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Title:	A ROBUST FRAMEWORK TO DETECT MOVING VEHICLES IN DIFFERENT ROAD CONDITIONS IN INDIA
Author:	Dr.S.APPAVU ALIAS BALAMURUGAN, BALAJI GANESH RAJAGOPAL, Dr.KUMAR PARASURAM
Abstract:	Traffic situation in India is a quite complex in nature when compared to the traffic models in other nations. It is very essential to model the traffic nature in Indian roadways, both rural and urban roads. Indian road conditions are predominantly occupies different classes of roads viz. single, double, multi-way, cross junctions etc. This research article addresses the different nature of Indian roads with an insight to model the traffic situations in different weather conditions also. The proposed system tries to solve the problem of counting and classifying the vehicles in Indian road conditions. The system uses color image based foreground moving object detection by preserving the color and model of the moving vehicles. The color image based background subtraction technique is supported by cascaded linear regression. The system also uses HoG for contour creation and extraction followed by morphological dilation to connect the missing pixels in the vehicle object. The framework uses adaptive Support Vector Machines to train and model the different classes of vehicles. It has been found that the proposed framework shows an accuracy of 92% in varying levels of traffic density, Illumination conditions.
Keywords:	Vehicle detection, Vehicle counting, Low quality video, Color image based background model, MoG, HoG, SVM Classifier
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	THE ANALYSIS OF TEXTURAL IMAGES ON THE BASIS OF ORTHOGONAL TRANSFORMATIONS
Author:	GULZIRA B. ABDIKERIMOVA, FEODOR A. MURZIN, ALEKSEY L. BYCHKOV, XINYU WEI, ELENA I. RYABCHIKOVA, TALGATBEK AYAZBAYEV
Abstract:	The aim of the conducted research is development and search of analysis algorithms of textural images. The software products, which allow analyzing successfully textures in details, can be used in different fields of science and the industry. First of all, it is chemistry and materials science. It is possible to analyze materials of organic origin, cuts of metals and minerals, ceramics, etc. Another field of research, where we can effectively apply these methods, is the diagnosis of internal pathologies of human, including malignant, according to the images received by means of the thermal imager. In this study we are talking about application of spectral decomposition on various orthonormalized bases of images, which were received by the translucent electronic microscopy. The program is implemented in the Matlab environment, which allows spectral transformations of six types: 1) cosine, 2) Hadamard of the order, 3) Hadamard of the order $\frac{p-1}{2}$ prime number, i.e. based on Legendre's symbol, 4) Haar, 5) slant, 6) Dobeshi-4. Various experiments were made. The algorithms, which were studied in this research, have allowed us to allocate effectively on the analyzed images some fields, which can be characterized by different degrees of structure orderliness. To say more precisely, chemists are interested in the disorder areas of structure of materials, for example, during studying the ultrastructure of plant cell walls. This research was made for the Institute for Chemistry of Solids and Mechanochemistry of the Siberian Branch of the Russian Academy of Sciences. The main attention was paid to the development of software tools for the analysis of the above microphotographs. It is supposed that received characteristics for different images - textural signs, as well as various spectral coefficients can be further correlated with values, which characterize the physical and chemical properties of the analyzed material: reactivity, porosity, diffusion coefficient, and so on. For correlation, it will be possible to use algorithms for machine learning, for example, based on the neurocomputer approach.
Keywords:	Image Processing, Textural Images, Orthogonal Transformations, Microphotography Analysis, Electronic Microscopy, Herbal Raw Material.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	HYBRID ARTIFICIAL BEE COLONY ALGORITHM WITH MULTI-USING OF SIMULATED ANNEALING ALGORITHM AND ITS APPLICATION IN ATTACKING OF STREAM CIPHER SYSTEMS
Author:	MAYTHAM ALABBAS, ABDULKAREEM H. ABDULKAREEM
Abstract:	<p>A new hybrid evolution algorithm (ABC-SA), i.e. artificial bee colony algorithm (ABC) with multi simulated annealing (SA) using, is presented. In ABS-SA procedure, the ABC provides a global search and the SA algorithm provides local search. SA processes are used to improve the original ABC algorithm into two different manners: (i) repair the initial food sources of ABC, which is generally carried out randomly, in order to look for promising areas; and (ii) selecting a candidate food source because SA can escape from local optimum point by accepting worse solutions at a particular probability in the neighbor searching period.</p> <p>The ABC-SA algorithm has been applied to break a number of linear and nonlinear stream cipher systems, which is one of the hard electronic cipher systems because of high security and difficulty in breaking it.</p> <p>The current findings are encouraging. Comparison of the results indicated that in most cases the ABC-SA algorithm outperforms the original ABC algorithm.</p>
Keywords:	Artificial Bee Colony Algorithm, Simulated Annealing, Hybrid algorithm, Stream Cipher System
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	HIDDEN ENCRYPTED TEXT BASED ON SECRETE MAP EQUATION AND BIOINFORMATICS TECHNIQUES
Author:	ALAA KADHIM F., RASHA SUBHI ALI
Abstract:	<p>The speedy development in information technology desires the secure transmission of confidential information that gets an excellent deal of attention. Therefore; it's necessary to use effective methods to reinforce information security. Steganography is one in all leading technologies getting utilized around the world for along time. Biotechnological methods can be used for cryptography to improve security of data. Steganography is the act of hiding messages inside an image. Combining these two methods is a topic of high relevance since secure communication is inevitable for mankind. This research presents an analysis of steganography, by using Least Significant Bit (LSB), DNA computing and creating a secret map for hiding data. The DNA computing was used to encrypt secret data, LSB was utilized to add the encrypted data into least significant bits of the cover and the secret map was utilized to specify the location of hiding data. The same equation must be used by the sender and the receiver to create the secret map and the creation for this map depends on the shared key.</p>
Keywords:	Least Significant Bit (LSB), DNA Computing, Secret Map, Steganography.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	BTS ALGORITHM: AN ENERGY EFFICIENT MOBILITY MANAGEMENT IN MOBILE CLOUD COMPUTING SYSTEM FOR 5G HETEROGENEOUS NETWORKS
Author:	L. PALLAVI, A. JAGAN, B. THIRUMALA RAO
Abstract:	<p>As of late, cell phones are turning into the essential stages for each client who dependably meander around and get to the distributed computing applications. Mobile Cloud Computing (MCC) consolidates the both portable and distributed computing, which gives ideal administrations to the versatile clients. In cutting edge versatile conditions, for the most part because of the immense number of portable clients in conjunction with the little cell measure and their convenient information's, the impact of portability on the system execution is reinforced. In this paper, we propose an energy efficient mobility management in mobile cloud computing (E2M2MC2) system for 5G heterogeneous networks. The proposed E2M2MC2 system use back track searching (BTS) algorithm for congestion prediction and selection of optimal routes to manage user mobility. The simulation results shows that the proposed E2M2MC2 system helps in minimizing delay, packet loss rate and energy consumption in a heterogeneous network.</p>
Keywords:	Mobile Cloud Computing, Mobility Management, Heterogeneous Network, Best Route, Energy Efficient, Back Track Search, distributed follow me cloud controller
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

Title:	LOW LIGHTNESS ENHANCEMENT USING NONLINEAR FILTER BASED ON POWER FUNCTION
Author:	NABEEL M. MIRZA, HANA H. KAREEM, HAZIM G. DAWAY
Abstract:	In fact, optical imaging systems produce images that demand to enhance low contrast, poor illumination, and other reasons. Thus, it is essential that those images pass through an improvement stage before testing them by specialists in many different applicative fields. Therefore, this research aims at improving the low lightness by a Nonlinear Filter Power Function (NFPF) algorithm. NFPF is applied to enhance the illumination of color images; it consists of three steps sequential: intensity enhancement, contrast enhancement, and color restoration of RGB channels. The interest of the proposed enhancement method has been evaluated depending on three criteria, namely: entropy, Normalize Mean Squared Error for Hue (NMSEH) and Normalize Mean Squared Error for Saturation (NMSES). The suggested algorithm (NFPF) was compared with four previous algorithms such as a Parallel Nonlinear Adaptive Enhancement (PNAE), New Nonlinear Adaptive Enhancement (NNAE), Multi-Scale Retinex with Color Restoration (MSRCR), and Histogram Equalization (HE). Qualitative results show that the proposed algorithm (NFPF) has outperformed other algorithms accordance to subjective and objective assessment.
Keywords:	Image Enhancement, Adaptation Power Function, Histogram Equalization, Intensity Enhancement.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

Title:	INTELLECTUAL TECHNOLOGIES AND DECISION SUPPORT SYSTEMS FOR THE CONTROL OF THE ECONOMIC AND FINANCIAL PROCESSES
Author:	BIDIUK P.I., PROSIANKINA-ZHAROVA T.I., TERENTIEEV O.M., LAKHNO V.A., O.V. ZHMUD
Abstract:	A computer based decision support system is proposed the basic tasks of which are adaptive model constructing and forecasting of various types of processes that are developing in socio-economic systems under the influence of fundamental structural changes. The complexity and urgency of the solvable problem is the need to provide acceptable quality forecasts of financial and economic indicators for short data samples, when the usage of retrospective data is impossible or significantly limited. The DSS development is based on the system analysis principles, i.e. the possibility for taking into consideration of some stochastic and information uncertainties, forming alternatives for models and forecasts, and tracking of the computing procedures correctness during all stages of data processing. A modular architecture is implemented that provides a possibility for the further enhancement and modification of the system functional possibilities with new forecasting and parameter estimation techniques. In addition, the proposed system, thanks to the modular architecture, can be improved by using the software of different vendors without any additional structural changes. A high quality of the final result is achieved thanks to appropriate tracking of the computing procedures at all stages of data processing during computational experiments: preliminary data processing, model constructing, and forecasts estimation. The tracking is performed with appropriate sets of statistical quality parameters. Example is given for estimation of financial risk in insurance sphere and the electricity consumption in terms of energy saving. The examples solved show that the system developed has good perspectives for the practical use. It is supposed that the system will be universal and find its applications as an extra tool for support of decision making when developing the strategies for companies and enterprises of various types.
Keywords:	Mathematical Model, System Analysis Principles, Adaptive Forecasting, Decision Support System, Risk Estimation
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

Title:	APPLICATION OF SUPPORT VECTOR REGRESSION FOR JAKARTA STOCK COMPOSITE INDEX PREDICTION WITH FEATURE SELECTION USING LAPLACIAN SCORE
Author:	ZUHERMAN RUSTAM, KHADIJAH TAKBIRADZANI
Abstract:	Researchers and investors have been searching for accurate model to predict the stock value. An accurate model prediction could gain profits for investors. According to Indonesia Stock Exchange, stock is becoming one of the most popular financial instrument in Indonesia. Investors take the smaller sample called index that represent the whole because it would be too complicated to record every single security that trades in the country. There are many stock indices in the world, one of them, is Jakarta Composite Index (JKSE). One of the benefits of following the stock indices value is to reduce the loss in investment. Thus,

this paper is focused in supervised learning method to solve regression problem, Support Vector Machines for Regression (SVR). There are fourteen technical indicators calculated in this paper. Laplacian score will be calculated for each fourteen technical indicators. Laplacian score is calculated to mirror the locality preserving power. Support Vector Machines for Regression (SVR) with feature selection using Laplacian Score is the proposed methodology with Jakarta Composite Index (JKSE) are considered as input data. The best model is the prediction model with thirteen features and 30% training data which has value of Normalized Mean Squared Error (NMSE) is 1.30691E-07

Keywords:	Laplacian Score; Support Vector Machines for Regression (SVR); Jakarta Composite Index (JKSE); Stock Price Trend Prediction.
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Title:	LANDSAT 8 SATELLITE IMAGERY ANALYSIS FOR RICE PRODUCTION ESTIMATES (CASE STUDY : BOJONEGORO REGENCYS)
Author:	BANGUN MULJO SUKOJO , SALWA NABILAH , CEMPAKA ANANGGADIPA SWASTYASTU
Abstract:	Bojonegoro as the mainstay of rice producers in the province of East Java, have a mission to realize the dream become a national food basket. In 2012, Bulog's Bojonegoro Bulog to be the highest regional subdivisions throughout Indonesia. Seeing this potential, it is necessary to attempt to monitor the stability of agricultural production on a regular basis. By integrating the technology of remote sensing using Landsat satellite imagery 8 to identify a growth phase and forecasting models Autoregressive Integrated Moving Average (ARIMA) to predict the productivity of rice, are expected to provide a solution and ease of repeated and continuous monitoring with wide area coverage. Identify the growth phase carried out in 9 phases. Of the linear regression between growth stage rice plants with vegetation index values are used, the value of the coefficient of determination (R ²) of 0.7229 for NDVI algorithms and algorithms MSAVI amounted to 0,879. Used reflectance values of wave band SWIR2 (1.57µm-1.65µm) to help distinguish each growth phase of the identification algorithm MSAVI where to phase 3, 4, 5 has a reflectance SWIR2 above 0.15, while the phases 7, 8, 9 has reflectance SWIR2 under 0.15. Forecasting process rice productivity obtained seasonal ARIMA (1,0,0) 3. So that it can be seen Forecast Figures (ARAM) rice productivity for subround III in 2013 amounted to 66.21 quintal per hectare. Results highest estimate of 169,595.385 tons for tillering phase (15 weeks ahead of harvest) and amounted 72246.878 tons for seedling phase (13-14 harvest next week). So it can be seen that when the study was conducted, Bojonegoro located in the growing season.
Keywords:	ARIMA, Phase Grown Rice, Landsat 8, Rice Productivity
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Title:	A NEW PROPOSAL OF COMPRESSION METHOD FOR ENHANCING SHAMIR'S SECRET SHARING USING GAUSSIAN ELIMINATION BASED ON HYBRID TRANSFORM CODING (IWT-DCT)
Author:	SALAH S. AL-RAWI, AHMED S. FASIH, AHMED T. SADIQ
Abstract:	Based on the dictionary coding technique, a new lossless compression method (CBDM) is presented to compress the color image in sufficient manner without missing any information and give a good CR. Then we use this proposed method in the sharing scheme (which presented and explained in reference [3]) to enhancing the performance of the system by combining it with other methods in compression phase into the sharing system, which suggested to share a secret image into multiple shadow pictures utilizing a method for solving a system of linear equation by Gaussian Elimination and scheme of Shamir's threshold. This sharing system gives a shadow image size for everyone user to be as smaller as possible $[1/4.6*(v/k)]$ of the secret image (where $v=2,3,...$, according to k value; the minimum number of qualified shares to reconstruct the secret), and any number of shares less than k uncovers any data about the secret image. This technique is secure for an image sharing with excellent execution time and gives fantastic (PSNR) value rate [larger than 34 dB] as shown in result table using DPCM that keep an image quality good however much as could be expected.
Keywords:	Secret Image Sharing (SIS), Visual Secret (VS), RLC, DPCM, Gaussian Elimination (GE).
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	A REVIEW ON TOOLS AND TECHNIQUES FOR FAMILY TREE DATA VISUALIZATION
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Author:	SITI FATIMAH BOKHARE, WAN MOHD NAZMEE WAN ZAINON
Abstract:	Visualization is an important and helpful ways to support the exploration of large data sets. The leading benefit of visualization is that it does not only provide graphical representation of data but also allows changing of form, omitting what is not required and browsing deeper to get further details. This paper reviews some of the previous research related to family tree (or sometimes known as genealogy) data visualization. It focuses on existing techniques and applications that are currently available to address family tree visualization issues. The content of this paper is divided into several sections such as visualization usability, family tree visualization, graph theory of kinship network and graph visualization. Visualization gives opportunity to approach huge network type of data and makes it easily comprehensible. In order to gain the full benefit of family tree data, a proper understanding about the current visualization tool or techniques that is used to represent these type of data in a fully interactive environment will be highly beneficial.
Keywords:	Data Visualization, Family Tree Visualization, Theory of Kinship Network, Social Network Visualization
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	IS / IT STRATEGY PLANNING IN PT GIFTCARD INDONESIA WITH WARD & PEPPARD FRAMEWORK
Author:	KEVIN BERSON S TURNIP, AHMAD NURUL FAJAR
Abstract:	This Study aims to analyze strategic plan for IT in the business GIFTCARD INDONESIA, which can provide guidance in managing IT resources to meet the needs of all business processes, supporting the development of business and improve efficiency. By using the IT Strategic Planning framework, with the input of external and internal business and IT environment. This study also use Critical Success Factor to measure current portfolio application and create future portfolio application. IT Strategic Plan that resulted from this research, defines the structure of the IT organization and the IT infrastructure to support the new development of IT services, which can be implemented in supporting the advancement of the business.
Keywords:	Ward and Peppard, IS Strategy, IT strategy, IS/IT Management Strategy, PT Giftcard Indonesia
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Title:	LIGHTWEIGHT SECURE SCHEME FOR IOT-CLOUD CONVERGENCE BASED ON ELLIPTIC CURVE
Author:	AMRANI AYOUB, RAFALIA NAJAT, ABOUCHABAKA JAAFAR
Abstract:	The internet of things appears as a solution to connect people around the world. Its utility lies in the ability to connect objects and exchange information anywhere and everywhere. Many objects and services in different fields will be created, such as smart homes, e health, transport and logistics. The evolution of IoT, increases the number of connected object that generates a huge number of data. However, with the low capacity of storage and processing of these objects, there is a requirement to connect these objects to a large pool of resource like Cloud computing. The convergence between IoT and Cloud, will bring many services that will be of great benefit to humanity. However, this convergence will not see the day unless the communication between devices and the Cloud is secure. Most of the secure scheme proposed, that we will quote in the following sections, either have a weakness on their scheme, or are based on Hypertext Transfer Protocol (HTTP) which consumes bandwidth and which will exhaust the resources of the devices. Publish / Subscribe is a messaging pattern where publishers publishes messages to subscribers. The use of protocols based on pub/sub like Message Queuing Telemetry Transport (MQTT) is very essential when response time, lower battery, bandwidth and throughput usage are on the first place for future solutions. In this paper, a secure Elliptic Curve Cryptography (ECC) protocol using Publish / Subscribe lightweight protocol has been proposed for creating a secure tunnel between IoT devices and Cloud Computing, and that can allow a very fast communication also it's a light protocol that will not exhaust the resources of the IoT object. In fact, we use the AVISPA tool for a formal verification of our proposed protocol.
Keywords:	Security; Cloud Computing; Elliptic Curve Cryptography; Internet of Things; MQTT.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	MEASURING INFORMATION SECURITY AND CYBERSECURITY ON PRIVATE CLOUD COMPUTING
Author:	WENDY, WANG GUNAWAN
Abstract:	Information security is an essential topic that contributes the success of business operation nowadays. The urgency of applying effective information security can be seen in all business and non-profit entities. The article takes the case of university XYZ that uses private cloud computing as essential tools to support its business processes. The article examines the effective way of measuring the level of information security and CyberSecurity performance that focuses on private cloud use with its recommendations. The article applies the ISO 27001:2013 framework by involving all clauses in Annex A ISO 27001:2013 and COBIT5 for CyberSecurity, section Applying to CyberSecurity. Annex A ISO 27001:2013 and COBIT5 for CyberSecurity is used to measure the information security and CyberSecurity performance, respectively. The article uses a survey method to the employees in the IT division at University XYZ. The article examines the maturity level gap between current and expected results and provides necessary recommendation to improve current situation. The outcome of the article is expected to provide as a reference for information security application in higher education institutions.
Keywords:	Information Security, CyberSecurity, Private Cloud Computing, ISO 27001, COBIT 5.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	AN EMPIRICAL EXAMINATION OF CHARACTERISTICS OF MOBILE PAYMENT USERS IN INDONESIA
Author:	GUNAWAN WANG , NADIA MIRANDA PUTRI , ARIO CHRISTIANTO , DANNY HUTAMA W
Abstract:	The current use of mobile devices is a necessity for almost all people, especially in Indonesia. A total of more than 100 million mobile phones have been used by the Indonesian people and approximately 150 million cellular cards have been registered in Indonesia. This is an opportunity for entrepreneurs in the technology field to take advantage of this business opportunity to create applications that use mobile devices such as banking applications. In Indonesia, banking applications have existed since 2007 and continue to grow until now with almost the same features. After testing the questionnaire, it was found that innovativeness, reachability, compatibility, convenience affect perceived usefulness and perceived ease of use towards the intention of use
Keywords:	Mobile Payment, System Characteristics, Individual Differences, Mobile Payment Users
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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Title:	MODIFIED K-MEANS CLUSTERING MODEL IN MULTI STORE DELIVERY SERVICE
Author:	PURBA DARU KUSUMA
Abstract:	There are several delivery service problems in companies that have multiple stores in one city. These problems occur especially for companies that offer products that these products must be delivered to the customers location by using their own delivery service. For several companies, they distribute their stock in a single main warehouse and in their stores. In the other side, their delivery service fleet is also distributed in their main warehouse and in every store. This condition triggers inefficiency in stock and the delivery fleet. In this work, we propose the centralized shared delivery service model. As a centralized model, the delivery service is handled by the central management so that coordination in delivery process among vehicles can be more efficient. As a shared system, the vehicle is not dedicated for single store only so that the vehicle can deliver products that come from more than one store in a single trip. In warehouse management, we use single warehouse concept so that all purchased products from all stores will be delivered from the main warehouse. In this work, we propose modified k-means clustering model in managing the delivery process. By using clustering mechanism, each vehicle will deliver products that their destination location is near to each other. In this work, we propose two variants of the k-means clustering model. In the first variant, we combine the k-means clustering method with the round robin method. In the second variant, we combine the k-means clustering method with sequential vehicle creation method. There are research findings after we have done tests. The increasing of the city size makes all observed variables increase. This condition occurs in all models. The increasing of the maximum delivery distance does not affect the total delivery distance but makes the number of vehicles decrease and in the other side makes the delivery distance per vehicle increase. The increasing of the number of stores does not affect the total delivery distance. In the first model, the increasing of the number of stores makes the number of vehicles increase and the delivery distance per vehicle decrease. In the other models, the increasing of the number of stores does not affect the number of vehicles and the delivery distance per vehicle. The increasing of the

	number of destinations makes all observed variables increase.
Keywords:	Delivery Service, K-Means Clustering, Round Robin, Single Warehouse Multi Store.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019
	Full Text
Title:	TRACKING VEHICLES IN URBAN SMART CITY BASED XILINX PLATFORM
Author:	INAAM RIKAN HASSAN, MOHAMMED ABDULRAHEEM FADHEL
Abstract:	Computer vision becomes one of the significant smart city applications due to the unbelievable growth in electronics, informatics, and communication fields. Since the smart city is directed by smart self-governing systems, A lot of algorithms have been released for achieving smart city requirements. These algorithms include methods for detecting text, faces, vehicles and moving objects. Then, by comparing their output with the ground-truth, the performance of these algorithms can be measured. This paper focusing on following (detect and track) the moving vehicles. Two different object detection algorithms have been tested, namely temporal difference algorithm and fixed background algorithm for a video of (120 x 160) pixels frame-size. The designed system was implemented based on FPGA board (Xilinx-ISE 14.6 XC3S700A), while the simulation was built by employing MATLAB. To stay away from the limitation of the FPGA board size, the Verilog code was invoked by utilizing the MATLAB platform.
Keywords:	Urban Smart City, Temporal Difference Algorithm, Fixed Background Algorithm, Xilinx
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019
	Full Text
Title:	ARRHYTHMIA DETECTION BASED ON COMBINATION OF FREEMAN CHAIN CODE AND FIRST ORDER TEXTURE FEATURES
Author:	ZAMEN F. JABR, RANA H. HUSSAIN, SHAYMAA R. SALEH
Abstract:	This paper presents a novel method of detection and classification an Arrhythmia based on ECG chart using image processing techniques and neural network as classifier tool .The method consist of three major stage firstly preprocessing to prepare the ECG chart image, secondly features extraction stage represent by freeman chain code and first order features which are arranged in vector consist of 14 input each one hold one feature value, finally stage this vector of features entered to BPNN classifier to classify an Arrhythmia type. The system applied on dataset consists of 90 ECG chart images. Two different ratios of training/testing groups which are (30% to 70%,50% to 50%) are applied to the classifiers. The higher system's accuracy in first ratios was100% for training group and 90.5% for testing group while higher system's accu-racy in second ratio was 100% for training group and 97.8% for testing group with time 31.6 second. The system achieved using Matlab.
Keywords:	ECG chart, Arrhythmia, Freeman chain code, First order features, Artificial neural network.
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019
	Full Text
Title:	ESTIMOTE-BASED LOCATION AWARENESS ON MOBILE DEVICES FOR VISUALLY IMPAIRED
Author:	GIVA ANDRIANA MUTIARA, GITA INDAH HAPSARI, PERIYADI, AGUS PRATONDO
Abstract:	The limitations vision that possessed by the visually impaired in interacting with their environment, causing them to have difficulties in doing traveling. But, along with the development of smartphone technology, the visually impaired people began using smartphones to help them engage in any activities. Estimote beacons are a small device that broadcast a Bluetooth signal that can be captured by a smartphone. This research contributions to provide the information to the visually impaired person in order to have easy use compatible with the smartphone since the Estimote beacons are used as a location awareness device to give the information about the surrounding environment. The systems were configured and programmed using android studio for indoor and outdoor locations. Based on the indoor result testing, it can be stated that the implementation of the Estimote beacon as a location awareness in indoor area, must be focused on the installation of the Estimote beacons. The installation must be set smoothly and the broadcast signal should not be overlap. The outdoor result testing indicates that the Estimote beacon signal is stable to receive on the smartphone at a distance 0 ♦ 31.64 meters, begin unstable at a distance of 38.61 meter and become undetected at a distance of 79.79 meters.
Keywords:	Estimote Beacons, Visually Impaired, Mobile Devices, Location Awareness, Bluetooth

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Title:	A ZONE TIME BASED VEHICULAR AD-HOC CLOUD NETWORK SERVICES MANAGEMENT SYSTEM
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Author:	FIRAS M. KHALAF, FOAD SALEM MUBAREK
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Abstract:	Vehicular Ad-hoc Networks (VANET) is a network infrastructure that provides the communications among vehicles and have many Characteristics including reducing congestion, minimizing accidents, reducing fuel consumptions etc. The concept of cloud computing basically relies on using of the idle vehicles resources and provision it for other vehicles either for free, or a user only pay for services used (e.g. memory, processing time and bandwidth etc.). Exploiting the added benefits of Cloud Computing and merging it with VANET is an advance step that requires a special designs and solutions to accommodate VANETs characteristics with the cloud concept requirements. The main problem for vehicular cloud networks is high mobility and difficult predictability in urban area, making it difficult to implement in connection and data processing, because continuous interruptions in communication lead to loss data. Therefore, in this paper, we proposed a system to manage some vehicular cloud network services to ensure all these services completed without dropped or disconnected during execution time. We adopt the concept of dynamic vehicles, which will satisfy the needs of the users. Dynamic vehicle is evaluated with respect to spending time within the zone, this time is calculated in several ways and in most cases the best vehicles participating in the service are selected depending on zone time. The proposed system is compared with the normal system. For accurate comparison, two important metrics are selected, i.e. throughput and packet delivery ratio to evaluate the two systems. The results proved that our system is more reliable and efficient than the normal system in different scenarios.
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Keywords:	NS2, VANET, VCC, VCC services, Zone time.
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Title:	A SYSTEMATIC REVIEW ON DISTRIBUTED DATABASES SYSTEMS AND THEIR TECHNIQUES
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Author:	KATEMBO KITUTA EZCHIEL, SHRI KANT, RUCHI AGARWAL
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Abstract:	Distributed Databases Systems (DDBS) are a set of logically networked computer databases, managed by different sites and appearing to the user as a single database. This paper proposes a systematic review on distributed databases systems based on respectively three distribution strategies: Data fragmentation, Data allocation and Data replication. Some problems encountered when designing and using these strategies have been pointing out. Data fragmentation involves join optimization problem since when a query has to combine more than one fragment stored on different sites. This produces the high time response. Heuristic approaches have been examined to solve this problem as it is known as a NP-Hard problem. Data Allocation is also another particular problem which involves finding the optimal distribution of fragments to Sites. This has already been proved to be a NP-complete Problem. The review of some heuristics methods as solutions has been conducted. Finally, Data replication, with its famous synchronization algorithm, which is the unique strategy to manage exchange of data between databases in DDBS, has been studied. Thus, following problems have retained our attention: serialization of update transactions, reconciliation of updates, update of unavailable replicas in Eager or synchronous replication, sites autonomy and the independence of synchronization algorithm. Therefore, this has been our motivation to propose an effective approach for synchronization of distributed databases over a decentralized Peer-to-Peer (P2P) architecture.
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Keywords:	Distributed Database, Data Fragmentation, Data Allocation, Data Replication, Data Synchronization, Peer-to-Peer (P2P) architecture.
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Title:	A REUSABLE BALINESE CALENDAR ENGINE
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Author:	I MADE DWI MARTADI PUTRA, I MADE SUKARSA, DWI PUTRA GITHA, I WAYAN KANDI WIJAYA
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Abstract:	Most of the Balinese digital calendar development begins with creating an engine, which becomes an inefficient development process. In this study, a reusable engine of the Balinese calendar was designed. This study used DSRM methodology to identify problems and produce an engine as the solution. The engine was a combination of Python and PLSQL,
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which makes it flexible to be customized and embedded. The engine has several algorithms to calculate Balinese calendars attributes (wuku, dewa, wewaran from ekawara to dasawara, ingkel, jejepan, lintang, watek, urip or neptu, ekajala rsi, zodiak, pengalantaka, sasih and year of Saka Calendar, full moon or new moon) and adjusted with the Saka and Pawukon calendar system. The engine consists of a web service that served as data parser and a database to store the attributes. Results of the experiment showed that the engine was able to generate appropriate Balinese calendar attributes of one day up to one-month or one-year Gregorian calendar, compared to the other existing Balinese digital calendar.

Keywords:	Balinese Calendar, Engine, Python, Pawukon, Saka
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Title:	EDM PREPROCESSING AND HYBRID FEATURE SELECTION FOR IMPROVING CLASSIFICATION ACCURACY
Author:	SAJA TAHA AHMED, PROF. DR. RAFAH SHIHAB AL-HAMDANI, DR. MUAYAD SADIK CROOCK
Abstract:	Educational Data Mining (EDM) is in charge of discovering useful information from educational datasets. In recent years, the data is mounting rapidly due to the ease access to the websites of e-learning intakes extraordinary enthusiasm from different colleges and instructive foundation. High dimensionality, irrelevant, redundant and noisy dataset can affect the knowledge discovery during the training phase in a bad way as well as degrading machine learning performance accuracy. All these factors often rise demand for dataset preparation, analysis, and feature selection. The fundamental aim of research is to enhance the precision of classification by information preprocessing and expel the unessential information without discarding any vital data by means of feature selection. This paper proposes EDM dataset preprocessing, and hybrid feature selection method by combining filter and wrappers techniques. In the filter-based feature selection, the statistical analysis is based on the Pearson correlation and information gain. In the wrapper method, the accuracy of the feature subset is tested using a neural network as a baseline algorithm. The obtained results show an enhancement in performance accuracy toward selecting minimum feature subset with high predictive power over using all features.
Keywords:	Educational Data Mining, Hybrid Feature Selection, Neural Network, Data Preprocessing, Accuracy.
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Title:	DEVELOPED CRIME LOCATION PREDICTION USING LATENT MARKOV MODEL
Author:	REEM RAZZAQ ABDUL HUSSEIN, Dr.MUAYAD SADIK CROOCK, Dr SALIH MAHDI AL-QARAAWI
Abstract:	Latent models, called hidden Markov models (HMMs), are types of algorithms that have been designed to detect crime activities by obtaining a sequence of observations from hidden values. The main contribution of these types of models is the fusion of coupled parameters with two types of HMM algorithms. The first algorithm is the Viterbi algorithm, which is commonly used to find the most probable path, and the accuracy of this algorithm is equal to 80%. The second algorithm is the Baum-Welch algorithm, which has been used to produce robust and accurate models. The modeling results normally focus on evaluating relative mean square errors in log likelihoods, transition matrices, and emission matrices for comparison of modeling performance based on different tolerance values. Previous reports have shown that the modified Baum-Welch algorithm can achieve good results for decreasing tolerance values. The goal of this Work is to generate a compact model that deals with ternary parameters rather than binary parameters by determining the sequential relation of past crime types and locations. Geographic locations can improve the HMM visualization in MATLAB. Moreover, crime levels and their most probable locations are predicted. The obtained results prove the goal of this work.
Keywords:	Vine Copula, Hidden Markov Models, Viterbi Algorithm, Baum Welch Algorithm, Measurement Errors
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Title:	WIRELESS SENSOR NETWORK FOR ILLEGAL LOGGING APPLICATION: A SYSTEMATIC LITERATURE REVIEW
Author:	GIVA ANDRIANA MUTIARA, NANNA SURYANA, OTHMAN BIN MOHD

Abstract:	Wireless Sensor Networks (WSN) is a technology available for outdoor area application. The characteristic of illegal logging application is suitable to apply WSN-based application. Because the illegal logging application is implemented in a wide range area, supervised the environment forest, and consists of hundreds of sensor nodes. This paper aims to review and summarize as systematically the contribution of WSN Technology in illegal logging area research as a long-range network application especially in detection and identification method, timber tracking methods, data exchange, and transmission method. A Systematic Literature Review (SLR) were outlined in this paper as a standard methodology of predefined research strategy to solve the problems by tracing the previous research. By defining the Research Question (RQ) to guidelines the SLR process and inserting the search string in the database reputation journal, the previous research can be configured. There are 42 previous studies applied WSN to used it in the illegal logging application. The result stated that WSN has biggest contributions since 33% researcher using WSN to tracking application, 41% use the WSN as a data exchange in their system, and 48% used WSN as data transmission between sensor nodes. This paper is expected to give a contribution to the researcher who wants to build the system to tackle illegal logging since the illegal logging has been hot issues in the world.
Keywords:	Wireless Sensor Network, Illegal Logging, Long-Range WSN, Data Exchange
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Title:	AN EXPERT SYSTEM FOR THE DESIGN AND CLASSIFICATION OF ISLAMIC GEOMETRIC PATTERNS USING COMPUTER GRAPHICS
Author:	AHMAD M. ALJAMALI, MOHAMED FAKIR
Abstract:	<p>Islamic geometric patterns (IGP) have often presented an enduring historic reverence to those who have strived to present a sensible classification of these structures. They are complex, beautiful structures, which combine elements of art, with elements of mathematics, especially relating to geometric patterns. This article proposes an innovative approach to classify and design IGP using computer aided technologies.</p> <p>The researcher surveyed many existing methodologies regarding the classification of IGP like 7-frieze patterns, 17-wallpaper patterns theories and design approaches based on principles of classical gridding systems. The proposed methodology suggests a system which can design classification of a pattern (collection of unit patterns) and classification of a design (a collection of grids and geometric attributes). The Classification of a pattern consists of repeating the unit base pattern by isometric transformations (translation, mirroring, rotation and glide reflections) to generate a pattern that can be classified as 7-frieze patterns or the 17-wallpaper patterns. Classification of a design involves the normalization of the grids and geometries. In this paper, the researcher also presented an argument that those pattern theories are purely base models. The researcher has been successful in developing a new method of classification rightly validated by geometric and scientific analysis. The researcher succeeded in developing software that draws the grids of any IGP star/rosette design and displays its classification instantly.</p> <p>So, the approach can be considered as a measurable method of classification for any given Islamic geometric design. The software is enabled to detect and classify the IGP star/rosette sub-motif grid from its gridding system of classification which will allow the user to explore and design the sub-motif pattern, motif pattern, unit pattern and finally the pattern in x-y direction.</p>
Keywords:	IGP, Pattern Theories, Star/Rosette Classification and Design
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Title:	A NEW HUMAN FACE AUTHENTICATION TECHNIQUE BASED ON MEDIAN-ORIENTED PARTICLE SWARM OPTIMIZATION AND SUPPORT VECTOR MACHINE
Author:	HAIDAR ABDUL WAHAB HABEEB, HASANAIN ALI HUSSEIN , MOHAMMED HASAN ABDULAMEER
Abstract:	One of the main complications in face recognition applications, it is non-linearity. Support vector machine is one of the most significant classification techniques in last a few years which can determine the global finest solutions in many complicated problems with minor number of training samples. However, selecting the ideal parameters for SVM is a major challenge especially when SVM used in face recognition applications. Numerous methodologies are utilized to manage this issue, for example, PSO, OPSO, AAPSO and AOPSO. Nevertheless, there is a room of upgrades still exists respects this sort of enhancement process. Recently, an enhanced version of PSO has been introduced called Median-oriented PSO (MPSO) with a few favorable benefits: simple to execute, insensitive to

variable dimension, and no requirement for any calculation particular parameters. In this study, a new face recognition technique based on a combination of Median-oriented particle swarm optimization and support vector machine is proposed. The proposed scheme is called (MPSO-SVM) and we introduced it as a face recognition technique. In MPSO-SVM, MPSO is utilized to discover the optimal parameters of SVM. Two human face datasets: SCface dataset and CASIAV5 face dataset are used as a part of the experimentation to assess the proposed MPSO-SVM in recognizing the human faces. The proposed technique is compared with PSO-SVM, OPSO-SVM and AAPSO-SVM and the results showed that the proposed MPSO-SVM has higher face recognition accuracy than the other approaches.

Keywords:	Face recognition, SVM, PSO, Optimization, MPSO
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Title:	FRACTAL METHOD FOR NON-METAMORPHIC ANIMATION USING ITERATED FUNCTION SYSTEM ALGORITHM
Author:	DEWI ROSMALA, TEDJO DARMANTO, DELFIAN PUTRA CALIBRA

Abstract: In this research, the Fractal method is implemented for Non-Metamorphic animation using Iterated Function System Algorithm. This study aims to find out how implementation process of animation created by a fractal method with IFS algorithm. The method used in this design is the drawing and animating stage. The fractal method is used at the stage of drawing; therefore reading and calculation of the input of data values of the IFS codes are done. The coordinate points generated from the IFS code consisting of the dimensional coefficient relative to the frame and the values of the points so that the affine coefficient is obtained through calculating the IFS algorithm matrix and forming a fractal object. In the animating stage, the object that has been obtained from the drawing stage is processed by non-metamorphic animation process through calculating the number of locations and the duration between the points of the object location so that the object is seen moving from the point of the initial location to the point of the final location. Based on the results of the fractal method for testing IFS, it can be applied to the animation using an object of fractal which the best results requires a sufficient iteration value of 10000 times to form a full fractal object and the iteration process does not last long, and as well as the off set value search testing performed on various iteration tests, having an offset value average by 0.11735%.

Keywords:	Affine Coefficient, Drawing, Fractal, IFS Code, Non-Metamorphic Animation
Source:	Journal of Theoretical and Applied Information Technology 15 th January 2019 -- Vol. 97. No. 01 -- 2019

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A REUSABLE BALINESE CALENDAR ENGINE

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ABSTRACT

Most of the Balinese digital calendar development begins with creating an engine, which becomes an inefficient development process. In this study, a reusable engine of the Balinese calendar was designed. This study used DSRM methodology to identify problems and produce an engine as the solution. The engine was a combination of Python and PLSQL, which makes it flexible to be customized and embedded. The engine has several algorithms to calculate Balinese calendars attributes (*wuku*, *dewa*, *wewaran* from *ekawara* to *dasawara*, *ingkel*, *jejepan*, *lintang*, *watek*, *urip* or *neptu*, *ekajala rsi*, *zodiak*, *pengalantaka*, *sasih* and year of Saka Calendar, full moon or new moon) and adjusted with the Saka and Pawukon calendar system. The engine consists of a web service that served as data parser and a database to store the attributes. Results of the experiment showed that the engine was able to generate appropriate Balinese calendar attributes of one day up to one-month or one-year Gregorian calendar, compared to the other existing Balinese digital calendar.

Keywords: *Balinese Calendar, Engine, Python, Pawukon, Saka*

1. INTRODUCTION

The digital age is a chance for converting any analog stuff into a digital application, include Balinese traditional calendar. The lunisolar calendar that used since a long time ago by Balinese-Hindu people in Bali - Indonesia, now has many digital forms like in www.kalenderbali.org [1] or a desktop application named BalaBali [2].

Unlike Gregorian calendar, a Balinese calendar has a unique dating system because it is consist of Saka and Pawukon calendars which run simultaneously [3]. It makes every single day have attributes which indicating a good time for several activities and religious ceremony [4] that regularly come repeatedly [5].

There are several studies about creating digital versions of Balinese calendar like in [6] and [7]. The researchers were built a set algorithm first before designing calendar. Building an engine from the beginning is inefficient and it would be worse if there are any inappropriate calculations. A standard engine for digital calendar development is needed to avoid mistakes in calculation.

In this study, an engine was designed which provide an appropriate calculation of Balinese calendar attributes. The engine built in python because python offers a flexibility [8] when implemented in many system. The engine would be flexible to embedded and customized.

The rest of this paper is presented as follows. Section 3 presents literature review about some attributes in Balinese calendar. Section 4 loaded by explanation of methodology used in this study. Experiment and analysis of the engine are presented in section 5. The result of analysis is concluded in section 6.

2. PREVIOUS RESEARCH

Pradnyani in 2014 developed an Android-based Balinese calendar. It was started by designing the algorithm to calculate Balinese calendar's attributes like *wariga*, *purnama*, *tilem* and *sasih*, etc, as in Balinese Saka calendar [6].

In the same year, Suwintana and Prihatini breakdown their study about developing a Balinese calendar that can display *rahinan*, *wewaran*, *panglong* and *ingkel* of each day. The algorithm

designed by their own used as the engine for calculating every attributes that appeared in the data flow diagrams of the system [7].

The mentioned previous studies show that the development of the Balinese calendar begins with creating an engine before integrating it into the calendar's design. It was not efficient and tend to have any inconsistent calculation. In this study, an engine was developed to address the issue. The engine was supported by Python language, therefore it was easy to embed into many environments.

3. LITERATURE REVIEW

There are two calendars used in Bali, the Pawukon and Saka calendars. Both these calendars run simultaneously, along with the Gregorian Calendar. Each calendar has different attributes and number of the days in a year. This section includes explanation about those two calendars, as well as attributes of either.

3.1 Pawukon Calendar System

Pawukon calendar is an arithmetic calendar system. One year of Pawukon calendar consists of 210 days [9]. There are 30 *wuku* (week) in a year, which every week has its own name. The name of *wuku* in a year listed in Table 1.

Table 1. List of 30 Wuku

No	Name of Wuku	No	Name of Wuku
1	<i>Sinta</i>	16	<i>Pahang</i>
2	<i>Landep</i>	17	<i>Krulut</i>
3	<i>Ukir</i>	18	<i>Mrakih</i>
4	<i>Kulantir</i>	19	<i>Tambir</i>
5	<i>Tolu</i>	20	<i>Medangkungan</i>
6	<i>Gumbreg</i>	21	<i>Matal</i>
7	<i>Wariga</i>	22	<i>Uye</i>
8	<i>Warigadean</i>	23	<i>Manail</i>
9	<i>Julungwangi</i>	24	<i>Prangbakat</i>
10	<i>Sungsang</i>	25	<i>Bala</i>
11	<i>Dungulan</i>	26	<i>Ugu</i>
12	<i>Kuningan</i>	27	<i>Wayang</i>
13	<i>Langkir</i>	28	<i>Kulawu</i>
14	<i>Medangasia</i>	29	<i>Dukut</i>
15	<i>Pujut</i>	30	<i>Watugunung</i>

The word *wuku* literally means a slice [10], since it is a week-division in a year. The cycle of pawukon calendar start from *Sinta wuku*, then ended with *Watugunung wuku*. When reached *Watugunung wuku*, Hindu's people in Bali usually celebrate Saraswati as a gratituation of knowledge and science.

3.2 Balinese-Saka Calendar System

Besides Pawukon system, Hindu-Balinese also had another calendar system called Saka or Caka. Saka calendar system based on the moon phases. It length approximately the same as the Gregorian calendar [11].

One Saka year consists of 12 months called *sasih*, which is correspond to the number of months in the Gregorian calendar. The 12 *sasih* in Balinese Saka calendar are shown in Table 2.

Table 2. Sasih in Balinese Saka Calendar

No	Name of Sasih	No	Name of Sasih
1	<i>Kasa</i>	7	<i>Kapitu</i>
2	<i>Karo</i>	8	<i>Kaulu</i>
3	<i>Ketiga</i>	9	<i>Kesanga</i>
4	<i>Kapat</i>	10	<i>Kedasa</i>
5	<i>Kalima</i>	11	<i>Jyesta</i>
6	<i>Kanem</i>	12	<i>Sadha</i>

Besides in the Table 2, each of *sasih* also has another naming system. The other name of each *sasih* are shown in Table 3.

Table 3. Another name of Sasih

No	Name of Sasih	Another Name
1	<i>Kasa</i>	<i>Srawama</i>
2	<i>Karo</i>	<i>Bhadrawada</i>
3	<i>Ketiga</i>	<i>Amuji</i>
4	<i>Kapat</i>	<i>Kartika</i>
5	<i>Kalima</i>	<i>Marggasira</i>
6	<i>Kanem</i>	<i>Pomya</i>
7	<i>Kapitu</i>	<i>Magha</i>
8	<i>Kaulu</i>	<i>Phalguna</i>
9	<i>Kesanga</i>	<i>Caitra</i>
10	<i>Kedasa</i>	<i>Waisaka</i>
11	<i>Jyesta</i>	<i>Jyestha</i>
12	<i>Sadha</i>	<i>Asadha</i>

Each month in the Balinese Saka Calendar consist of 30 days. In a month, there are two important celebration of moon phases, the full moon (*Purnama*) and new moon (*Tilem*). The beginning phase until a full moon called *penanggal*. After a full moon to 15 days while waiting for a new moon called *panglong*.

Every beginning of the Saka year (*Isakawarsa*) is celebrated as Nyepi. This celebration is known as the day of silence, where Balinese people live in silence and turn off the lights for one day [12]. Nyepi always falls at Kedasa *sasih*.

3.3 Wewaran

Wewaran is a system for determining the number of days in a week. On the other hand, *wewaran* is a system for grouping days. Unlike the Gregorian calendar which has fixed 7 days in a week, Balinese

calendar system defines several divisions of the number of days in a week. The division called *wewaran* [13]. For example, the three-days week *triwara* consist of *pasah*, *beteng* and *kajeng*, scheduled as the day for traditional markets in the villages. In the past, traditional market in Bali shifts from one village to another. If the market day felt on *Pasah*, it means a market's crowded situation on that day may affect the traffic jam on the road near the market

There are 10 groups of *wewaran*, start from 1 (*ekawara*) to 10 (*dasawara*) days in a week. Each of days in the group distinguished by its name, nature, condition, location, and *urip*. Table 4 shows the *wewaran* system in Balinese calendar.

Table 4. List of Wewaran and Its Urip

No	Wewaran	Name of the day	Number of the <i>urip</i>
1	Ekawara	1. Luang	1
2	Dwiwara	1. Menga 2. Pepet	4 5
3	Triwara	1. Pasah 2. Beteng 3. Kajeng	9 4 7
4	Caturwara	1. Sri 2. Laba 3. Jaya 4. Mandala	6 5 1 8
5	Pancawara	1. Umanis 2. Paing 3. Pon 4. Wage 5. Kliwon	5 9 7 4 8
6	Sadwara	1. Tungleh 2. Aryang 3. Urukung 4. Paniron 5. Was 6. Maulu	7 6 5 8 9 3
7	Saptawara	1. Redite 2. Soma 3. Anggara 4. Buda 5. Wraspati 6. Sukra 7. Saniscara	5 5 4 7 8 6 9
8	Astawara	1. Sri 2. Indra 3. Guru 4. Yama 5. Ludra 6. Brahma 7. Kala 8. Uma	6 5 8 9 3 7 1 4
9	Sangawara	1. Dangu 2. Jangur	5 8

		3. Gigis 4. Nohan 5. Ogan 6. Erangan 7. Urungan 8. Tulus 9. Dadi	9 3 7 4 4 6 8
10	Dasawara	1. Pandita 2. Pati 3. Suka 4. Duka 5. Sri 6. Manuh 7. Manusa 8. Raja 9. Dewa 10. Raksasa	5 7 10 4 6 2 3 8 9 1

Table 3 showed that attributes have it own *urip*. *Urip* or *neptu* is a lived rhythm. In Balinese ritual ceremonies, the existence of *urip* in a day symbolized by adding *uang kepeng* or chinese *kepeng* (*pis bolong* in Balinese language), a traditional money which is deals in many aspect of Balinese traditional ceremonies [14]. *Uang kepeng's* coin known as traditional money with a hole in the middle.

3.4 Dewasa

Dewasa is a Balinese term for indicating characteristics of a day which appraise from attributes in Balinese calendar (*wuku*, *sasih*, *urip*, *wewaran*, etc). *Dewasa ayu* indicates a propitious or good time to do particular activities. There is also *dewasa ala* which is a suggestion of unpropitious or bad day, therefore it should be avoided for several activities and ritual ceremonies. Many activities and ritual ceremonies are celebrated depending on the *dewasa ayu* and *dewasa ala*, like agriculture and plantation, farm and fishery, equipment and weapon, construction, various businesses, and it also used in all the religious ceremonies. Some sacred ritual which was performed at certain times are based on *dewasa ayu* calculation [15].

Dewasa in a day is indicated by some attributes in Balinese calendar, like *wuku*, *sasih*, *wewaran*, *urip*, etc. Every attribute or combination of them has a characteristic. The characteristic would be a determiner whether the attribute(s) has a good or bad relation to several activities [16]. For example, Table 5 shows the characteristics of the *wewaran* attributes.

Table 5. Characteristic of Wewaran

Wewaran	Name of the day	Characteristic(s)
Ekawara	a. Luang	sole/empty
Dwiwara	a. Menga	open/light
	b. Pepet	closed/dark
Triwara	a. Pasah	apart
	b. Beteng	wealthy
	c. Kajeng	sharp
Caturwara	a. Sri	wealthy
	b. Laba	succeeded
	c. Jaya	superior
	d. Mandala	prosperity surround
Pancawara	a. Umanis	flavors
	b. Paing	creation
	c. Pon	mind
	d. Wage	good
	e. Kliwon	<i>budhi</i>
Sadwara	a. Tungleh	not eternal
	b. Aryang	thin
	c. Urukung	extinct
	d. Paniron	fat
	e. Was	strong
	f. Maulu	breeding
Saptawara	a. Redite	Soca: growing plots
	b. Soma	Bungkah: growing tubers
	c. Anggara	Godhong: growing vegetables and leaves
	d. Buda	Flower: growing flowers
	e. Wraspati	Wija: growing crops that produce seeds
	f. Sukra	Woh: growing fruits
	g. Saniscara	Pagers: building a fence
Astawara	a. Sri	prosperity (organizer)
	b. Indra	beautiful (mover)
	c. Guru	guidance (guides)
	d. Yama	fair (judicial)
	e. Ludra	smelting
	f. Brahma	creator
	g. Kala	value
	h. Uma	keeper (researcher)
Sangawara	a. Dangu	between light and darkness
	b. Jangur	between continue and cancel
	c. Gigis	simple
	d. Nohan	happy
	e. Ogan	confused
	f. Erangan	revenge
	g. Urungan	cancel
	h. Tulus	<i>langsui</i>
	i. Dadi	Continue
Dasawara	a. Pandita	happy / cheerful
	b. Pati	easy offense, soul of

c. Suka	art
d. Duka	femininity, subtle
e. Sri	always obedient, according to
f. Manuh	have a social feel
g. Manusa	the soul of leadership
h. Raja	spirituality
i. Dewa	hard soul, not through consideration
j. Raksasa	happy / cheerful
	easy offense, soul of art

The process of analyzing characteristics of *wuku*, *sasih*, *wewaran*, or the other attributes to determining *dewasa* exists in a science called *wariga*, an ancient Balinese science [17]. Several ancient palm-leaf manuscripts (*lontar*) which giving explanation about *wariga* include *Sundari Gading*, *Sundari Cemeng*, *Panglantaka*, and calculation of *Nampi Sasih* [18].

4. METHODOLOGY

This study used Design Science Research Methodology (DSRM), a research methodology based on problem and developing an application as the solution [19]. Figure 1 shows the 6 phase of DSRM methodology.

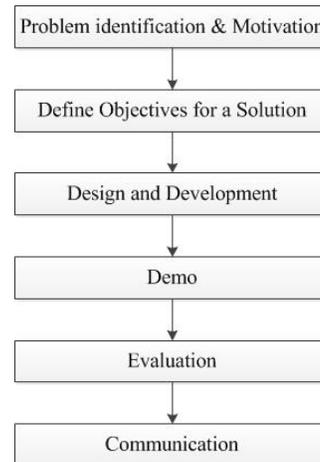


Figure 1. Phases in DSRM Methodology

This study starts with problem identification and motivation phase, which clearly defined a specific research problem then justify the value of the solution. In this study, the research problem was how to present the digital version of Balinese calendar which has a specific calculation.

The research problem would be followed by defining objectives for the solution. The objective in this study was developing a desktop-application for digitalizing Balinese calendar.

The determined solution would be actualized since the third phase until the last phase of DSRM methodology. In the third phase, functionalities of the design object was determined and creating the actual artifact. The whole application then demonstrate in the Demonstration phase, to measure the application's usage in solving the research problem. Demonstration result would be a material for evaluation, as the next phase.

The last phase in the methodology is communication. The research problem and its importance, artifact, utility, novelty, effectiveness, and the other relevant audiences of the research would be communicated. Journal publication is one of the way for communicating the research result [20].

5. RESULT AND ANALYSIS

In this study, a python engine which provides attributes of Balinese calendar was developed. There was a database for storing attributes. The engine processed data from user input. With sets of algorithms, the engine would process the input to provide the right attribute of a single day, month, or a year. However, the engine would not be optimal in showing date's attributes before the reference date, i.e. January, 1st 1899.

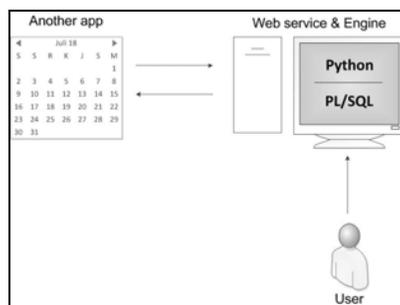


Figure 2. Engine Overview

Figure 2 shows the overview of the engine. The web service which is accessed by the user was coded in Python and PL/SQL. Web service was served as data parser, therefore it would be able to reuse for programming another Balinese calendar application.

The developed engine in this study used some algorithms for calculating Balinese calendar

attributes. Here presents the algorithms for calculating *wuku*, *wewaran*, full and new moon.

5.1 Algorithm for Attributes

Attributes which calculated by the engine are *wuku*, *dewa*, *wewaran* (*ekawara* to *dasawara*), *ingkel*, *jejepan*, *lintang*, *watek*, *urip* or *neptu*, *ekajala rsi*, *zodiak*, *pengalantaka*, *sasih* and year of Saka Calendar, *puinama* (full moon) or *tilem* (new moon) at the day. The attributes were able to calculated as they have an algorithmic pattern. Each attribute has a different pattern, therefore it needs many algorithms for every single attribute. For example, calculation of *ekawara* and *dwiwara* are different, although they went to the same group, i.e. *wewaran*. Some algorithms for calculating the attributes are presented here.

5.1.1. Calculating *wuku*

In Pawukon Calendar system, there are 30 *wuku* as the division of a year. Every *wuku* aged for 7 days, then one year of Pawukon Calendar consists of 210 days. The *wuku* starts of Sinta and ended at Watugunung. Here is the algorithm for calculating *wuku* of each day.

```
set reference date (refDate);
get input date (inDate);
dateDiff <- abs(inDate - refDate)
timeDiff <- round(dateDiff/7)
wukuNo <- timeDiff%30
if (wukuNo == 0) then wukuNo <- 30
```

Calculation of *wuku* using absolute of input date from the user, and reference date which set on January 1st, 1899. The result of abs then divided by 7 and rounded. If the result is 0, then the *wuku* is Watugunung.

5.1.2. Calculating *wewaran*

There are 10 kinds of *wewaran* for grouping days in a week. All the type of *wewaran* consist of the different number of the days, therefore each of *wewaran* has a different calculation. For *ekawara*, because it is contained only 1 number of the day, the other day would not have attribute of *ekawara*. For another *wewaran* from *dwiwara* to *dasawara*, every day should have those attribute because it consists of more than 2 number.

```
A= uripPancawara
B= uripSaptawara
ekawara <- A + B
if (ekawara % 2 == 0)
  ekawara = menala
else
  ekawara = 0
```

Calculation of *ekawara* using two items, *urip pancawara* and *urip saptawara*. The two *urip*'s

then divided by 2. If the results is 0, then the day was having *ekawara*. The other result indicating that the day did not having *ekawara's* attribute.

Calculation of *dwiwara* is slightly different from *ekawara*. The calculation still used *urip pancawara* and *urip saptawara*, but when the condition of modulo is not resulted in 0, then the *dwiwara's* attributes comes *Menga*.

Attributes *triwara* to *dasawara* has a different calculation. When *ekawara* and *dwiwara* used *urip pancarawa* and *urip saptawara*, calculating attributes from *triwara* to *dasawara* using the number of *wuku* and number of *saptawara*. Here the example of calculation of *triwara*.

```
A= noWuku
B= noSaptawara
triwara <- (A*7) + B
if (triwara % 3 == 0)
    triwara = Kajeng
else if (caturwara % 3 == 1)
    triwara = Pasah
else
    triwara = Beteng
```

The number of *wuku* (*noWuku*) in the algorithm refers to the sequence number of *wuku* when it was sorted from *Sinta* to *Watugunung*. If the *wuku* is *Sinta*, then the number of *wuku* becomes 1, and when the number 30 would go for *Watugunung*. The condition is the same for the number of *saptawara* (*noSaptawara*).

5.1.3. Calculating *purnama/tilem*

Full moon (*purnama*) and new moon (*tilem*) have a 15 day time difference. *Purnama* counted 15 days since the beginning of a *Sasih*, while *tilem* counted 15 days after full moon was felt. The engine provided information of a full moon / new moon when happens during a day. The algorithm for calculating when a full moon or new moon is:

```
Set date
checkSasih()
checkPenanggal()
checkPanglong()
if penanggal <- fullMoon
else newMoon
```

The function *checkSasih()*, *checkPenanggal()* and *checkPanglong()* mean the engine called a function for checking the *sasih* first, then checking the existence of *penanggal* or *panglong* attribute on that day. If the day having a *penanggal*, then it would be the day for a full moon. The new moon is indicated by the existence of a *panglong*.

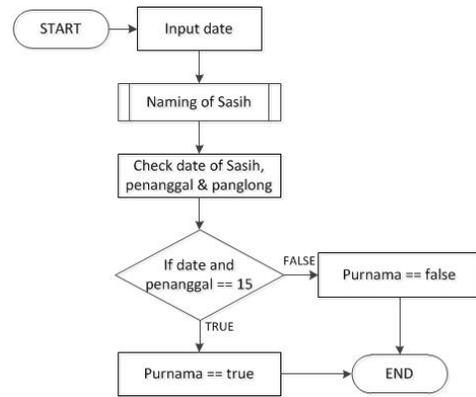


Figure 3. Flowchart of Full Moon Indication

Figure 3 shows a flowchart for observing if a full moon falls on a specific day, which determined by the existence of attribute *penanggal*.

5.2 The System and Analysis

The engine was developed in Python. The used of Python as the programming language would give a flexibility in further development because Python has a flexibility when embedded in a website or mobile application. Development of the engine supported by using some software which listed as follows:

- a. XAMPP 7.1.9
- b. Python 2.7.12
- c. JetBrains ToolBox 1.6.2914
- d. PyCharm Professional 2017.2.4
- e. DataGrip 2017.2.3

The engine was tested through a console. The user was allowed to give an input date, then it processed in the engine. The input processed through a sort of algorithm to produce the attributes. List of attributes was stored in the database, therefore the result of calculation would be matched and delivered to the user. The user would be delivered output in the console. Figure 4 showed the input process in the console.



Figure 4. The Engine When Tested on Console

The instruction in console given in Bahasa Indonesia. The console provides 3 input lines for entering the start-date, start-month, and start-year of calculation that user want to do. After start-date,

the next line provided for giving the end date, month and year of calculation. These type of input allowed the user to adjust the engine for calculating the attributes of a day, a month, and also a year.

If the start and end date are the same, this engine would calculate attributes of a single day. The given input is November 11, 2017. With the algorithms, the engine would calculate the Balinese calendar attribute of November 11th, 2017, and deliver the result to the user. The result of calculation shown in Figure 5.

```

root@martadi-X456URK:/home/martadi
-----Hasil Pencarian Keseluruhan-----
Hari : Sabtu
Tanggal : 11
Bulan : 11
Tahun : 2017
WUKU : 12.Kuningan
DEWA : Bhataru Indra
EKAWARA : Luang
DHIWARA : Pepet
TRIWARA : Kajeng
GATURWARA : Laba
PANCAMARA : Kliwon
SADWARA : Maulu
SAPTAMARA : Saniscara
ASTAMARA : Indra
SANGMARA : Dodi
DASAWARA : Raja
INGKEL : Buku
JEJEPAN : Paksi
LINTANG : Rarang Pegelangan
PANCASUDA : Tunggak Senti
PANGARASAN : Lakuning Bumi
RAKAM : Sanggar Hartingn
WATEKMADYA : Watu
WATEKALIT : Uter
NEPTU : 17
EKAJALARESI : WEROHI PUTRA
ZODIAK : SCORPIO
TANGGAL 1 BALI : 8
TANGGAL 2 BALI : -1
PENGALANTAKA : Panglong
NAMA SASIH : Kalina
SASTI TAHUN : 1939
PURNAMA :
TILEM :
HARI RAYA : Hari Raya Kuningan
DEWASA AYU : , Carik Walangati, Kajeng Kliwon Uwudan, Kajeng Rendetan,
Kala Sangkut, Kala Kutla Manik, Purwanin Dina, Purwanin Panglong,Uncal
Belung
root@martadi-X456URK:/home/martadi#

```

Figure 5. The Result of Calculation

Figure 5 shows the output of the engine. The output attributes are *wuku*, *dewa*, *wewaran* (*ekawara* to *dasawara*), *ingkel*, *jejepan*, *lintang*, *pancasuda*, *pangarasan*, *rakam*, *watekmadya*, *watekalit*, *urip/neptu*, *ekajalaresi*, *zodiak*, *pengalantaka*, name of *sasih*, Saka year, *purnama/tilem*, Hindu's ceremonies and *dewasa ayu* on the day. The number of output attributes is 32 Balinese calendar's attributes.

To ensure the attribute's accuracy, the output of the engine would be compared with an existing Balinese calendar. This comparison process uses BalaBali calendar, as a digital Balinese calendar which is already figured the right Balinese calendar attributes. Figure 6, which attached at the end of this article, showed BalaBali's attribute on November 11, 2017.

Attributes in Figure 6 exactly match with the attributes resulted by the engine. It shows the engine has provided the appropriate attributes for a single date.

The testing process continued for one month in the Gregorian calendar. The start date entered into the system is November 1, 2017, and end date on November 30, 2017. Output attributes of the engine showed in Figure 7 which placed on page 9 of this article.

The attributes would be matched again with BalaBali Balinese calendar. Figure 8 shown the Balinese calendar's attributes of BalaBali calendar. Figure 8 is attached on page 10 of this article.

The comparison between attributes which resulted from the engine and attributes in BalaBali calendar was exactly matched. This means calculation process in the engine produces the appropriate attributes.

The last comparison is matching *purnama*, *tilem* and Nyepi ceremonies from 1980 to 2020 of Gregorian calendars to the ceremonies from the calculation of the engine. The comparison is shown in Table 6 attached at the end of this article. Results in Table 6 shows that the date of *purnama*, *tilem*, and Nyepi in the engine are exactly the same as the date at BalaBali.

The experiment showed that the developed engine calculated Balinese calendar's attributes accurately, therefore it was already to embed. Figure 9 shows one of development of the engine which embedded into a website service www.infowariga.com as a widget.

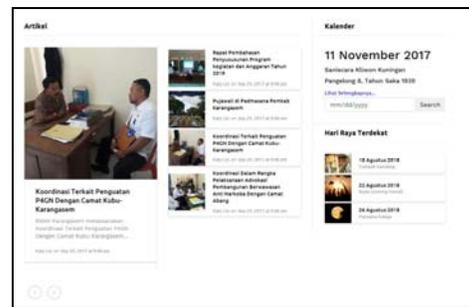


Figure 9. The Reusable Engine Embedded in a Website

Digital Balinese calendar really useful for Balinese-Hindu people who wants to trace their date of birth. Balinese people who were born in the early 20th century usually did not record their date-month-year birthday. They only remember their *otonan*, a Balinese "birthday" based on Pawukon calendar [21] which be repeated every 210 days [22] and estimated year of birth. With giving remembered attributes as the input, the calendar would help in tracing one's date of birth.

6. CONCLUSION

A reusable Balinese calendar engine had developed in this study. The engine provides algorithms for calculating Pawukon calendar and Balinese Saka calendar's attributes. The attributes include *wuku*, *dewa*, *wewaran* (*ekawara* to *dasawara*), *ingkel*, *jejepan*, *lintang* (latitude), *pancasuda*, *pangarasan*, *rakam*, *watekmadya*, *watekalit*, *urip/neptu*, *ekajalaresi*, *zodiac*, *pengalantaka*, name of *Sasih*, *Saka year*, *purnama / tilem*, Hindu's ceremonies and *dewasa ayu* (propitious day) on a single day, one month, or one year. According to the comparison result, the attributes generated by the engine were exactly matched to the existing BalaBali calendar, therefore the resulted attributes were appropriate. However, this engine would not be optimal to generate attributes before the referenced date, i.e. before January 1st, 1899. In the future, the engine could expand the reference date. Hopefully, the output of this work would be a standard engine for digital Balinese calendar.

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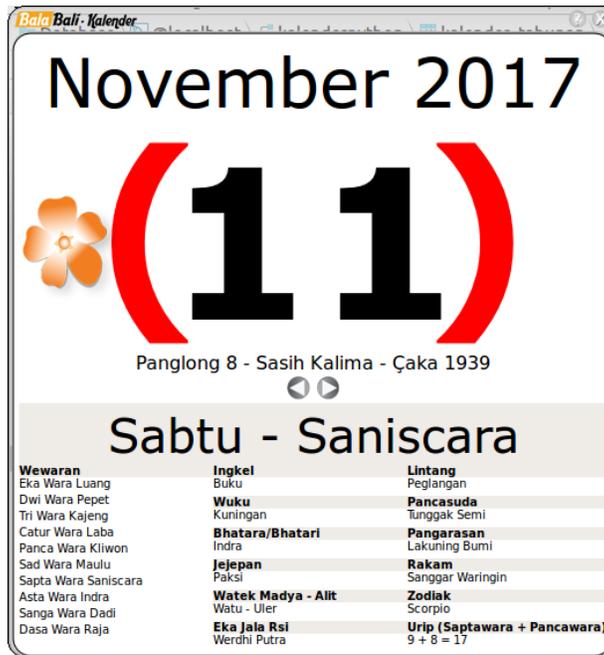


Figure 6. Balinese Calendar Attributes in BalaBali Calendar on Saturday, November 11th, 2017

id_kalender	hari	tanggal	tgl_masehi	bln_masehi	thn_masehi	nampih	tgl_1_bali	tgl_2_bali	bln_bali	thn_bali	pengelanta
1	Rabu	2017-11-01	1	11	2017	Normal	13	-1	Kalima	1939	Penanggal
2	Kamis	2017-11-02	2	11	2017	Normal	14	-1	Kalima	1939	Penanggal
3	Jumat	2017-11-03	3	11	2017	Normal	15	-1	Kalima	1939	Penanggal
4	Sabtu	2017-11-04	4	11	2017	Normal	1	-1	Kalima	1939	Panglong
5	Minggu	2017-11-05	5	11	2017	Normal	2	-1	Kalima	1939	Panglong
6	Senin	2017-11-06	6	11	2017	Normal	3	-1	Kalima	1939	Panglong
7	Selasa	2017-11-07	7	11	2017	Normal	4	-1	Kalima	1939	Panglong
8	Rabu	2017-11-08	8	11	2017	Normal	5	-1	Kalima	1939	Panglong
9	Kamis	2017-11-09	9	11	2017	Normal	6	-1	Kalima	1939	Panglong
10	Jumat	2017-11-10	10	11	2017	Normal	7	-1	Kalima	1939	Panglong
11	Sabtu	2017-11-11	11	11	2017	Normal	8	-1	Kalima	1939	Panglong
12	Minggu	2017-11-12	12	11	2017	Normal	9	-1	Kalima	1939	Panglong
13	Senin	2017-11-13	13	11	2017	Normal	10	-1	Kalima	1939	Panglong
14	Selasa	2017-11-14	14	11	2017	Normal	11	-1	Kalima	1939	Panglong
15	Rabu	2017-11-15	15	11	2017	Normal	12	-1	Kalima	1939	Panglong
16	Kamis	2017-11-16	16	11	2017	Normal	13	-1	Kalima	1939	Panglong
17	Jumat	2017-11-17	17	11	2017	Normal	14	-1	Kalima	1939	Panglong
18	Sabtu	2017-11-18	18	11	2017	Normal	15	-1	Kalima	1939	Panglong
19	Minggu	2017-11-19	19	11	2017	Normal	1	-1	Kanem	1939	Penanggal
20	Senin	2017-11-20	20	11	2017	Normal	2	-1	Kanem	1939	Penanggal
21	Selasa	2017-11-21	21	11	2017	Normal	3	-1	Kanem	1939	Penanggal
22	Rabu	2017-11-22	22	11	2017	Normal	4	-1	Kanem	1939	Penanggal
23	Kamis	2017-11-23	23	11	2017	Normal	5	-1	Kanem	1939	Penanggal
24	Jumat	2017-11-24	24	11	2017	Normal	6	-1	Kanem	1939	Penanggal
25	Sabtu	2017-11-25	25	11	2017	Normal	7	-1	Kanem	1939	Penanggal
26	Minggu	2017-11-26	26	11	2017	Normal	8	-1	Kanem	1939	Penanggal
27	Senin	2017-11-27	27	11	2017	Normal	9	-1	Kanem	1939	Penanggal
28	Selasa	2017-11-28	28	11	2017	Normal	10	-1	Kanem	1939	Penanggal
29	Rabu	2017-11-29	29	11	2017	Normal	11	-1	Kanem	1939	Penanggal
30	Kamis	2017-11-30	30	11	2017	Normal	12	-1	Kanem	1939	Penanggal

Figure 7. Output of Engine Attributes for One Month



Figure 8. One-Month Balinese Calendar Attributes in BalaBali Calendar

Table 6. Full Matched of Purnama, Tilem and Nyepi from 2017th

No	Full Match of Purnama, Tilem and Nyepi Celebration from 2017		Python Engine	BalaBali Calendar
1	Purnama Kapitu 1938 Saka	: Wraspati Paing Dukut	√	√
2	Tilem Kapitu 1938 Saka	: Sukra Paing Sinta	√	√
3	Purnama Kawolu 1938 Saka	: Saniscara Paing Ukir	√	√
4	Tilem Kawplu 1938 Saka	: Saniscara Umanis Tolu	√	√
5	Purnama Kasanga 1938 Saka	: Radite Umanis Warigadean	√	√
6	Tilem Kasanga 1938 Saka	: Soma Umanis Sungsang	√	√
7	Nyepi Tahun Baru 1939 Saka	: Anggara Paing Sungsang	√	√
8	Purnaina Kadasa 1939 Saka	: Anggara Umanis Kuningan	√	√
9	Tilem Kadasa 1939 Saka	: Anggara Kliwon Medangsia	√	√
10	Purnama Jiyestha 1939 Saka	: Buda Kliwon Pahang	√	√
11	Tilem Jiyestha 1939 Saka	: Wraspati Kliwon Merakih	√	√
12	Purnama Sadha 1939 Saka	: Sukra Kliwon Medangkungan	√	√
13	Tilem Sadha 1939 Saka	: Sukra Wage Uye	√	√
14	Purnama Kasa 1939 Saka	: Saniscara Wage Perangbakat	√	√
15	Tilem Rasa 1939 Saka	: Radite Wage Wayang	√	√
16	Purnama Karo 1939 Saka	: Soma Wage Dukut	√	√
17	Tilem Karo 15/1 1939 Saka	: Anggara Wage Sinta	√	√
18	Purnama Katiga 1939 Saka	: Anggara Pon Ukir	√	√
19	Tilem Katiga 1939 Saka	: Buda Pon Tolu	√	√
20	Purnama Kapat 1939 Saka	: Wraspati Pon Wariga	√	√
21	Tilem Kapat 1939 Saka	: Sukra Pon Julungwangi	√	√
22	Purnama Kalima 1939 Saka	: Sukra Pahiug Dunggulan	√	√
23	Tilem Kalima 1939 Saka	: Saniscara Paing Langkir	√	√
24	Purnama Kanem 1939 Saka	: Radite Paing Pahang	√	√
25	Tilem Kanem 1939 Saka	: Soma Paing Merakih	√	√