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Proceedings of the 2018 International Conference on Industrial Enterprise and System Engineering (IcoIESE 2018)

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The 2018 International Conference on Industrial Enterprise and System Engineering (ICoIESE-18), organized by the School of Industrial Engineering, Telkom University, was held in Yogyakarta, Indonesia on November 21 - 22, 2018. The conference welcomed researchers, engineers, and practitioners in the advances and business applications of information systems. The eight subjects covered included aspects of Soft Computing and Data Mining, Information Systems, Software Engineering, Enterprise Architecture, Manufacturing Systems, Industrial and Supply Chain Management, Ergonomics and Human Factors, and Engineering Management.

Please click here for the conference website. *(Conference website no longer available.)*

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Proceedings of the 2018 International Conference on Industrial Enterprise and System Engineering (IcoIESE 2018)

PREFACE

It is our privilege to welcome all presenters, participants, delegates, experts and scholars to the 2018 International Conference on Industrial, Enterprise, and System Engineering (ICoIESE-2018).

The support of enterprise application software (EAS) for day to day activities within one organization becomes crucial to the success of an organization. Enterprise Application Software (EAS) is computer software used to satisfy the needs of an organization rather than individual users. Such organizations would include industries, services, interest-based user groups, charities, or governments. New application developments have allowed organizations to not only improve the processes effectiveness and efficiencies for greater productivity, but have also provided businesses in order to cut costs, plan for the future, and maintain competitive advantage in the information era.

The 2018 International Conference on Industrial, Enterprise, and System Engineering (ICoIESE-2018) aims to bring together researchers, engineers and practitioners interested in the advances and business applications of information systems. Eight simultaneous tracks will be held, covering different aspects of Soft Computing and Data Mining, Information System, Software Engineering, Enterprise Architecture, Manufacturing System, Industrial and Supply Chain Management, Ergonomics and Human Factors, and Engineering Management. The tracks covered in ICoIESE-2018 are

expected to facilitate and drive innovative ideas for attaining better qua
as well as solving real-world problems in enterprise.

This ICoIESE-2018 is an activity organized by School of Industrial Engineering, Telkom University, Bandung, Indonesia. The conference co-organized by Universitas Ahmad Dahlan (UAD). Indeed, we are honored to host this event and would like to express our gratitude to authors which contribute to the numbers of accepted papers, which indicates a support from researchers throughout the globe.

The conference has attracted many local and international participants. We have received 115 submissions from 7 countries (including Indonesia, Malaysia, Germany, Poland, Australia, Taiwan, and Japan. The ICoIESE-2018 conference also presented two special sessions:

1. Process Innovation using Operational Big Data in Industry 4.0 era, by Prof. Hyerim Bae, PhD from Pusan National University and;
2. Swarm Intellegence for Data Mining in The Halal Food Chain Industry by Prof. Dr. Ku Ruhana Ku Mahamud from Universiti Utara Malaysia.

Each paper submitted was screened by the proceeding's chairs and carefully peer-reviewed by 2 experts from Program Committee. Finally, only 67 papers with the highest quality and merit were accepted for oral presentation in this ICoIESE-2018 and will be submitted to Atlantis Press.

Finally, we would like to express my sincere gratitude to the Atlantis Press. My thanks also go to Dean of School of Industrial Engineering, Telkom University especially to all committees for their utmost and kind support in organizing our 2018 International Conference on Industrial, Enterprise, and System Engineering.

Lastly but not least, I would like to thank you all again for being here. I hope your experience at this event would be both beneficial and memorable.

I wish the conference will be a recurrent event and Enjoy to visit Yogyakarta!

Chair of ICoIESE-2018

Dr. Irfan Darmawan

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67 articles

Information System Planning for Emerging Start-Up Company: A Case from Software House

Rayinda Pramuditya Soesanto, Wawan Tripiawan, Afrin Fauzya Rizana, Amelia Kurniawati, Fadillah Ramadhan

The use of IS believed to bring positive impact on the productivity and competitiveness of the organization. Most organizations in all sectors of industries, commerce, and government become fundamentally dependent on the use of information system especially startup companies. Start-up companies are considered...

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Flash-aware Clustered Index for Mobile Databases

Wojciech Macyna, Michal Kukowski

Flash memory become the very popular storage technology. Recently, it ..., be treated as a main storage memory in mobile devices, PDA and personal computers. However, the architecture based on flash memory has some limitations. They suffer from poor write performance, as the flash blocks must be erased...

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A Comparison of Naïve Bayes and Bayesian Network on The Classification of Hijaiyah Pronunciation with Punctuation Letters

Adiwijaya Adiwijaya, Annisa Riyani, Mohamad Syahrul Mubarok

Arabic is a unique language because it really concerns in makhraj (the way of sound is made) that differentiate letters and words. The difference in pronouncing letters and words make the meaning of those words different, because pronunciation in Qur'an letters really concern in harakat (the length of...

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Web Application Design Using Single Page Application To Increase Website Performance on Rumantara

Ilham Farobi, Soni Fajar Surya Gumilang, Muhammad Azani Hasibuan

One of the travelers needs when going to some places is a place to stay for a while and put their things. More importantly, a place that fits their needs and budget. This matter makes most of the travelers difficult to find a place to stay because of most of them is hotels with unneeded amenities that...

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Extending the UTAUT Model to Understand the Citizens' Acceptance and Use of Electronic Government in Developing Country: A Structural Equation Modeling Approach

Deden Witarsyah Jacob, Irfan Darmawan

The rapid development of information and communication technologies had a positive impact on the government to provide better and efficient services to the community. Despite some criticisms of electronic government services (e-gov) but so far, its utilization has continued to improve. The citizens need...

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Face Recognition Using Local Binary Pattern (LBP) and Local Enhancement (LE) Methods At Night Period

Abdurrahman Fi Zhilali'l, Muhammad Nasrun, Casi Setianingsih

Face recognition is a technique that is widely used in the field of identification of a person or in the field of security. This technique basically determine the similarity on each face of a person who will be identified with the face already stored in a storage (database). In this paper the facial...

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Performance Appraisal Design Using 360 Degree Feedback at University X

Deniar Yudithama, Fida Nirmala Nugraha, Devi Pratami

Directorate of Information Systems is a unit that provides information technology services, at University X, that needs to perform at its best most of time. Its employees' performance directly affects the unit performance. One problem in employee assessment due to its high subjectivity. Currently the...

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Fishery Supply Chains in Indonesia: Improvement Opportunities on The Downstream Side

Niniet Indah Arvitrida, Dian Rahmawati, Dwi Lastomo, Rindawati, Kusnadi

This paper investigates improvement opportunities for fishery supply chains in Indonesia. A downstream perspective is taken, and Surabaya is employed as a case study. This research applies desk study and exploratory work to obtain existing landscape of the fisheries supply chains. This landscape is used...

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Deduplication for Data Profiling using Open Source Platform

Margo Gunatama, Tien Fabrianti, Muhammad Azani Hasibuan

Many companies still yet to know the importance of data quality for the company's improvement. Many companies in Indonesia, especially BUMN and Government companies have only single application with single database, which cause a problem related to duplication of data between columns, tables and applications...

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Web Services to Overcome Interoperability in Fingerprint-based Attendance System

Alam Rahmatulloh, Rohmat Gunawan, Irfan Darmawan

The fingerprint-based attendance management process generally consists of recording, management, and reporting. The method of recording attendance

recording, management, and reporting. The method of recording attendance data is done with the help of fingerprint attendance machine. Even though the computer connection is running online, the administrator still needs to process...

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Business Process Mapping in Software Development Company

Made Andriani, Atya Aisha, Melianna Pranita, Joko Siswanto, Kadarsah Suryadi

The concept of business process is a tool in managing corporate value chain. Business process mapping becomes essential in increasing the organization growth. Previous studies already identified the value chain in the software industry, but only develop in the level macro-process and have not mapped...

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DESIGN OF GEOGRAPHIC-BASED DECISION SUPPORT SYSTEM FOR ROAD REPAIRMENT WITH GDSS METHOD: CASE STUDY IN BANDUNG DISTRICT

Dicky Faisal Dramar, Farid Wira Darmawan, Audira Zuraida, Rayinda Pramuditya Soesanto, Ika Arum Puspita

In an effort to make road improvements effective and efficient in Bandung Regency, the Public Works Service performed road repairs based on the most damaged areas. In the implementation there is a problem of limited information possessed by the Office of Public Works Bandung Regency so that road improvements...

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Web-Based Food Delivery Management System

Soni Fajar Surya Gumilang, Nia Ambarsari, Mei Dina Isti Nurmala

The process of ordering a meal in an organization still using a conventional system or in other words, the civitas organization must come to the cafeteria to order the desired menu. The conventional system uses paper for order recording process. So the problem happens repetitively, such as redundancy...

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Cost-Based Storage of the R-tree Aggregated Values over Flash Memory

Wojciech Macyna, Krzysztof Majcher

The flash memory due to its shock - resistance, power economy and non-volatile nature is considered as a very popular storage device. It is widely used in mobile phones, sensor networks and hand-held devices. What attracts the attention is the data storage in the flash memory. Database vendors try to...

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Development of Project Document Management System Based on Data Governance With DAMA International Framework

Hanung Nindito Prasetyo, Regina Nathania Djepapu, Ferra Arik Tridalestari, Irman Hariman

Information will continue to grow in an organization, Various forms of information formed such as file documents, archives, policies, procedures, and so forth. In the current era of information technology, document management becomes an absolute thing for the organization. All business

management becomes an absolute thing for the organization. All busine processes, activities...

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On the Relationship of Travel Time and Energy Efficiency of Industrial Robots

Kai Eggers, Zygimantas Ziaukas, Jens Kotlarski, Tobias Ortmaier

This paper presents an approach to quantify the energy saving potential with regard to travel time of industrial robot motions. In order to minimize the influence of the exemplary considered trajectories and, thus, provide general results, the evaluation is done on a large set of automatically generated...

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Factors That Influence An Academic Institution's Intention To Accept CloudIOT: A Proposed Framework

Ali Mehimed Ahmed Ireda, Mohommed Awadh Ben-Mubarak, Adubhahir Buhari

The combination of Cloud Computing (CC) and Internet of things (IOT) which is known as CloudIOT are two different kinds of technologies that are already part of our lives. The growing usage of CloudIOT in the education sector is changing the Teaching and Learning processes. There is very limited study...

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Behavior Proportion According to Merapi Volcano Eruption Evacuations in 2010

Dwi Handayani, Bertha Maya Sopha, Budi Hartono, M. Kusumawan Herliansyah

This paper presents the need of contingency plan for evacuation of Mera... Volcanic eruption by considering the behaviour proportion of people in the slopes of Mount Merapi when facing emergency response phase. The research had used exploratory retrospective view survey with face-to face interview. The...

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Applying An Overlapped Design Schedule Based Dependency Structure Matrix to Minimize Project Makespan

Chao Ou-Yang, Indy Cesara

Design process scheduling is conducted by optimizing human resources or workers allocation to several tasks in project with several real constraints to achieve the objective, minimizing the project makespan. In real business case, despite the tasks are already allocated to the optimal workers, rework...

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Group-Centered Framework Towards a Positive Design of Digital Collaboration in Global Settings

Irawan Nurhas, Jan Pawlowski, Stefan Geisler, Maria Kovtunenko, Bayu Rima Aditya

globally distributed groups require collaborative systems to support their work. Besides being able to support the teamwork, these systems also should promote well-being and maximize the human potential that leads to an engaging system and joyful experience. Designing such system is a significant challenge...

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Optimizing Woven Fabric Defect Detection using Image Processing and Fuzzy Logic Method at PT. Buana Intan Gemilang

Ratna Safitri, Tatang Mulyana

The development of textile industry which 3rd position in the largest export values in Indonesia prove that the quality of textile must be one of factors that should be considered for all of textile companies. Buana Intan Gemilang is one of the companies that produce woven fabric. This company's produce...

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Design and Marketing Performance Analysis on Unit Business Government and Enterprise Service Unit at Telkom XYZ Area by Using Balanced Scorecard for Marketing

Fauziyyah Fauziyyah, Endang Chumaidiyah, Sari Wulandari

Measuring the performance of marketing division still rarely to be encountered, due to the limited measurement tool. Evaluation of marketing performance is usually associated only with the number of 'sales' both in volume and revenue, for instance the BGES unit at Telkom XYZ area. Thus, it cannot be...

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Development of Inventory Control Application for Pharmaceutical Product Using ABC-VED Cycle Counting Method to Increase Inventory Record Accuracy

Fadhilah Amin Fathoni, Ari Yanuar Ridwan, Budi Santosa

A good inventory control system is needed in the organization to reduce costs

and stay competitive. One of the inventory control strategy is stock-takir

This research aims to develop a new stock-taking policy for a pharmaceutical company using ABC-VED Cycle Counting. Proposed stock-taking policy using...

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Comparison of Web Scraping Techniques : Regular Expression, HTML DOM and Xpath

Rohmat Gunawan, Alam Rahmatulloh, Irfan Darmawan, Firman Firdaus

Data collection is the initial stage of research. There are various data sources on the internet that can be used in the research process. The process of taking data or information from sites on the internet is called web scraping. Some methods of web scraping include Regular Expression (Regex), HTML...

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OPERATIONAL RISK ANALYSIS FOR BARCODING PROJECT IN PT. XYZ WITH ENTERPRISE RISK MANAGEMENT METHOD

Amanda Putri Kusumawardhani, Endang Chumaidiyah, Rita Zulbetti

PT. XYZ is running the Bacoding Project to facilitate the process of recording raw material data in the production process. This Barcoding Project certainly has operational risks that may occur, therefore by using the Enterprise Risk Management approach (ERM) that is a process, effected by an entity's...

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Company Strategy Based on Linier Regression of Stocks Return to the EPS and Dollar Exchange at Pharmaceutical Industry in Indonesia Stock Exchange 2010-2016

Industry in Indonesia Stock Exchange 2010-2018

Nico Septian, Endang Chumaidiyah, Rita Zulbetti

Pharmaceutical Industry one of industry that has a great effect on health aspect and it affects the economy in a country. This study aims to determine the effect of Earning Per Share, Debt to Equity Ratio, Return On Asset, Inflation and Dollar Exchange at simultaneosly and partially to stock return in...

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Analysis Comparison of Data Mining Algorithm for Prediction Student Graduation Target

Rachmadita Andreswari, Muhammad Azani Hasibuan, Dela Youlina Putri, Qalbinuril Setyani

The main objective of a higher education institution is to provide quality education for its students. The most important indicator to measure the quality of higher education performance is the percentage of student graduation on time. However, not all student can successfully have completed their studies...

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The Determinants of Accident Risk Perception, Travel Motivation, eWOM and Travel Intention on Island Tourism Destination

Sari Wulandari, Husni Amani, Nurdinintya Athari

The high number of tourist transport accidents in Indonesia makes transportation security as a factor that affects tourist risk perception. Electronic word of mouth (eWOM) about tourism places also affects the tourist risk perception. Research on the effect of travel risk perception on intention to travel...

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Container Loading Problem in Multiple Heterogeneous Large Object Placement Problem to Minimize Delivery Delays

Budi Santosa Chulasoh, Erlangga Bayu Setyawan

Timely delivery of goods is the main target of a third-party logistics engaged in transportation. The problem that is often discussed in previous research to minimize delivery delays is by optimizing the route so that it minimizes total travel time. In this study, we found variables that contribute to...

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A Model Development of Perishable Product to Minimize Total Supply Chain Cost on Fresh Food and Frozen Product Sales on The Trains

Nia Novitasari, Dida Diah Damayanti, Anton Abdulbasah Kamil

The inventory system has a function as an act of planning, implementing, controlling the flow and storage of a product and information effectively and efficiently in order to fulfill customer demand. However, there are differences between inventory system policies on non-perishable products and perishable...

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DESIGN OF DECISION SUPPORT SYSTEM APPLICATION FOR DETERMINING SCHOLARSHIP GRANTEE USING ANALYTICAL HIERARCHY PROCESS AND FACTOR RATING

Afrin Fauzva Rizana. Ravinda Pramuditva Soesanto

Scholarship refers to a program provided by organization that is given tc students to relieve the tuition fee. There are several criteria and requirements that have to be fulfilled to get the scholarship. In practice, all the requirements will be checked manually for each applicant to determine who deserves...

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Self-Adaptive Load Balancing System for Grid Computing

Irfan Darmawan, Aradea Aradea

Load balancing is a necessary way of a computer network infrastructure services, with the aim of balancing of computing resources to achieve optimal load processing time. When this has been many methods that can be used for load balancing techniques, namely by adjusting the load on the computing resources...

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Model Tree with Modified L1 Loss Function for Predicting Missing Attendance Data of Faculties

Mohammad Arif Rasyidi, Rachmadita Andreswari

The problem of missing attendance data in our university often arises due to the negligence of faculties. In this study, we address the problem by directly predicting the work duration of faculties. The nature of the problem require us to not only make accurate predictions, but also minimize the rate...

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Application of Risk IT Based on ISO 31000 Standards Process

Capability Assessment Model (Case Study: Andalas University)

Mohammad Hafiz Hersyah, Kridanto Surendro

The fact given that capability function is to aim executed things works properly and effectively in organization business process could not executed well without considering risk management aspects. Risk management overlay every event possibilities that able to either to hinder or accelerate organization...

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MAINTENANCE POLICY of JET DYEING MACHINE USING LIFE CYCLE COST (LCC) AND OVERALL EQUIPMENT EFFECTIVENESS (OEE) IN PT.XYZ

Akbar Perwira Wibowo, Fransiskus Tatas Dwi Atmaji, Endang Budiasih

PT. XYZ is one of the textile companies located in Majalaya, Bandung Region, West Java Province established since 1976. In the production process, one of the important roles is the process of dyeing. The dyeing machine K has the highest frequency of damage compared to other jet dyeing machine in the...

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Clustering of User Query in Search Engine on Indonesian E-Commerce by used AD-OPTICS Algorithms

Ranita Windriani, Ibnu Asror, Dana Sulistyo Kusumo

The development of e-commerce in Indonesia is increasing, now make e-commerce as the land of very large data. The data is also used not only as a content in e-commerce, but with the existence of Web Mining, the data is processed in such a way that will generate new information to be utilized in system...

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Mohammad Tubishat, Norisma Idris

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Tool Design for Tea Cutting Machine to Reduce MSDs Using Ergonomic Function Deployment : A Research at PTPN 8 Ciater

Mira Rahayu, Muhamad Adhi Guna Dwyantoro

The process of picking the tea leaves is done in three different ways, the first one is using the farmer hands, the second is using a scissors, and the third is using a cutting machine. When the farmer using the tea leaf cutting machine, the fatigue level is increasing compared with using the other tools...

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Investigation on Simulation of Wind and Solar Power Hybrid Systems through Human Machine Interface by InTouch Wonderware Software

Tatang Mulyana, Hari Setiawan, Rasidi Ibrahim

Human Machine Interface (HMI) serves as a bridge for operators to understand the processes that occur in a production system. Without the HMI, operators have difficulty in monitoring and controlling the production system. It serves to facilitate the operator in monitoring the plant, plant control, plant...

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An Inventory System For Packaging Material Under The Probabilistic Demand Using Joint Replenishment Method At Cocoa Company

Rafif Prayogi, Ari Yanuar Ridwan, Budi Santosa

Company XYZ is a company runs in the cocoa industry located in Bandung. Currently, Company XYZ has the problem in controlling inventory system of packaging materials because there is only one supplier who supply the material, variation of lead time, high stocks of packaging material that pile up in the...

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Multi-class Classification of Ceramic Tile Surface Quality using Artificial Neural Network and Principal Component Analysis

Muhammad Hanif Ramadhan, Haris Rachmat, Denny Sukma Eka Atmaja, Rasidi Ibrahim

The visual inspection of ceramic tile surface is an important factor which may influence the perceived surface quality of the product. While manual labor offers an alternative in the task of visual inspection, human limitation related problem such as fatigue and safety may pose an undesirable inspection...

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INTEGRATED MODEL DEVELOPMENT OF SPARE PART INVENTORY AND MAINTENANCE

Prafajar Suksesanno Muttaqin, Dida Diah Damayanti, Anton Abdulbasah Kamil

This research concern about inventory and maintenance problem at critical spare part in locomotive mechanical system in PT KAI Bandung. We proposed periodic review approach in managing spare part inventory, while maintenance interval is preventive maintenance schedule for spare parts. This research is...

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Intention determination of sharing economy business provider in the theory of planned behavior model using partial least square (study case: Airbnb Indonesia)

Resha Akbar, Luciana Andrawina

The sharing economy, also called collaborative consumption, has its long-standing thought and practice. People generally believe that the sharing economy will give the world a new mode of production, consumption pattern, and business model. Besides, Internet technology development is an effective means...

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THE PROPOSED OF VENDOR SELECTION IN GOODS PROCUREMENT USING FUZZY ANALYTICAL HIERARCHY

PROCESS (FAHP) METHOD AT PT. PERTAMINA HULU ENL.RGI OFFSHORE NORTH WEST JAVA (PHE ONWJ)

Kristoforus Maximinus Krisnabayu Tandra Widyatama, Ika Arum Puspita, Mumu Natapriatna

Along with the change of strategic system in the government that changed the scheme of contracts for oil and gas product from Cost Recovery to Gross Split in the oil and gas company like Pertamina Hulu Energi Offshore North West Java (PHE ONWJ), the company is required to be more effective and efficient...

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Latent Dirichlet Allocation Modeling for CPS Patent Topic Discovery

Usharani Hareesh Govindarajan, Amy J.C. Trappey, Gopal Kumar

Industry 4.0 is an organized framework to infuse the latest technology in the manufacturing sector. The inclusion of next-generation technologies such as Cyber-Physical Systems (CPS), cloud computing, big data and artificial intelligence approaches increases productivity and manufacturing output in today's...

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Self-Adaptive Cybersecurity System

Aradea Aradea, Iping Supriana, Kridanto Surendro, Husni Mubarok, Irfan Darmawan

Complexity of cyberspace environment nowadays, arouse security vulnerabilities for all owned assets. Appropriate way out or solution for every obstacle in a case like this is a must for ICT role. However, user trust for ICT usage raises concerns. Cyberspace environment is caused by rapid increase

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High Security Adaptive BCH Code Discrete Wavelet Transform Copyright Protection

Irma Safitri, Rizki R. Ginanjar, Yosa Yunawan

In this research, we analyzed the audio watermarking system with combining adaptive wavelet with SVD in various BCH Codes. The host audio signal is embedded with a watermark signal in the form of an image signal accompanied by several attacks on the watermarking system. The results showed that ODG and...

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Localized Island Model Genetic Algorithm in Population Diversity Preservation

Alfian Akbar Gozali, Shigeru Fujimura

Premature convergence in island model is a consequence of the selection in migration mechanism. It is a process of migrating several individuals (usually the best one) from a source into destination island to keep its diversity. The main reason is the similar characteristic of relocated individual because...

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PROPOSAL OF MAINTENANCE POLICY ON BARMAG FK6800 MACHINE IN FT3 PT XYZ USING RELIABILITY-CENTERED MAINTENANCE AND RISK-BASED MAINTENANCE METHOD

Irsalina Maharani, Fransiskus Tatas Dwi Atmaji, Nopendri Nopendri

XYZ is a company that is engaged in the textile industry since 1974. XYZ ... some different kinds of yarns which through several production processes in 24 hours a day to fulfill the market demands. Therefore, all machines have to be in the best condition as it can be. These machine should be maintained...

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OLAP Cube Processing of Production Planning Real-life Event Log: A Case Study

Rachmadita Andreswari, Mohammad Arif Rasyidi

Business process modeling in an application log can be done by using process mining technique. To analyze the process flow in more detail in several dimensions needs cube process. Multidimensional depiction in star schema to perform Online Analytical Processing (OLAP) can be done by drill-down, roll-up,...

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Self-Adaptive Cybersecurity System

Aradea [1)], Iping Supriana [2)], Kridanto Surendro [3)]
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***Abstract* - Complexity of cyberspace environment nowadays, arouse security vulnerabilities for all owned assets. Appropriate way out or solution for every obstacle in a case like this is a must for ICT role. However, user trust for ICT usage raises concerns. Cyberspace environment is caused by rapid increase in cybercrime, continually, and always forming new way or kind of the offense. This paper underlining the importance of developing cybersecurity capability that not only be prepared to anticipate short-term needs but the issue of the growth of cybercrime is a significant concern that was anticipated. Key strategies used is the concept of self-adaptive formulated through the model representations goal, with control strategies that can guide us in understanding the domain and identify possible changes and growth. Modeling results showed cybersecurity system development strategy taking into account the breadth of factors so that it can anticipate future requirements.**

Keywords—Self-adaptive software; cybersecurity; goal based; control strategy

I. INTRODUCTION

Utilization of ICT system at this time faced to environment complexity. Where the environmental condition is dynamic, open and unpredictable, raising a variety of vulnerabilities to security. Even based on a research study [1], some users have been reluctant and do not believe in the benefits of ICT, although the various research community has made the number of works and efforts, government agencies, the private sector, and industry to create ICT security solutions. This is because every day we can witness the growth of a variety of information related to new cyber attacks, theft, threats and potential cybercrime, whether through print and electronic media.

According to above depiction, we saw that cybercrime activities would grow continuously day per day. So that this problem related to issues [2] that correspond to the requirement of automation, autonomy, flexibility, scalability, agility, speed, and so on. This corresponds to how the system can adapt to various possibilities of cybercrime activities, which continuously grow and thrive. This condition implying that handling of ICT system behavior is not enough prepared in anticipate cybercrime only for an operational system, but planning for control its growth [3] can become a key factor for the success of ICT system. Here we emphasize the importance of setting a perspective that can guide us in understanding the domain and identify possible changes [4] and growth. So that the ICT system developed has the knowledge services [5], and can meet the scope of the life cycle of the scheme as a whole.

This paper proposes an approach to domain model construction, that handled by control strategy to anticipate various of changing and its growth. Part II in this article depict about the cybersecurity system. Part III explains about proposed model, Part IV discussion about related works, and Part V is the conclusion.

II. CYBERSECURITY SYSTEM

Cyberspace defined [6], as a virtual environment that concentrates on various infrastructure, technology devices, and people who connected to the network, so that bring forth an evolution concept of information security of cybersecurity. This is including a small network such as home network, a big network of industry, national network, provider communication, and so on. Therefore, this condition remains risk and threat that exist for cyberspace and will be related to potential cyber-attacks, cyber-espionage, cyber-terrorism, cyber-bullying, hacktivism, etcetera.

Based on a survey and at cyberspace domain, in England [7], conducted from November 2015 to February 2016 and involve about 1008 companies, the result showed 69% says cybersecurity has very high priority (33%) or high enough (37%) for senior management. Various qualitative findings highlight the variety of factors that have helped the company to understand the importance of the cyber city. However, they do not fully understand how the company can be at risk and what action should be taken. Only half of all company (51%) that made an effort to identify risk related to cybersecurity and this just occurs among middle companies (78%) and large enterprises (94%). Many companies have a various form of rules or controls for cybersecurity, even though still under the

best-practice standard, and only 13% that determines the minimum level of cybersecurity to their supplier.

Violation of cybersecurity influencing all kind of business and spending expensive cost. One-quarter (24%) of all business detect one or more violation of cyber safety in the last 12 months. This occurs higher in middle companies (51%) and at large corporations (65%). The large corporations are also more frequently targeted, 25% of them had experienced a breach at least once a month. The most common types of violations that are suffered by a virus, spyware or malware (68%), and offenses involving imitation/impersonation of organizations (32%).

Estimated average cost of all offenses during the past 12 months is £ 3,480 and is much higher for large enterprises, namely £ 36,500. Estimated average cost of the most severe violations of the previous 12 months, is £ 2,620 in the whole business, and £ 32,300 for large companies. Breaches of the most expensive of the findings of this survey are to reach a cost of £ 3 million. Cases like this indicate that cybersecurity violation occurs on an ongoing basis and continues to grow, it has consequences for the financial companies are substantial and dangerous for survival. Therefore, in this case, essential to establish a series of measures to prevent and protect themselves from various kinds of cybercrime.

III. SELF-ADAPTIVE CYBERSECURITY

Based on the result the of a previous study [8], the self-adaptive model developed on different system needs. In response to a various change of system its self and its environment. This is related to a character like self-managing, self-configuring, self-healing, self-optimizing, self-protecting, and self-* [9]. Cybersecurity needs basically will correspond to several abilities of the character, and here we propose a model that can be implemented to anticipate not only change the needs but the handling of cybersecurity growth activities, also become our most significant attention.

A. Model Configuration

System environment configured as a model goal, where every goal and its subgoal represent the purpose of every system entity. The defined goal will have a plan, and every plan has dependency connection with a goal, resource, or another purpose component. So that if one plan has uncertainty, then all plan that corresponds to dependency with the scheme, values of every property, need to be observed.

Figure 1 shows a conceptual model is proposed. On the domain model the goal can be decomposed (AND/OR) into subgoals. It can be identified requirements (R-1, R-2, Rn) of each goal that effect on certain parameters, and have a positive or negative contribution (++ / + or - / -) to one or more soft goals (non-functional). In the control model, the property (P-1, P-2, P-n) of each of these targets are identified and transformed into system components, as well as observations on the possible amendment. Further analysis through control strategies, and determine which variation of adaptation by the determination rule is defined as a plan (Plan Sets-1, Plan Sets-2, Plan Sets-n). A more detailed description can be seen in our previous paper [10] [11] [12].

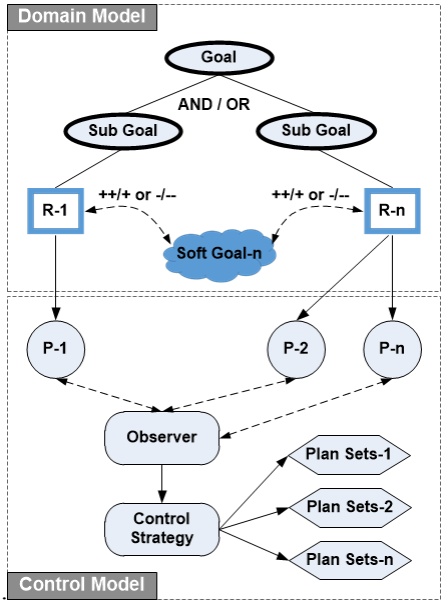


Figure 1. Conceptual model.

The control model is system behavior handling, that is the observed environment and self-adapted if needed, such as through reconfiguring when a change occurs, self-optimize when operation switch, handle the certain error, and so on. There is two principal component in this model, inference engine, and rule base. The model formulated through the rule-based system with knowledge structure base that constructed as generic and smooth, so can handle knowledge growth that represents various context and system behavior. Each additional or change of specification can be done with edit knowledge base through rule editor.

Based on the specification of model goal that becomes a system input, the system the will determine model domain that derived from the generic structure and configures the system that executed by the actuator. If necessary, a new feature on the system to be developed, but the system does not provide the feature, developers can make use of the rules and adjust module. Details of the mechanism of this model can be seen in our previous paper [13] [14] [15].

B. System Modeling

Cybersecurity system modeling, begin with identifying each entity of system and its goal, so resource and processes can be determined, including relation each other. As illustration case, we use cybersecurity entity that proposed [6], consist of the public sector, the private sector, critical infrastructure, citizen, and attacker. Then each process from the entity connected to an interface that will be system executor. Next step is each system component that has been defining, mapped into a tree structure of knowledge, as can be seen in Figure 2. The interface element is represented as an actor of the tree; here

knowledge structure prepared to anticipate requirement growth of actor, both internal actor or external actor. While entity element of the system represented as entity tree, where knowledge structure that constructed aim to anticipate change and growth of activity process of cybersecurity.

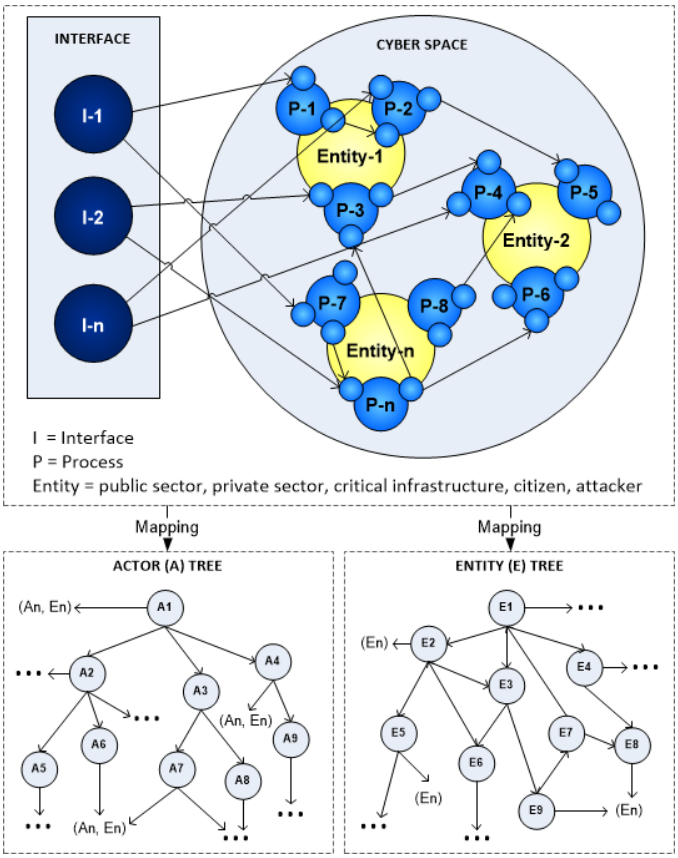


Figure 2. Modeling of actor and entity of cybersecurity

The tree structure of actor and entity tree, automatically will add, delete, update and confirm each its node, as a response from condition change, both from the internal system or external system or from the environment. As illustration, actor tree will be related to change and growth of citizen actor or attacker, such as personal, government, the private sector, industry, etcetera. While entity tree will be related to change and growth of each process activity of system entity, both private or public sector. So that, based on knowledge tree structure formula, can be defined change and growth of each process activity of cybersecurity.

Based on the model at Figure 2, it can be determined by a model goal for cybersecurity need, such as shown in Figure 3. The main aim of the system with a soft goal is to increase safety; The goal can be reached through decomposition into three subgoals, namely; a user interface, asset protection, and threat detection. Detect context-1 is a plan to detect citizen, consist of group actor that can access cyberspace system. Developed strategy in here is to detect each suitability of its properties value, such as device and role. Detect context-2 is a plan to fulfill the goal of asset protection, consist of security target for public sector (public entity and government institution) and private sector (small business group, middle, and large) that related to resources of critical infrastructure. Detect context-3 is a plan to threat detection that coming from each attacker (person or system that is trying to access, attack and demolition cyberspace system).

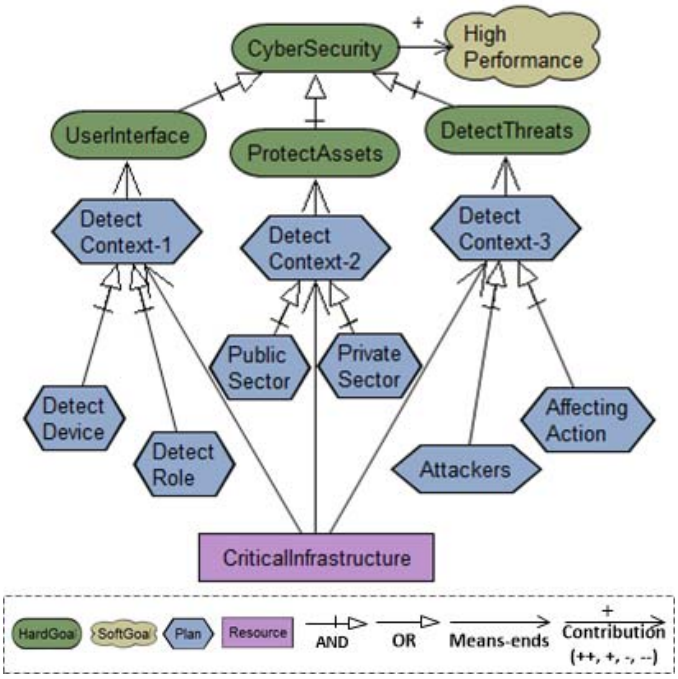
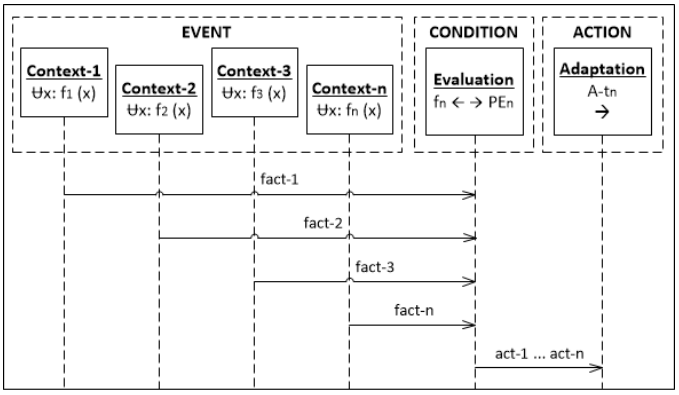


Figure 3. Goal model of cybersecurity system

Figure 4 shows the mechanism of self-adaptive systems cybersecurity, starting with event capturing system performance stemming from the fact ($\Sigma = f_1, f_2 \ldots f_n$) context information environment. Each context is associated with the specification of new facts from context-1 detect, detect context-2, and detect context-3. Condition evaluate the state refers to a particular event that occurred, including the capture characteristics of the attacks that took place in every context ($Q = fn \leftarrow \rightarrow Pen$). Evaluation is done reconfigure based policy engine (PE) to select the most appropriate action behavior. Policy This engine provides high-level goals that control the operation and functions of related systems. The general form is event-condition-action (ECA) rules to determine the action when the event is raised, and there is some certain condition is met.



Gambar 4. Dynamic adaptation behavior of cybersecurity system

The policy engine is represented as a knowledge base, that provides an interface for a system an administrator to determine and change system policy. In our version, this model enlarged with rule model editor, where addition or change specification can be done with editing knowledge base directly or re-input to the system. According to that evaluation, adaptation action (δ = A-ta$_n$) is committed, namely asset protection at a certain time (t) with consideration of assessment toward occurring of each event. The adaptation action is dealing with authorization of cyberspace service, where the authorization evaluated based on control to the growth the of knowledge tree because knowledge tree will always continue to grow and drive based on new facts that captured from every information context.

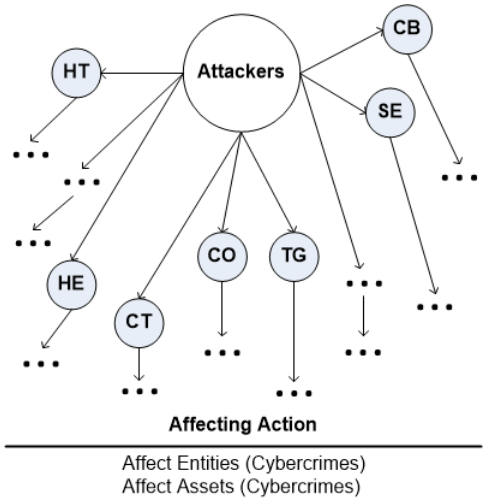


Figure 5. Attacker growth.

Figure 5. shows an example of growth specification of knowledge tree for the attacker. Achievement of detection threat goal will be accomplished by plan detect context-3, on an ongoing basis will have a growing knowledge. For example, an entity attacker will affect the other entity or its assets. Any form of attack can be detected by category, for instance [6] hacktivist (HT), hackers (HE), contractor (CT), Criminal organization (CO), a terrorist group (TG), competing businesses (CB), sabotaging employee (SE), and can continue to grow depends on the facts captured context information. In this case, the tree of knowledge actor Attackers will continue to grow and will be stored in the policy engine as input material for evaluation in determining the choice of adaptation actions cybersecurity.

If viewed from the point of view of the system reliability, so the proposed model has the principle of maintainability. The system may change when necessary and continue to improve its availability because system entity has the ability to update its knowledge as an intelligent system. This shows the level of the system reliability that continues to increase based on dynamic environmental conditions. As a future agenda, we will conduct quality testing in more detail and technically related to the ability of the system to maintain its performance level when used in various conditions, whether viewed from the characteristics of maturity, fault tolerance, and recoverability

IV. RELATED WORK

Various efforts have been made by researchers to provide a solution to the problem of the safety of a system, including Giorgini et al. [16] proposed a model of security goals that extend the model goal Tropos [17] through the concept of trusts model of relations among social actors. Mouratidis et al. [18] also propose the integration of security in cycle models and UML diagrams goal, with a view of socio-technical systems (STS), the same thing is done by Ali et al. [19] with the addition of security models to analyze the requirements of a variety of contexts. Tong Li et al. [20] introduce a holistic approach to security, new patterns, and models as a contextual model of goal attack. Atom et al. [21] proposed a framework for implementing cybersecurity through performance measurement.

The researchers adopted a similar approach to the proposed model, namely through a model approach goal to represent the domain model, but here we extend it through the concept of control strategies are formulated more flexible, so that changes and growth in cybersecurity systems can be accommodated more easily.

Additionally, Florez et al. [6] proposes a model for the analysis of the complexity of the dynamic ecosystem of cybersecurity, and produce models for a strategy of software components. While Mlakic et al., [22] introduced the method of expert systems are formulated through a fuzzy logic approach and serve to determine the appropriate response time in the event of cyber-attacks. Both researchers are proposing a computational model to determine the decision in the selection of candidate solutions to meet the characteristics of the cybersecurity, but related domain model that represents the problem domain as a system requirements have not been

covered. On this occasion, the model we will propose is to integrate the computational model into the modeling requirements so that we have the advantages of both.

Based on the description, the proposed model has coverage from two points of view, namely modeling angle for model domain represented by goal-oriented requirements engineering (GORE) approach, and computational point of view for control model represented by knowledge-based systems approach (KBS) through a specially designed control strategy. So as a step forward to meet the needs of comparison in more detail, we plan to establish one of the previous works that can be considered to meet both points of view.

V. CONCLUSION

The advantage of ICT in cybercrime very depends on its capability to understand and anticipate growth of form and kind of offenses, which constantly appears. It can foster the confidence of user to the benefits of ICT. In this paper, the self-adaptive model proposed with emphasizing of importance to understand and capture variability context and system behavior through domain goal modeling, and need of strategy control that handle solution scope more broad and smooth. We believe the proposed model can give contribution for cybersecurity domain, where the view of cybercrime must see based on life cycle of a system that continuously grows and thrives.

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