b>Author:</b>	ISSAM BOUGANSSA, MOHAMED SBIHI, MOUNIA ZAIM
<b>Abstract:</b>	<p>The demonstration of the points representing the contours of objects in a Radiographic image can serve as a diagnostic tool, to differentiate areas of the image and to extract reduced information often relevant to characterize the image. This contour materializes by a rupture of intensity in the image in a given direction; several methods exist to detect this rupture.</p> <p>The objective of this work is to execute in real time the algorithms corresponding to the approaches of detection of the contours on Radiographic images based on the Laplacian method, using hardware and software tools. Real-time data processing requires high</p>



	processor power, the possibility of reprogramming as well as a good management of memories. This is provided by the FPGA circuits.
<b>Keywords:</b>	Edge Detection, Real Time, FPGA, VHDL, Laplacian Algorithm.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	CLOUD COMPUTING AND MULTI-AGENT SYSTEM: MONITORING AND SERVICES
<b>Author:</b>	TARIQ FALAH ALWADAN
<b>Abstract:</b>	In cloud computing, client can use and retrieve the services anytime by using any smart devices to manage complex computing processes and to access very large data storage. The developers have recognized the required of an automated system that can help in utilizing the cloud power, enhancing its functionality and improve its performance. Multi-Agents System (MAS) technique presents a perfect way for scalable and open systems that are changed dynamically. MASs are usually used to resolve challenges via a decentralized method where a group of agents cooperate to solve a problem. In this paper a new architecture is introduced which consists of a Multi Agent System that being employed by a cloud computing to assist in determining the best resources and to create negotiation method among cloud providers and users to utilize the full capability of cloud computing. Also this architecture is designed so that it can monitor the users jobs while they are being processed.
<b>Keywords:</b>	Cloud Computing, Multi-Agents System; public cloud; private; hybrid cloud.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	AN ALGORITHM FOR GENERATING PERMUTATIONS IN SYMMETRIC GROUPS USING SOFT SPACES WITH GENERAL STUDY AND BASIC PROPERTIES OF PERMUTATION SPACES
<b>Author:</b>	SHUKER MAHMOOD KHALIL, FATIMA HAMEED KHADEER
<b>Abstract:</b>	In this paper we introduced algorithm to find permutation in symmetric group using soft topological space to structure permutation topological space. Moreover, this class of permutation topology is called even (odd) permutation topology if its permutation is even (odd). Further, new notions in permutation topological spaces are investigated like splittable permutation spaces and ambivalent permutation spaces.
<b>Keywords:</b>	Soft Set Theory, Symmetric Groups, Splitting, Ambivalent, Permutation Topological Spaces
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	POSSIBLE LENSING SCHEMES FOR FIBER-OPTIC COUPLING IMPROVEMENT
<b>Author:</b>	Zaid Ahmed Aljawary, Mohammed Ameer Alrwas, Mohammed Khazal Rashad
<b>Abstract:</b>	Integrated coupling between the laser source (such as laser diodes, LDs) and single-mode fibers (SMFs) are one of the most important and fundamental techniques of optical communications. Integrating lenses in source-fiber and fiber-detector receivers was found a great efficiency enhancement way. Meanwhile, on the other hand Lensed fibers have desirable features of the coupling scheme over ordinary Micro-Lenses, such as compactness, simplicity, stability, and freedom from bulky sizes. Three ways of lens coupling schemes are mentioned. Using a micro - lens, then other ways using lensed fiber-ends to achieve efficient coupling of an optical fiber with a light source from a side and detector on the other side. These scheme findings could guide the evolution of a mass-produced at a low price in

	comparison to the other complex technical ways thatll achieve not more than 5% higher coupling efficiency.
<b>Keywords:</b>	SMF, efficiency, coupling schemes, Micro-Lenses
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	REVIEW ON DIFFERENTIAL SUBORDINATION
<b>Author:</b>	MOHAMMED KHALID SHAHOODH
<b>Abstract:</b>	The complex analysis is one of the beautiful and important subject in the mathematics because of its applications which are not only in several aspects of the analysis, but even in several areas of the mathematics and science in general. Recently, much interesting has been given to investigate the differential inequalities which are containing the functions with their derivatives, and that field has been developed in the last sixty years. In the theory of the complex functions, the characterization of the given analytic function can be determined by using the differential inequality, and also by the differential inequality, most of the geometric properties can be described in the theory of geometric functions. In addition, one of the important branch in the field of the complex analysis is the geometric function theory because this theory deals with the geometric properties of analytic functions. Now days, in the geometric function theory, many applications have been existed for the theory of differential subordinations which its origins going back to Miller and Mocanu [38]. Then, the extensions of that theory can be found in different fields, such like the harmonic functions theory, the partial differential equations, the integral operators theory and the meromorphic functions theory. Due to that, the present paper had done in order to provide a literature study which focused on the theory of differential subordination and its applications in the study of analytic and univalent functions. Furthermore, the properties of the first, the second and the third order differential subordination are studied. This investigation concern on the most important results that have been introduced in the theory of differential subordination by the previous studies. Then, the contribution of this review is to provide an overview on the developments in the theory of differential subordination since the appearance of that concept right up to the recent years. The review of the previous studies may open research issues in the future works, and will allow the future researchers to have a useful background on the essential aspects of this research field.
<b>Keywords:</b>	Analytic function, Admissible function, Best subordinant, Differential subordination, Differential superordination, Meromorphic function, Univalent function, Linear Operator, Multivalent Functions, Multiplier Transformation, Generalized Bessel Functions.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	A MULTI-CLASS SPATIAL CLASSIFIER FOR IMPROVING MOVING OBJECTS DETECTION AND TRACKING
<b>Author:</b>	MATHESWARI RAJAMANICKAM, DR . AISHWARYA PALANIAPPAN
<b>Abstract:</b>	Object detection and tracking aims at detecting and tracking several objects over a sequence of images (i.e. video). The research works focuses on image segmentation and classification for moving object detection and tracking. Batch incremental classifier is used for classifying four classes of moving objects. Object fusion technique developed to solve the detection and tracking of moving objects failed to generate the visual descriptors of the image. In order to obtain efficient and robust moving object detection and tracking with minimum time, a Multi-Class Spatial Classifier (MCSC) method is introduced. Initially, the Markov Random Field (MRF) principle is applied in MCSC method for both fixed and moving objects in a sequence of images to provide label field fusion that exhibits the shape of the objects in the scene. Next, the fuzzy edge strength of each pixel location is identified with MRF modeling, which preserves the object boundary to classify the images of the segmented objects. Finally, the spatial classification is performed through the maximum a

	posteriori probability (MAP) estimation principle. This helps to improve the classification accuracy with minimum time. The performance of the proposed MCSC method achieves higher object detection and tracking accuracy in terms of classification accuracy, false positive rate and classification time.
<b>Keywords:</b>	Moving Object Detection and Tracking, Multi-Class Spatial Classifier, Object Classification, Markov Random field, Fuzzy Edge Strength, MAP Estimation.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
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<b>Title:</b>	SHORT-TERM FORECASTING OF WEATHER CONDITIONS IN PALESTINE USING ARTIFICIAL NEURAL NETWORKS
<b>Author:</b>	IHAB HAMDAN, MOHAMMED AWAD, WALID SABBAAH
<b>Abstract:</b>	Weather conditions such as quantity of the rain, daily wet or dry temperature, and humidity are important factors affecting the economy in any country. Weather forecasting departments in Palestine use linear statistical methods for forecasting daily, monthly, and yearly weather parameters. This research introduced a non-linear model to forecast daily, monthly, and yearly weather conditions which provided a much more efficient method for weather forecasting compared to the traditional linear statistical methods. This proposed non-linear forecasting model can help predict more accurate results so that meteorology and weather departments can organize their data and put the right plans to maintain the correct progress in their works. The proposed model has the ability to analyze previous weather condition patterns and use them to forecast future weather conditions. The collected weather datasets which consist of daily mean values for the three previous years in Palestine were used as targets for Multilayer Perceptron Feed-Forward Backpropagation Neural Networks (MLPFFNNBP) to forecast the future weather conditions. The dataset of rain quantity in this work consists of preprocessed mean values for ten years. The proposed model is constructed using the corresponding dataset and learning neural network to forecast weather conditions in the north region of the West Bank, Palestine which contributes to the improvement of agricultural plans. Running the proposed model using the previously mentioned data produced significant and accurate forecasted results with an acceptable minimum Mean Square Error (MSE).
<b>Keywords:</b>	Artificial Neural Networks, Weather Conditions, Forecasting, Backpropagation Algorithm
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
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<b>Title:</b>	ON THE USAGE OF ARYABHATTA REMAINDER THEOREM FOR IMPROVED PERFORMANCE OF RPRIME RSA
<b>Author:</b>	CH JL PADMAJA, BEHARA SRINIVAS, V.S.BHAGAVAN
<b>Abstract:</b>	In the recent era, RSA is one of the widely known and largely used public key cryptosystems in the world. To improve the performance and speed of RSA cryptosystems, many variants to original RSA have been suggested in the literature. But there is no published literature on the evaluation of these faster variants based on the security aspects such as attacks and mitigation strategies. Through this article we intended to perform a classification of faster RSA variants, cryptanalytic attacks of RSA, mapping of different attacks to mitigation strategies and a complete evaluation of Faster RSA variants based on the severity of security threats. To assess the severity of threats, a Threat Severity Evaluation classification of these variants has been made. Also, we extended our study to look upon how the performance of RSA variants changes with a change in the decryption algorithms and build a suitability analysis to check the applicability of Aryabhatta Remainder Theorem(ART) in place of Chinese Remainder Theorem(CRT). RPrime RSA is the fastest known variant of modified RSA cryptosystems with no known security attacks or threats. RPrime uses Chinese Remainder Theorem for solving congruence equations in the decryption stage, which requires more modulo inverse operations. The decryption speed can be improved by

	reducing the number of modulo inverse operations required to solve the congruence. Aryabhata Remainder Theorem takes only one modulo inverse operation to solve two congruence relations. When compared with Chinese Remainder Theorem, ART requires lesser modulo inverses. In this article, we have replaced RPrimes CRT with Aryabhata Remainder Theorem. Performance of our new model is tested with larger modulo such as 2048 and 4096.
<b>Keywords:</b>	Aryabhata Remainder Theorem, Attacks, Chinese Remainder Theorem, RSA Variants, Threat severity.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
<b>Title:</b>	THE DETERMINANT FACTORS OF KMS USAGE TOWARDS ORGANIZATIONAL PERFORMANCE IN OIL AND GAS INDUSTRY
<b>Author:</b>	AKBAR BADPA, JUHANA SALIM, JAMAIAH YAHAYA, SEDIGHEH SHAKIB KOTAMJANI
<b>Abstract:</b>	Knowledge management (KM) brings about organizational performance and competitive advantages. To make KM practice successful in organizations, KM initiatives or Knowledge Management System (KMS) is required. KMS is the technology that supports KM in creating, sharing, transferring and disseminating knowledge. Likewise, KMS usage brings about organizational performance and competitive advantages in organizations in different sectors such as oil and gas industry. However, systematic review of literature shows that although oil and gas industry has been investing immensely in KMS development, KMS usage has remained sluggish or even failed. Further, there is a paucity of study on determinants of KMS usage in oil and gas industry. Therefore, the current paper developed a conceptual model based on the main information system theories, namely: theory of planned behavior (TPB), technology acceptance model (TAM), and task-technology fit (TTF). Based on KM literature The combination of TAM, TTF and TPB provide a strong predictive power concerning participants' use of KMS.. The paper integrates the core constructs of the above theories and the factors extracted from the literature stream on KMS. As a result, the paper develops a conceptual model composed of four main dimensions: human, technology, organization and knowledge. The endogenous variable is KMS usage and the dependent variable is organizational performance. Thus, this study provides synopsis of effective factors of KMS usage towards organizational performance that helps system developers and managers at petroleum industry to consider the importance of KMS usage. Thus, the study has theoretical and practical implications.
<b>Keywords:</b>	Knowledge Management, Information Technology, Information Science, Knowledge Management System Usage, Organizational Performance
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
<b>Title:</b>	AN IMPROVED EVOLUTIONARY HYBRID PARTICLE SWARM OPTIMIZATION ALGORITHM TO MINIMIZE MAKESPAN FOR NO WAIT FLOW SHOP SCHEDULING
<b>Author:</b>	LAXMI A. BEWOOR , V.CHANDRAPRAKASH , SAGAR U.SAPKAL
<b>Abstract:</b>	A flow shop with no-wait schedules jobs continuously through all machines without any wait at consecutive machines. This scheduling problem is combinatorial optimization problem and observed as NP-hard as appropriate sequence of jobs for scheduling from all possible combination of sequences is to be determined for reducing total completion time (makespan). This paper presents an effective hybrid Particle Swarm Optimization algorithm for solving no wait flow shop scheduling problem with the objective of minimization of makespan. This Proposed Hybrid Particle Swarm Optimization Makespan (PHPSOM) algorithm represents discrete job permutation by converting the continuous position information values of particles with random key representation rule. The proposed algorithm balances global exploration and local exploitation with evolutionary search guided by the mechanism of PSO, and local search by the mechanism of Simulated Annealing (SA) along

	with efficient population initialization with Nawaz-Enscore-Ham (NEH) heuristic. The effectiveness of the proposed method is validated by extensive computational experiments based on Taillards benchmark suite. Computational results and comparisons with best known solutions for makespan confirm that the proposed algorithms performance is better than the existing methods in terms of searching quality and robustness. Statistical tests of significance validate the improvement in the solution quality.
<b>Keywords:</b>	No-wait flow shop, Scheduling, Particle Swarm Optimization, Simulated Annealing, Makespan
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
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<b>Title:</b>	A SMOOTH TEXTUAL PASSWORD AUTHENTICATION SCHEME AGAINST SHOULDER SURFING ATTACK
<b>Author:</b>	MOHAMMED A. FADHIL AL-HUSAINY , DIAA MOHAMMED ULIYAN
<b>Abstract:</b>	Authentication is a common approach to protect user information in the online information systems such as ATMs. One of the easiest ways for user authentication uses Personal Identification Number (PIN). PINs are vulnerable to malicious attacks. The tendency of users to select easy passwords or short password makes the passwords vulnerable to many attacks like camera recording attack and adversary shoulder attacks. In this paper, the proposed textual password authentication scheme is introduced as an alternative to graphical password schemes. In this technique, no need to use the traditional keyboard or even pressing the keys that represent the password characters. This technique gives the user a more secure session to enter the password and solves most of the defects exist in the authentication systems that depend on the use of the textual or graphical passwords.
<b>Keywords:</b>	Shoulder surfing attack, textual password authentication, information security, Matrix Transpose
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
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<b>Title:</b>	SEMANTIC-BASED E-GOVERNMENT FRAMEWORK BASED ON DOMAIN ONTOLOGIES: A CASE OF KUWAIT REGION
<b>Author:</b>	NASER ALAZEMI , Abdullah J. Al-Shehab , Hawaf Abd Alhakem
<b>Abstract:</b>	Accessibility of information in the web is the main feature in knowledge acquisition. Ontology is an explicit specification of conceptualization. It defines the terms with specified relationships between them, and can interpret by both humans and computers. Currently, E-Government is facing several problems relating for integration of the information systems, extraction, and representation across heterogeneous organizations. In Addition, e-government is the civil and political conduct of the government, which involves using information and communication technologies (ICT). Therefore, e-government services need to provide information where format and methods of delivery adapt according to the users and situations. In recent years, semantic Web technologies based on ontology have brought about promising solutions to the above engineering problems. In this paper, we propose a semantic-based framework for e-government. In addition, the platform Protege for semantic ontology development is introduce. We proposed ontological model for the Education ministry domain and Medicine ministry domain. The Web Ontology Language (OWL) represents this ontology, which is the standard language for the semantic web. Moreover, it was testing in proposed semantic framework. The ontology will be useful in the knowledge of the e-government semantic integration, and semantic Web applications.
<b>Keywords:</b>	E-government; Semantic Web; Domain ontology; Services; Framework; owl; Integration; Citizens;
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

<b>Title:</b>	A NOVEL TEST CASE PRIORITIZATION USING MENDEL OPERATOR BASED GENETIC ALGORITHM
<b>Author:</b>	ANJU BALA, RAJENDER SINGH CHHILLAR
<b>Abstract:</b>	This paper aims at prioritization of test cases such that the testing effort reduces significantly while the code coverage remains almost the same. This is achieved by a novel Mendelian Operator based Genetic Algorithm by following two principles i.e. segregation and independent assortment of alleles. The doctrinal sense of simple GA is conceptually improved by inducing Mendel operator in the reproduction cycle. Besides the traditional genetic operators of selection, crossover and mutation, Mendels principles are included, in the form of an operator in the genetic algorithms evolution process. The proposed approach is different than the simple or conventional GA in terms of Mendels dominance, recessiveness, genotype, phenotype and the Punnett square. The results obtained have comparable coverages and are better than those of the conventional GA in terms of size of test suit. In this paper, a telemedicine project is taken for experimentation, developed for remote doctor allocation for facilitating the on line assistance to the patients.
<b>Keywords:</b>	Mendelian Operator; Genetic Algorithm; Regression Testing; Test case Prioritization
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

<b>Title:</b>	DESIGN AND IMPLEMENTATION OF SECURITY SOLUTION FOR M-GOVERNMENT ON MOBILE PLATFORMS USING HYBRID OF NTRU-PKI AND AES-RIJNDAEL
<b>Author:</b>	MALIK ANAS TAWFEEQ, MOHAMAD T. SULTAN
<b>Abstract:</b>	In recent years and specifically in the era of rapid technology development, many changes have taken place in the field of communication technologies (ICT), where mobile devices have replaced computers in multiple significant tasks. This has influenced the interactions between citizens and government agencies in what is called the m-Government, which is an extension of the e-Government that provides services to citizens in general or subscribers in particular. As these services range from public to private bodies and data transmitted sometimes require authentication and confidentiality, the need to secure them has been found to be inevitable. The problem faced here is regarding security of transmitted data as cryptography algorithms whether symmetric or asymmetric; suffer from issues of key exchange mechanism or security performance. In this research, the authors proposes a system technique to secure the transmission of the m-Government using hybrid security algorithms of AES-Rijndael and NTRU, with concentration on confidentiality and authentication as core services in m-Government current transactions, in order to enhance the security of transmission medium and achieve better security of m-Government services. The findings of this dissertation have shown proof of the powerful presence of security factors concerning confidentiality and authentication in the field of m-Government, and test performance approves that the proposed technique is applicable on smartphone devices.
<b>Keywords:</b>	AES; NTRU; M-Government; Confidentiality; Authentication
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

<b>Title:</b>	ORTHOGONAL WAVELET FUNCTION FOR COMPRESSION SATELLITE IMAGERY OF PEAT FOREST FIRES
<b>Author:</b>	NOVERA KRISTIANTI, ALBERTUS JOKO SANTOSO, PRANOWO
<b>Abstract:</b>	Background: In the process of digital image data representation, constrained the number of data volumes are required. One of the main sources of information in data processing of

imagery is satellite imagery. Some applications of remote sensing technology requires a good quality image but in small size. Purpose: This study focuses on image compression is done to reduce the size of the image needs. However, the information contained in the image retained its existence. Method: In this study, using 17 orthogonal wavelet function used to reduce data satellite images of peat forest fires. Then, 17 of these orthogonal wavelet functions are compared with the parameter measurement i.e. PSNR (Peak Signal to Noise Ratio) and compression ratio. The benchmark of image compression is seen from the largest PSNR and large compression ratio Finding: Based on orthogonal wavelet function testing, then the Haar (daubechies 1) wavelet function results obtained has the highest PSNR for all level of decomposition on all test image i.e 50.783 dB for test image 1, 50.954 dB for image 2 and 49.855 dB for image 3. For the highest compression ratio on all test image is a function of wavelet symlet 8 i.e 97.00% for image 1, 97.05% for image 2 and 96.90% for image 3. Originality value: Satellite imagery that has been reduced would contribute to facilitating the processing of data as well as data input for the creation of digital image processing for system detection peat forest fires hotspots.

**Keywords:** Image Compression, Satellite Imagery, Peat Forest, Orthogonal Wavelet function, Information System

**Source:** Journal of Theoretical and Applied Information Technology  
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[Full Text](#)

**Title:** IPFJRO: THE DEVELOPMENT OF IMAGE PROCESSING ONTOLOGY

**Author:** OOI JESSIE, MANSOOR ABDULLATEEF ABDULGABBER, SIAU CHIUN LIEW

**Abstract:** IPFJRO is an image processing-based ontology develop specifically for an ontology-based keywords search system. Ontology ease the human computer communication by presenting the concept or information in a way that can be understand by both machine and human without any misunderstanding. At the same time, it allows the information reuse across different applications. However, despite its advantages, development of an ontology is still a lengthy and complicated process. Hence, not every domain has its own complete ontology developed and ready to use. In this study, we had developed a domain ontology. We had select Image Processing as the domain of our ontology. This ontology was based on the terminologies from research articles and image processing text book. The development of this ontology followed the guidelines in Ontology Development 101. We used Protege as the development tool. This study focused on the methodology, design and development of the ontology. Theres a total of 63 classes and 831 individuals in IPFJRO.

**Keywords:** Ontology, Ontology development, Knowledge Representation, Image Processing, Query

**Source:** Journal of Theoretical and Applied Information Technology  
15<sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

**Title:** REDUCED TIME COMPLEXITY VARIANT OF DIGITAL SIGNATURE ALGORITHM

**Author:** HAMZA A. A. AL-SEWADI, MOHAMMED M. RIFAAT

**Abstract:** Signing and verification time of messages is an essential issue. The standard Digital signature algorithm (DSA) approved by the national institute of standard and technology (NIST) has been widely used for message authentication. Besides, many variants of DSA has been suggested in order to improve the performance, such as Yen-Laih, GOST, McCurley, and other algorithms. This paper present a modified version of the standard NISI-DSA. It incorporates the same parameters used in NISI-DSA, but it is characterized by less computational complexity and improved signature verification time which is crucial for some sensitive applications. This variant achieved an increase in the verification speed of about 100% over most DSA variants, hence reducing the signature validation time considerably, however, no improvement was noticed in the signing speed. This signature validation speed gain was achieved with the same level of security as the parameters of standard DSA were used. The algorithm is first tested with prime numbers of 20, 40, 80, and 100 bits lengths, then it is experimented with using prime numbers provided by NIST with length of 1024 bits

and 128 bits for p and q, respectively. The speed of verification results shows more than two times faster than NIST-DSA.

**Keywords:** Digital Signature Algorithms, Time Complexity, Cryptography, Discrete Algorithms, Message Authentication, Data Integrity.

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[Full Text](#)

**Title:** THE INFLUENCE OF BUSINESS PROCESS AND RISK MANAGEMENT ON THE QUALITY OF ACCOUNTING INFORMATION SYSTEM

**Author:** AZHAR SUSANTO, MEIRYANI

**Abstract:** Business process and risk management are factors which can effect the quality of accounting information systems. In Indonesia, phenomenon happens in many organizations showing that most of them implement unintegrated accounting information systems. Because of integration is the main characteristic of the quality of accounting information systems so this characteristic became our interest to do some research. This research was carried out in order to find out some facts through examination of the influence of business process and risk management towards accounting information system quality. Data used in this research were gained through survey by distributing questionnaires to company in indonesia. The data were then managed statistically by applying SEM PLS. Research method used was explanatory research. The result of this study shows that the problem source of poor quality of accounting information system occurs due to the business process and risk management is not entirely as good as expected, this condition effect to the integration which at the end influence the quality of accounting information system and accounting information produced.

**Keywords:** Business Process, Risk Management, Quality Accounting Information System, Accounting Information system.

**Source:** Journal of Theoretical and Applied Information Technology  
15<sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

**Title:** COST FUNCTION BASED ON ANALYTIC HIERARCHY PROCESS FOR DATA REPLICATION STRATEGY IN CLOUD ENVIRONMENT

**Author:** MOHAMED REDHA DJEBBARA, HAFIDA BELBACHIR

**Abstract:** Data stored on a cloud is becoming more and more important. Thus, data replication across multiple cloud nodes is considered an effective solution to achieve good performance in terms of response time, load balancing and most importantly, high data availability and reliability. To maximize the benefit of data replication, strategic placement of replicas in the system is critical. Several replica placement works have been proposed in the literature; the most of these works are based on five parameters (criteria): mean service time, failure probability, load variance, latency and storage usage. Weights of these criteria have always been proposed by the user to calculate a cost function. In order to improve this cost function, we propose in this paper an original approach based on a multi-criteria optimization model. According to the context of the five criteria mentioned above, we have chosen the AHP (Analytic Hierarchy Process) multi-criteria optimization method which makes it easier to use it to determine the coefficient of each criterion. This modeling of the cost function makes it possible to improve the selection of the candidate sites for replica placement, which have a good impact on the simulation results, and improve performances.

**Keywords:** Cloud, replica placement, cost function, AHP method

**Source:** Journal of Theoretical and Applied Information Technology  
15<sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

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<b>Title:</b>	AN EFFICIENT SECURE SCHEME FOR DATA AGGREGATION IN WIRELESS SENSOR NETWORKS USING THE ADDITIVE PROPERTY OF COMPLEX NUMBERS
<b>Author:</b>	SAMIHA M. ELSHERIF , MOHAMED ELSHRKAWAY, M. ELSAYED WAHED
<b>Abstract:</b>	Data aggregation is an essential technique that has been widely used in Wireless Sensor Networks (WSNs) to reduce the energy consumption of sensor nodes. It can preserve the significant amount of energy by aggregates data from sensor nodes which reducing the number of data packets. However, data aggregation applications need integrity protection and privacy preserving of the data while transmitting it from sensing nodes to the base station. The existing schemes such as IPDA, ICPDA, and PEPPDA suffer from high communication, computation cost and data delay even it support both privacy and integrity. Therefore, this paper proposes an efficient, secure data aggregation scheme for wireless sensor networks. The proposed scheme eliminates redundant sensor data without using decryption and maintains data privacy during transmission. We use the additive property of complex numbers to support privacy and integrity checking. The complex number has two parts; the real part will be used to hide sensitive data and the imaginary part will be used to check the integrity of the aggregated data. The proposed scheme is compared with IPDA, ICPDA, and PEPPDA in terms of communication overhead, accuracy, and energy consumption. Simulation results show that the proposed scheme achieves better performance than other schemes by reducing the communication overhead and checking the integrity of aggregated data without the delay of aggregated data. It also increases the network lifetime by eliminating the redundant data transmitted from each sensor node.
<b>Keywords:</b>	Data aggregation, Wireless Sensor Networks, Privacy, Complex Numbers, Integrity.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

<b>Title:</b>	COMPREHENSIVE FEATURE SELECTION BASED SUPPORT VECTOR MACHINE CLASSIFIER (CFS-SVM) FOR CLINICAL DATASET
<b>Author:</b>	S. KAVIPRIYA , DR.T. DEEPA
<b>Abstract:</b>	Feature selection plays a significant role in any data mining research problem. In this research work, comprehensive feature selection is applied for selecting the attributes in the chosen PIMA Indian diabetes dataset. The comprehensive feature selection mechanism makes use of maximum significance pattern for selecting the most edifying features, which effectively distinguish between different classes of samples. By making use of the comprehensive feature selection mechanism, the degree of relevance between the feature variables and target variable is quantified, and the informativeness of features is determined according to the degree of the relevance score. In order to implement this mechanism, novel evidence metric, NEM, is employed to score the relevance degree of a candidate feature variable with respect to the target variable. Once after the feature selection is carried out, SVM classifier is applied for performing the prediction of heart disease among gestational diabetes patients in the dataset. Performance metrics such as sensitivity, specificity, true positive rate, false positive rate, precision, accuracy and time taken for feature selection are taken into account. The results are demonstrated with better performance.
<b>Keywords:</b>	Feature Selection, Data Mining, Gestational Diabetes, Accuracy, Time Taken, Feature Selection, Risk Prediction
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

<b>Title:</b>	AN UNDERSTANDING AND APPROACH SOLUTION FOR COLD START PROBLEM ASSOCIATED WITH RECOMMENDER SYSTEM: A LITERATURE REVIEW
<b>Author:</b>	HANAFI, NANNA SURYANA, ABD SAMAD BIN HASAN BASARI

**Abstract:** In the ecommerce services, there is a very important tool that will determine the success to increase number of buying and selling in the marketing target, that is how the user in finding products that are suitable to be purchased. This tool is called recommender system. Recommender system is important tool for establishing an effective communication between users and retailers in ecommerce business. Effective and enjoyable communication to find the product is considered to have a significant impact that increase of marketing achievement. Recommender system established in the mid-90s. Based on technical approach, there are four types of recommender system namely Collaborative, Contents Based, Knowledge Based and Demographic filtering. Collaborative filtering is considered to be more superior than another two methods. It offers obviously advantages in terms of serendipity, novelty and accuracy. Although it has some benefit. However, there is a critical problem in collaborative filtering that called cold start. It is a major problem to which many researchers have paid much more attention to this particular research interest. In response to this particular problem the critical review and analysis on state of the art of the current technology, some possible solutions including approach, method and techniques used have been identified but they need further validation.

**Keywords:** Recommender System, Recommendation System, Sparsity Data, Cold Start, Ecommerce Services.

**Source:** Journal of Theoretical and Applied Information Technology  
15<sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018

[Full Text](#)

**Title:** FINGER VEIN IDENTIFICATION BASED ON CORNER DETECTION

**Author:** AHMAD S. BADER ALI MAKKI SAGHEER

**Abstract:** Finger vein is a physiological biometric technology used in the identification systems for personal authentication based on the physical features of the vein patterns in the finger. In this paper, computer vision algorithms (FAST and Harris) were used to extract features (corner points) from the finger vein image, while the matching of patterns was based on the differences between corners represented in the form of points using the Manhattan distance. The False Matching Rate (FMR) and False Non-Matching Rate (FNMR) were minimized to obtain the optimum threshold value. This threshold were used to make the final decision. The proposed system proved that use of two algorithms together reduces the error rate and aids to produce a reliable system of finger vein identification.

**Keywords:** Finger Vein Identification, Biometric, FAST, Harris.

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[Full Text](#)

**Title:** MINIBUS BASED URBAN TRANSPORT PERFORMANCE EVALUATION BY USING DISCRETE EVENT SIMULATION

**Author:** PURBA DARU KUSUMA

**Abstract:** Nowadays, in many cities in Indonesia, minibus based urban transport faces very serious threat because of its occupation declination. This condition is affected by many factors, such as: the massive usage of private vehicle, the rise of online taxi, vehicle bad condition, and bad driver behavior. This condition triggers the question: is minibus based urban transport still needed? The other question is how to make the minibus based urban transport still survive because lot of workforces and families that their lives is depended on this business. Based on this problem, this research is done to evaluate the performance of the minibus based urban transport. This research is done by using discrete event simulation. In this simulation, the passenger acts as client and the vehicle acts as server. Parameters those are evaluated are the occupation, revenue, and the potential lost. Based on the simulation, the passenger inter-arrival time gives significant impact to the occupation and revenue. The passenger travel distance gives impact only if variable fee method is implemented. The recommended fee so that the vehicle can operate economically is 7,500 rupiah for fixed fee method or 1,000 rupiah per kilometer for variable fee method.

<b>Keywords:</b>	Discrete Event Simulation, Urban Transport, Stochastic, Revenue, Occupation.
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
<b>Title:</b>	MULTIPOINT RELAYS SELECTION THROUGH STABILITY OF ESTIMATED SPATIAL RELATION IN MOBILE AD HOC NETWORKS
<b>Author:</b>	AYOUB ABDELLAOUI, JAMAL ELMHAMDI, HALIM BERRADI
<b>Abstract:</b>	In Mobile Ad hoc Networks (MANETs), the mobility concept is an essential element of network performances. MANETs has a scalability constraint in terms of reachability and stability. Optimized Link State Routing (OLSR) protocol is a proactive routing protocol for wireless mobile ad hoc networks and the key idea behind it is to improve Multi-Point Relays (MPRs) selection algorithm. This paper proposed a new mechanism based on, a spatial mobility which speed, acceleration and direction Prediction-based Localization are included; named, Stability of Estimated Spatial Relation MPR. Furthermore, this mobility value will be exchanged between nodes using HELLO message and it will be used as a condition when a node selects its MPRs set. In addition, simulation results by Network Simulator 3 (NS3) have revealed that the improved algorithm could improve network performances in terms of throughput, delay and lost packets. Similarly, the proposed algorithm can be used as a functional mobility mechanism to improve MANETs.
<b>Keywords:</b>	MANETs, OLSR, MPRs, Estimated Spatial Relation, Stability, NS3 Simulator
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018
<a href="#">Full Text</a>	
<b>Title:</b>	CONTEMPORARY AFFIRMATION OF SECURITY AND INTRUSION HANDLING STRATEGIES OF INTERNET OF THINGS IN RECENT LITERATURE
<b>Author:</b>	KALATHIRIPI RAMBABU, Dr. N. VENKATRAM
<b>Abstract:</b>	(IoT) Internet of Things has attracted wide interest within workplaces and outside world in the past few years. With growing need for increased connectivity between computing devices, more number of researchers are focusing on increasing security and efficiency of the technology. In particular, a large volume of contemporary literature is devoted to security and intrusion handling. IoT involves connecting resource-constrained devices to highly intrusion prone and unreliable internet connection via IPV6 network and 6LoWPAN networks. Though proposals have been made to secure the network through encrypting data and authentication, exposure to wire-less attacks from within the 6LoWPAN networks remain. Given the high probability of such attacks to succeed, deploying efficient intrusion detection systems has become unavoidable. The present state of IoT security evincing that there are no dedicated intrusion detection systems that meet the requirements of the IPV6-connected IoT, which is since the present strategies of intrusion detection in IoT formulated by customizing the existing models related to Wireless Sensor Networks (WSN) and conventional Internet. This manuscript reviews the contemporary designs, implementations, and evaluations of novel intrusion detection systems for the IoT depicted in recent literature. This review primarily explored the taxonomy of the IoT architecture, requirements, possible attacks and security breaches. In addition, depicts the contemporary review of recent literature relates to security and intrusion detection in IoT. Our review portrayed that the existing contemporary models are having significant limits to detect malicious nodes related to critical aspects such as sinkhole and selective forwarding attacks. In addition, the review evincing that there is a significant need of research to depict intrusion detection systems related to IoT.
<b>Keywords:</b>	Internet Of Things (Iot), Intrusion Detection, Security Protocols, Sensors, Iot Nodes, Iot Layers, Security Issues, Security Challenges
<b>Source:</b>	Journal of Theoretical and Applied Information Technology 15 <sup>th</sup> May 2018 -- Vol. 96. No. 9 -- 2018



# ORTHOGONAL WAVELET FUNCTION FOR COMPRESSION SATELLITE IMAGERY OF PEAT FOREST FIRES

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## ABSTRACT

**Background:** In the process of digital image data representation, constrained the number of data volumes are required. One of the main sources of information in data processing of imagery is satellite imagery. Some applications of remote sensing technology requires a good quality image but in small size. **Purpose:** This study focuses on image compression is done to reduce the size of the image needs. However, the information contained in the image retained its existence. **Method:** In this study, using 17 orthogonal wavelet function used to reduce data satellite images of peat forest fires. Then, 17 of these orthogonal wavelet functions are compared with the parameter measurement i.e. PSNR (Peak Signal to Noise Ratio) and compression ratio. The benchmark of image compression is seen from the largest PSNR and large compression ratio **Finding:** Based on orthogonal wavelet function testing, then the Haar (daubechies 1) wavelet function results obtained has the highest PSNR for all level of decomposition on all test image i.e. 50.783 dB for test image 1, 50.954 dB for image 2 and 49.855 dB for image 3. For the highest compression ratio on all test image is a function of wavelet symlet 8 i.e. 97.00% for image 1, 97.05% for image 2 and 96.90% for image 3. **Originality value:** Satellite imagery that has been reduced would contribute to facilitating the processing of data as well as data input for the creation of digital image processing for system detection peat forest fires hotspots.

**Keywords:** *Image Compression, Satellite Imagery, Peat Forest, Orthogonal Wavelet function, Information System*

## 1. INTRODUCTION

Each day, a remote sensor produces large amounts of data including satellite images. This large volume of data causing inefficient in storage and processing using computers. In order to reduce data storage memory the data should be compressed [1] [2]. In image compression, it is not just focus on reducing the size but also focus on reducing the size of the image without removing the quality as well as the information of the image itself. [3]

The purpose of the image compression is to lower redundancies in the image data. Image compression is doing removals of one or more of the three fundamental data that has redundancies on it [3]. Compression is necessary in order to make an image more manageable with smaller size [4].

Compression of satellite imagery is used to reduce the use of memory needed to keep the image. In general case, satellite images often require large amounts of memory used [5]. Image

and data compression of remote sensing could use wavelet. The use of wavelet in image compression due to his ability to analyze the data image [6].

The use of wavelet image compression is considered effective and decrease memory usage, as well as fasten devices ability. The application of wavelet could also be used to improve the resolution of satellite imagery that has a low resolution to obtain satellite images without losing image information. Wavelet can improve the quality of an image as well as maintaining the information on the image as a texture and the edges line. [1] [7] [8].

The study was done by comparing 17 wavelet orthogonal i.e. Daubechies Family ( db 1 to db 5) , Coiflets Family ( coiflet 1 to coiflet 5) , and the family of Symlets ( symlet 2 to symlet 8) for the process of compression of satellite imagery. So with this research can be obtained the optimum orthogonal wavelet in-process compression of peat forest fires satellite imagery.

The compression process of large satellite imagery, needs to be done as the first step to making a prediction system. One method for doing compression is by using the wavelet. Utilization of wavelet can accelerate the process of transmission so that the process of peat forest fire prediction can be done more quickly. Prediction of peat forest fires is the first step to reduce forest fires and reducing the disaster victims.

### 1.1 Information Hiding

The determination of the right wavelet to do compressed of detection place satellite imagery before and during natural disasters can be used to prevent the potential dangers of natural disasters [9].

A forest fire is defined as a disaster caused by a natural forest area that is destroyed by fire. The cause of these fires includes the following factors; human carelessness, extremely hot weather and other factors [10].

The utilization of satellite imagery can be used as data advice in the design of an early detection system of fires on peat forests which is one of peat forest fire preventive measures.

### 1.2 Purpose

The purpose of this research is conducting a comparison process in the orthogonal wavelet compression of peat forest fires satellite image using parameters measure the PSNR (Peak Signal to Noise Ratio) and compression ratio. The type of wavelet used is orthogonal wavelet type 17 i.e. Daubechies Family ( db 1 to db 5), Coiflets Family ( coiflet 1 to coiflet 5 ), and the family of Symlets ( symlet 2 to symlet 8).

## 2. RELATED LITERATURE

Wavelet is a mathematical function that performs Division of data into several components with different frequencies, then each component will be studied with a resolution that is suitable for any size [11]. Wavelet is divided into two types namely orthogonal and biorthogonal [12].

Orthogonal Wavelet is a wavelet that is associated with the wavelet transform are orthogonal i.e. have the same analysis and synthesis. Orthogonal Wavelet is composed of 17 types of daubechies family (db1 to db 5), family coiflet (coiflet 1 to coiflet 5) as well as the family of symlet (symlet 2 to symlet 8).

Daubechies family included in orthogonal wavelet discrete wavelet transform that defines. In this, there is a kind of wavelet scale function (called the father wavelet) which produces analysis of orthogonal multiresolution [13]. Coiflet is a discrete wavelet family are approaching symmetrical. The second function scale (low pass filter) and the wavelet function (high-pass filter) must be in the normalization in advance [14]. The family symlet is a modified version of the daubechies wavelet with increased symmetry [15].

Some previous studies is already using wavelet for image compression. As in research [16], that use Haar wavelet image compression to do imagery compression. Research results showed the effectiveness of the use of wavelet in reducing the size of the image without removing too much resolution. Furthermore, research [17] is about image compression using Haar wavelet and wavelet Daubechies. This study using the measuring parameters the Mean Square Error (MSE) and others on a system which implements the compression of images. The purpose of the study is as a reference for application development using the right wavelet image compression.

In research conducted by [18], is researching the influence of wavelet for compression ratio and PSNR to find the optimal wavelet compression ratio and high PSNR. This study using 8-bit gray scale test image with size 512 x 512. With the results of the study found that wavelet which has the highest compression ratio in each family is Haar, Coiflet 1 and Symlet 2. While the highest PSNR wavelet features in each family is Haar, Coiflet 3 and Symlet5. For a wavelet have compression ratio PSNR values and optimal for each family is Haar, Coiflet 3 and Symlet 5.

The data processing has now turned into computerization. Thus the data that continues to increase in certain period affect the data storage that also getting bigger. Research conducted by this [11], trying to figure out the effect of decomposition level of wavelet to PSNR. Image test used is the 24-bit color image with 512 x 512 sizes. It is found that the effect of decomposition rate on PSNR is the greater level of decomposition, the smaller the PSNR.

The study [19] is about evaluation of the effectiveness of the function and scale wavelet transform in image compression and decompression. The parameters used are PSNR,

MSE and compression ratio. Utilization of wavelet conducted by [20] is for conditional random fields simulation. Wavelet compression used for the scale of the map domain spatial simulation. The goal of wavelet approach in this study is to acquire secondary data available but at different scales, which are used for the simulation of the main variables.

Furthermore, [21], using wavelet for extraction of roads from satellite imagery. The discrete wavelet transform is used as an approximation to the decomposition of the image to cut objects that are not needed on an image. Utilization of wavelet is also used by [22], in this research wavelet used for compression and satellite image watermark. DWT is used because it has features that support the progressive image transmission.

Furthermore, in a study conducted by [23] using a DWT as compression of remote sensing image with high spatial resolution. This approach was proposed to improve performance as well as reduce performs the computing. Wavelet decomposition also used this way in understanding topographic features with the research on Mount Merapi and Merbabu [24]. Analysis by wavelet decomposition is rated well in doing an analysis of topography using a computer because it is successfully separating the structure element from the named topography

Next research conducted by [25], about the use of 31 wavelet to compress satellite imagery. In the study comparing the functions of wavelet by looking at its effect on PSNR, compression ratio, and bits per pixel (bpp) and the influence of decomposition level of PSNR and compression ratio. In the study conducted by [20] is the comparison of algorithms that resulted in the application of discrete wavelet transform (DWT) in the optimal scale of decomposition of the test image of the mining site has the same good realization but with a shorter computation time.

Study to find the proper wavelet compression in satellite images of the tornado and hurricane disaster has been made by [26]. The result of the test image is a comparison using the compression ratio to get the correct wavelet image compression, can save memory, time of access, the processing time and delivery time

### 3. METHOD

This study focuses on testing particular 17 orthogonal wavelet function i.e. Daubechies Family (db1 to db 5), Coiflets Family (coiflet 1 to 5), and the family of Symlets (symlet 2 to 8).

In order to do comparisons of wavelet function to find the correct wavelet to compress the peat forest fires satellite imagery.

Image data input in the form of image colors in size 512 x 512. Satellite imagery obtained from MODIS Terra satellite. Stages of the process of compression of peat forest fire satellite image by using orthogonal wavelet can be seen in the following figure

The image compression result using orthogonal wavelet compared using PNSR and compression Ratio to obtain a correct wavelet conclusion in doing satellite imagery compression of peat forrest fires. Business process for this study can be seen at figure 1.

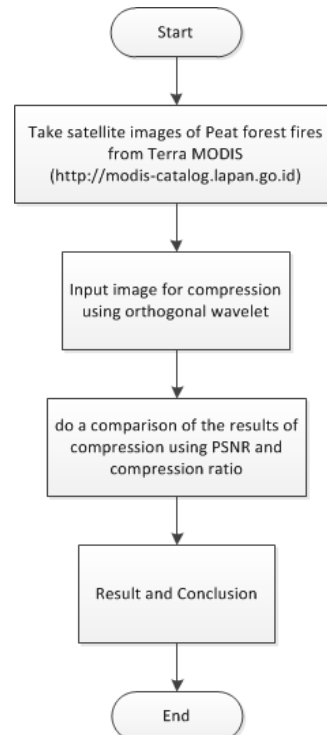


Figure 1: Business Process

### 3.1 Wavelets Functions

Orthogonal wavelet on analysis, has the number of convolutions for each scale proportional to the wavelet that is the basis on the scale [27].

Wavelet is a wavelet function that comes from the base of the  $\psi(x)$  is called the mother wavelet. The two main underlying wavelet operations are translation and dilation.

1. Translation for example  $\psi(x-1)$ ,  $\psi(x-2)$ ,  $\psi(x-b)$
2. Dilation for example  $\psi(2x)$ ,  $\psi(4x)$ , and  $\psi(2^jx)$ . [28].

Combination from translation and dilation produce the formula of wavelet that expressed in equations [29] :

$$\psi_{a,b}(x) = \frac{1}{\sqrt{|a|}} \psi\left(\frac{x-b}{|a|}\right) \quad (1)$$

Where,

$a, b \in \mathbb{R}; a \neq 0$  (R = Real-valued),

- $a$  = dilation parameter
- $b$  = translation parameter

### 3.2 Orthogonal wavelet function for compression satellite imagery of peat forest fires

The steps of compression satellite imagery can be seen at figure 2 :

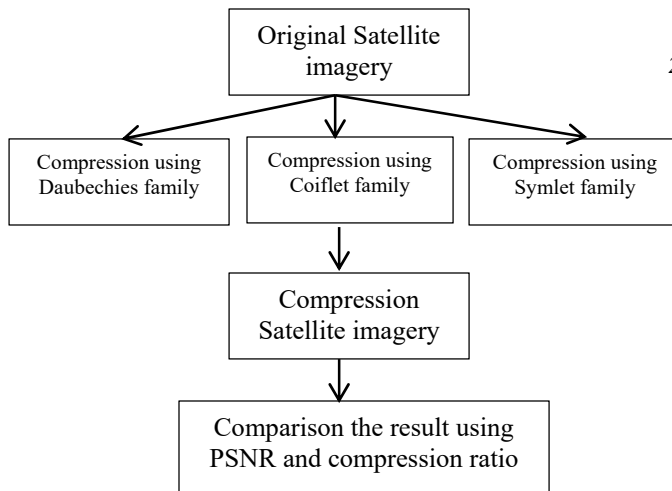


Figure 2: The process of compression satellite imagery

Algorithm :

1. Read the original satellite imagery
2. Applying the wavelet transform (orthogonal wavelet).
3. Quantize the coefficient to reduce the number of bits required for image compression.
4. Generate the image that has been compressed

### 4. SIMULATION RESULT

This research uses the color image as the input in 512 x 512 sizes. Tested image retrieved from MODIS Terra satellite image on peat forest fires in Central Kalimantan. The image used is as follows at figure 3, figure 4, and figure 5 .

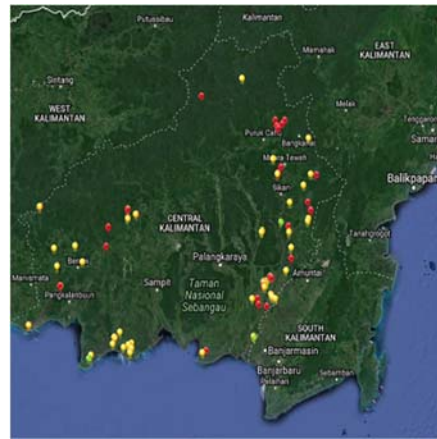


Figure 3. Test Image 1 (Hotspots on the 22nd until September 23, 2014) Source : <http://modis-catalog.lapan.go.id>

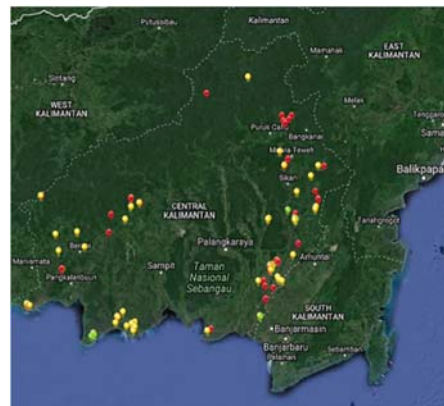


Figure 4. Test Image 2 (Hotspots on the 23rd until September 24, 2014) Source : <http://modis-catalog.lapan.go.id>



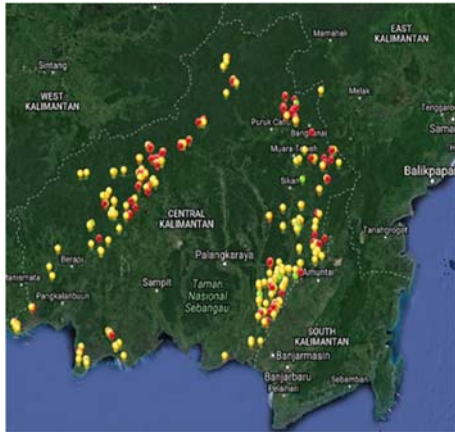


Figure 5. Test Image 3 (Hotspots on the 24th until September 25, 2014) Source: <http://modis-catalog.lapan.go.id>

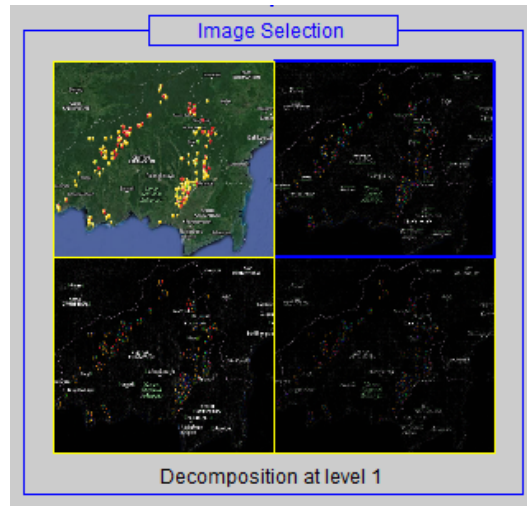


Figure 7 Decomposition Level 1

This study doing a test image compression using some orthogonal wavelet function (17 orthogonal wavelet functions). Then, the result of this peat forest fires satellite imagery compression will be compared using parameters measure the PSNR (Peak Signal to Noise Ratio) and compression ratio.

In Figure 7 displays the simulation results from the test image 3 compression using Haar wavelet with 3 levels of decomposition of 1.

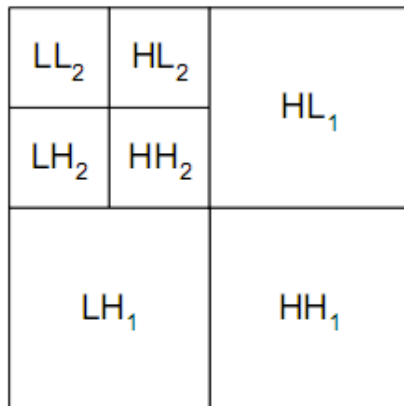


Figure 6 Image Decomposition  
Source : Albertus Joko Santoso et al [11]

In Figure 6 showing an image of the decomposition process that divides the image into 4 sub bands, i.e. HH, HL, LH, and LL on the decomposition process of level 1. Then the process is repeated in accordance with the specified level.

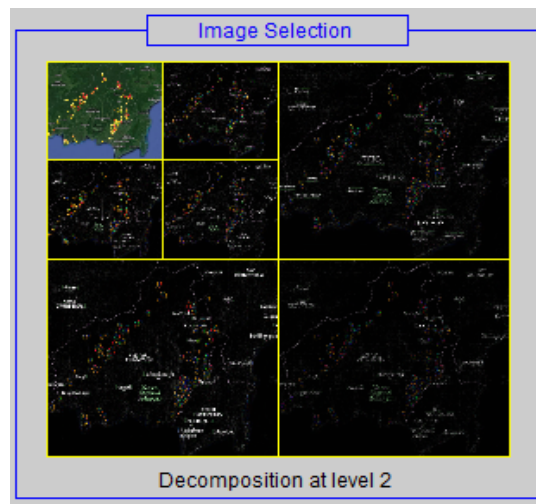


Figure 8 Decomposition Level 2

Figure 8 displays the simulated results of compression test image 3 using Haar wavelet decomposition with level 2.

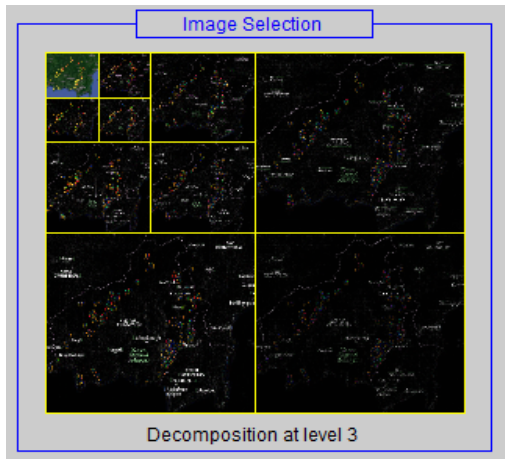


Figure 9. Decomposition Level 3

In Figure 9 displays the simulated results of compression test image 3 using Haar (daubechies 1) wavelet decomposition with level 3.

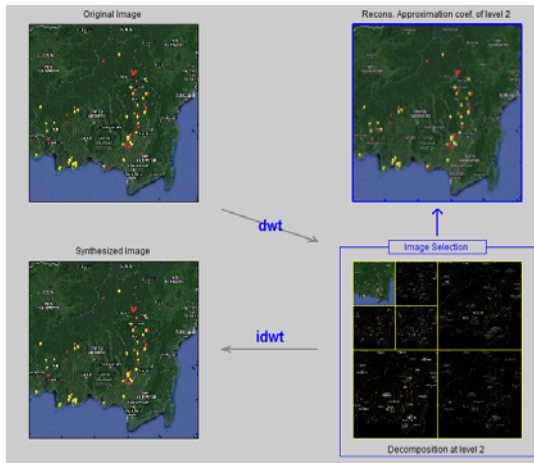


Figure 10 Reconstruct Image

In Figure10 displays the simulated results of reconstruct image decomposition level 2 using Haar wavelet

the PSNR of having more results it will produce quality imagery is rated better [26].

The formula for measuring the PSNR is as follows:

$$PSNR = 20 \times \log_{10} \frac{255}{\sqrt{MSE}} \quad (3)$$

Where,

$$MSE = \frac{1}{mn} \sum_{y=1}^m \sum_{x=1}^n (I(x,y) - I'(x,y))^2 \quad (4)$$

Where,

PSNR = Peak Signal to Noise Ratio

MSE = Mean Square Error

M = lines of the input image

N = columns of the input image

$I(x,y)$  = original image

$I'(x,y)$  = reconstruct image

In this study, PSNR is used to compare some of the functions of the orthogonal wavelet (17 wavelet orthogonal function) in compression of peat forest fires satellite imagery. The filter coefficients are longer than the smaller value of PSNR.

Table 1. PSNR Wavelet Orthogonal Daubechies (dB)

	Test Image 1	Test Image 2	Test Image 3
Haar (Db1)	46.394 44.719 <b>50.783</b>	46.837 44.779 <b>50.954</b>	46.116 44.234 <b>49.855</b>
Db2	46.788 44.479 50.649	47.145 44.516 50.770	46.910 44.106 49.717
Db3	46.939 44.437 50.221	47.254 44.480 50.374	47.129 44.050 49.351
Db4	47.099 44.107 49.890	47.433 44.145 50.056	47.252 43.745 49.114
Db5	47.283 44.108 49.816	47.664 44.123 49.934	47.373 43.734 49.111

## 5. RESULT AND CONCLUSION

### 5.1 Peak Signal to Noise Ratio (PSNR)

PSNR is a measurement parameter that is often used to measure the quality of image reconstruction, which is then compared to the original image. The results of the qualitative measure of PSNR form based on the mean-square-error in image reconstruction [30].

PSNR showing a comparison of several methods for finding a suitable method to solve problems as well as according to your needs [31]. If

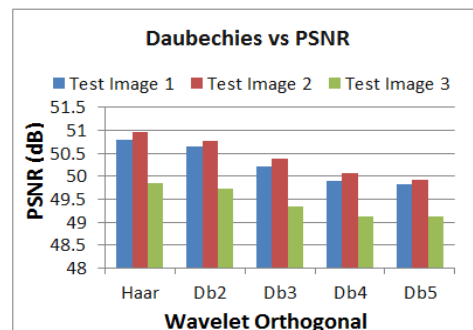


Figure 11. Daubechies wavelet influence towards PSNR

In table 1 and figure 11 could be seen the results of PSNR for the test image 1, image 2, and image 3 on wavelet orthogonal Daubechies family with decomposition levels 1, 2 and 3 are in Haar wavelet, and which has the lowest PSNR is the Daubechies wavelet of 5.

Table 2. PSNR Wavelet Orthogonal Coiflet(dB)

	Test Image 1	Test Image 2	Test Image 3
Coif1	47.096	47.530	47.052
	44.325	44.379	43.946
	<b>50.090</b>	<b>50.232</b>	<b>49.245</b>
Coif2	47.278	47.704	47.319
	43.467	43.566	43.122
	49.338	49.466	48.531
Coif3	47.331	47.747	47.389
	43.114	43.456	42.545
	48.412	48.567	47.662
Coif4	47.353	47.763	47.421
	43.136	43.472	42.583
	47.388	47.524	46.507
Coif5	47.364	47.768	47.439
	43.151	43.483	42.607
	46.564	46.721	45.767

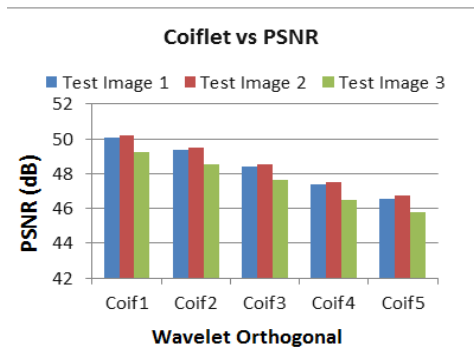


Figure 12. Coiflet wavelet influence towards PSNR

In table 2 and figure 12 could be seen the results for PSNR testing image 1, image 2, and image 3 on wavelet orthogonal decomposition Coiflet family with level 1, 2 and 3 is on the Coiflet1 wavelet, and which has the lowest PSNR is Coif wavelet 2 for the test image 1 and image 2 test, and the test image wavelet coif 4 for 1 and 3 test image.

Table 3. PSNR Wavelet Orthogonal Symlet(dB)

	Test Image 1	Test Image 2	Test Image 3
Sym2	46.788	47.145	46.910
	44.479	44.516	44.106
	<b>50.649</b>	<b>50.770</b>	<b>49.717</b>
Sym3	46.939	47.254	47.129
	44.437	44.480	44.050
	50.221	50.374	49.351
Sym4	47.211	47.642	47.281
	43.783	43.855	43.421
	49.605	49.755	48.779
Sym5	47.018	47.416	47.256
	43.665	43.748	43.302
	49.440	49.630	48.602
Sym6	47.264	47.688	47.357
	43.300	43.365	42.902
	49.065	49.211	48.263
Sym7	47.021	47.372	47.381
	43.316	43.407	42.932
	48.702	48.865	47.952
Sym8	47.290	47.707	47.391
	43.133	43.469	42.573
	48.237	48.395	47.410

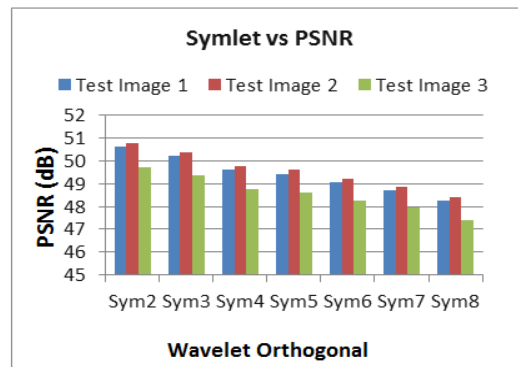


Figure 13. Symlet wavelet influence towards PSNR

In table 3 and figure 13 can be seen the results of PSNR testing image 1, image 2, and image 3 on wavelet orthogonal decomposition level symlet with families 1, 2 and 3 are on wavelet symlet 2 and that have a low PSNR wavelet is symlet 6.

## 5.2 Compression Ratio

Compression Ratio (CR) is the ratio between the size of the original image and the result image compression [32]. Compression ratio is defined as the ratio between the number of bits before compression with bit after compression [33]. Compression ratio is used to measure the reduction of the size of the data after the compression process [34]. The greater the compression ratio is then the orthogonal wavelet considered to have a better function [26].

The formula for measuring compression ratio is:

$$CR = \frac{\text{uncompressed image}}{\text{compressed image}} \times 100\% \quad (5)$$

Table 4. Compression Ratio Wavelet Orthogonal Daubechies (%)

	Test Image 1	Test Image 2	Test Image 3
Haar (Db1)	94.72	94.97	94.78
	93.55	93.59	93.49
	96.76	96.82	96.56
Db2	94.94	95.13	95.19
	93.53	93.55	93.48
	96.82	96.87	96.60
Db3	95.05	95.21	95.33
	93.51	93.53	93.47
	96.82	96.88	96.63
Db4	95.17	95.33	95.43
	93.43	93.46	93.41
	<b>96.85</b>	<b>96.90</b>	<b>96.83</b>
Db5	95.25	95.43	95.47
	93.41	93.42	93.39
	96.79	96.83	96.67

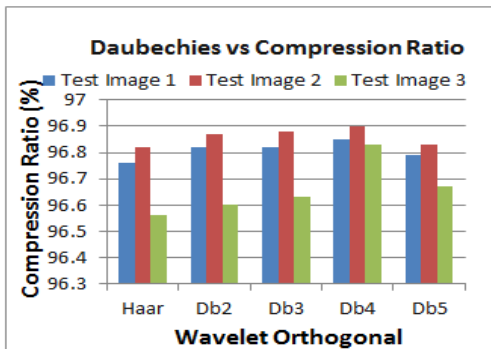


Figure 14. Daubechies wavelet influence towards compression ratio

Seen from table 4 and figure 14, the highest the compression ratio (CR) for the orthogonal Daubechies wavelet family is the Daubechies 4 for all the test images. While the Haar has the lowest compression ratio for all the test images.

Table 5. Compression Ratio Wavelet Orthogonal Coiflet(%)

	Test Image 1	Test Image 2	Test Image 3
Coif1	95.13	95.36	95.30
	93.51	93.54	93.47
	96.87	96.93	96.69
Coif2	95.30	95.49	95.50
	93.34	93.35	93.32
	<b>96.94</b>	<b>96.99</b>	<b>96.86</b>
Coif3	95.38	95.57	95.61
	93.26	93.50	93.18
	96.93	96.98	96.83
Coif4	95.40	95.62	95.69
	93.57	93.80	93.62
	96.91	96.96	96.83
Coif5	95.36	95.64	95.75
	93.63	93.91	93.84
	96.83	96.89	96.79

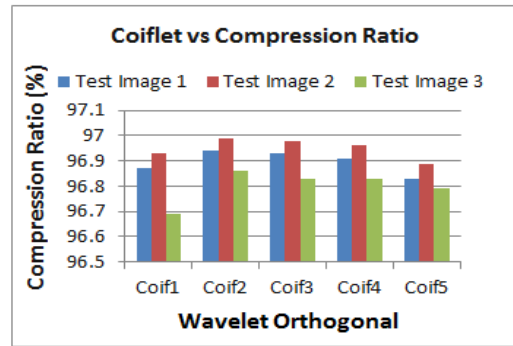


Figure 15. Coiflet wavelet influence towards compression ratio

Seen from table 5 and figure 15, the compression ratio (CR), the highest for the orthogonal wavelet families coiflet is Coiflet 2 for all the test images. While Coiflet 5 has the lowest compression ratio for all the test images.

Table 6 Result of Compression Ratio Wavelet Orthogonal Symlet(%)

	Test Image 1	Test Image 2	Test Image 3
Sym2	94.94	95.13	95.19
	93.53	93.55	93.48
	96.82	96.87	96.60
Sym3	95.05	95.21	95.33
	93.51	93.53	93.47
	96.82	96.88	96.63
Sym4	95.26	95.46	95.48
	93.46	93.48	93.44
	96.97	97.03	96.83
Sym5	95.20	95.39	95.50
	93.43	93.45	93.41
	96.98	97.05	96.84
Sym6	95.34	95.54	95.57
	93.35	93.38	93.34
	96.98	97.03	96.86
Sym7	95.23	95.38	95.59
	93.31	93.36	93.31
	96.96	97.00	96.84
Sym8	95.39	95.58	95.64
	93.46	93.68	93.36
	<b>97.00</b>	<b>97.05</b>	<b>96.90</b>

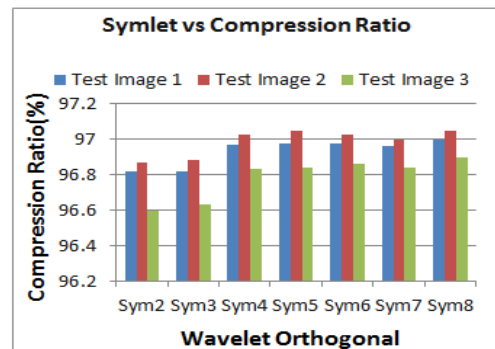


Figure 16. Symlet wavelet influence towards compression ratio

Seen from Table 6 and figure 16, the compression ratio (CR), the highest for wavelet orthogonal family of symlet is symlet 8 for all the test images. While symlet 2 has the lowest compression ratio for all the test images.

### 5.3 Comparison with previous work

The difference research of previous literature among others on the use wavelet devoted to 17 types of orthogonal wavelet i.e Daubechies Family ( db 1 to db 5), Coiflets Family ( coiflet 1 to coiflet 5 ), and the family of Symlets ( symlet 2 to symlet 8).

Then, in the previous research conducted as at [18] [11] is the use of the general image in the grayscale image or color image to the process of compression using wavelet.

This research uses specifically is a satellite image of peat forest fires. As well as research is also devoted to the process of compression of peat forest fire satellite imagery. This is done so that the results of this research can be used in particular in the areas of peat forest fires satellite imagery

### 5.4 Conclusion and Discussion

.Based on the research on the image of peat forest fires test results it is found that Haar wavelet has the highest PSNR for all test images up to testing at the level of decomposition three.

For each family of orthogonal wavelet highest PSNR are Haar/daubechies 1 (Daubechies Family) i.e 50.783 dB for test image 1, 50.954 dB for image 2 and 49.855 dB for image 3, Coiflet 1 (Coiflet Family) i.e 50.090 dB for image 1, 50.232 dB for image 2, 49.245 dB for image 3 and Symlet 2 (family Symlet) i.e 50.649 dB for image 1, 50.770 dB for image 2, 49.717 dB for image 2.

And for the highest compression ratios on all test image is Symlet 8. For each family of orthogonal wavelet compression ratio is highest Daubechies4 (Daubechies Family) i.e 96.85 % for image 1, 96.90 % for image 2 and 96.83% for image 3, Coiflet 2 (Coiflet Family) 96.94% for image 1, 96.99% for image 2 and 96.86% for image 3 and Symlet 8 (family Symlet) i.e 97.00% for image 1, 97.05% for image 2 and 96.90% for image 3.

PSNR is the benchmark of the similarity between the original image to the image

reconstruction. The benchmark of image compression is seen from the largest PSNR and large compression ratio. So it is concluded that the right orthogonal wavelet to compress satellite images of peat forest fires when using the PSNR parameter is wavelet haar because it obtains the highest results for all test images so it is judged to have good compression image quality. And from the compression ratio parameter then symlet 8 gets the highest result for all test images.

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