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2015 3rd International Conference on Information and Communication Technology (ICoICT)

The 3rd International Conference on Information and Communication Technology (ICoICT) provides an open forum for researchers, engineers, policy makers, network planners, and service providers in telecommunications. Extensive exchange of information will be provided on newly emerging systems, standards, services, and variety of applications on the area of telecommunications.

2015 3rd International Conference on Information and Communication Technology (ICoICT) took place 27-29 May 2015 in Bali, Indonesia.

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Program

Time	Ballroom	Room 1	Room 3	Session
Wednesday, May 27				
09:30-10:30	***Keynote: New infrastructure and applications developed from a cryptocurrency BITCOIN and a platform ETHEREUM***			
10:50-12:00	***Panel Session***			
13:30-15:10	***Tutorial: Making Multimedia Accessible***	***Parallel Session***	***Parallel Session***	***Parallel Session, Parallel Session, Parallel Session***
15:30-17:30	***Tutorial: A Hands-on Tutorial on Face Recognition***	***Parallel Session***	***Parallel Session***	***Parallel Session, Parallel Session***
Thursday, May 28				
08:30-09:30	***Keynote: Accesible smart ICT for daily Life***			
09:50-12:10	***Tutorial: How to Accelerate R&D Innovation with TRIZ***	***Parallel Session***	***Parallel Session***	***Parallel Session, Parallel Session, Parallel Session***
11:10-12:10	***Tutorial: Forensic vs. Anti-forensic in Biometirics: Towards Receipt-freeness and Coercion-Resistance in biometric authentication protocols***			
13:30-15:10	***Demo: Attacks in Remote User Authentication Scheme Review***	***Parallel Session***	***Parallel Session***	***Parallel Session, Parallel Session, Parallel Session***
15:30-17:10	***Tutorial: Eye-tracking Analysis***	***Parallel Session***	***Parallel Session***	***Parallel Session, Parallel Session***

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Dayawati, Retno	D2.3	203	*Face Image-Based Gender Recognition Using Complex-Valued Neural Network*
De Santo, Aniello	A2.6	625	*Connecting Times: Using Smart Technologies for Enhancing Ancient DownTowns Experience*
De Santo, Massimo	A2.6	625	*Connecting Times: Using Smart Technologies for Enhancing Ancient DownTowns Experience*
Deriche, Mohamed	D2.1	190	*Implementation and Evaluate the No-Reference Image Quality Assessment Based on Spatial and Spectral Entropies on the Different Image Quality Databases*
Dewandaru, Agung	E3.1	284	*Evaluation on Geospatial Information Extraction and Retrieval: Mining Thematic Maps From Web Source*
Dongoran, Emir	E1.2	58	*Analysis and Implementation of Graph Indexing for Graph Database Using GraphGrep Algorithm*
Dwi Atmaji, Fransiskus	B5.2	545	*LCC Application for Estimating Total Maintenance Crew and Optimal Age of BTS Component*
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Effendy, Veronikha	C2.2	218	*The Implementation User Experience Model in Applications Early Childhood Education Using Hierarchical Task Analysis Method (Case Study: Introduction Learning to Read)*
	E3.5	388	*Sentiment Analysis on Twitter Using the Combination of Lexicon-Based and Support Vector Machine for Assessing the Performance of a Television Program*
	A4.1	483	*Identifying Factors That Influence Student Failure Rate Using Exhaustive CHAID (Chi-Square Automatic Interaction Detection)*
Elmangoush, Asma	A1.1	81	*A Solution for Provisioning Reliable M2M Infrastructures Using SDN and Device Management*
Enriko, I Ketut	C4.3	529	*Designing Machine-To-Machine (M2M) System in Health-Cure Modeling for Cardiovascular Disease Patients: Initial Study*
Erfianto, Bayu	A1.4	97	*(EDsHEED) Enhanced Simplified Hybrid, Energy-Efficient, Distributed Clustering for Wireless Sensor Network*
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Farid Firmanda, Syahrial	A2.4	152	*Scheduler and Voice Recognition on Home Automation Control System*
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Gayatri, Andini	**A3.5**	399	***A Classification of Polycystic Ovary Syndrome Based on Follicle Detection of Ultrasound Images***
Getta, Janusz	**E3.2**	290	***Concurrent Processing of Increments in Online Integration of Semi-structured Data***
Gilbert, Lester	**A3.4**	317	***Technology Enhanced Interaction Framework and Method for Accessibility in Thai Museums***
Gozali, Alfian	**E1.2**	58	***Analysis and Implementation of Graph Indexing for Graph Database Using GraphGrep Algorithm***
	E3.6	393	***Implementation of GRAC Algorithm (Graph Algorithm Clustering) in Graph Database Compression***
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Gunawan, Djoko	**B4.2**	428	***Performance Evaluation of Hybrid Parallel Computing for WRF Model with CUDA and OpenMP***
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Hadiana, Ana	**B5.5**	560	***Web Based E-Learning System Analysis Using Kansei Engineering***
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Hall, Wendy	**C2.5**	236	***TWINE: Supporting Assessment of Trustworthiness of Web Information Using Linked Data***
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Handoko, Handoko	**E3.2**	290	***Concurrent Processing of Increments in Online Integration of Semi-structured Data***
Harun, Jamalludin	**A3.3**	311	***Students' Task Related Assessment: Does Knowledge Construction Process Through CSCL Learning Environment Obliging?***
Hashim, Suhaizal	**A3.3**	311	***Students' Task Related Assessment: Does Knowledge Construction Process Through CSCL Learning Environment Obliging?***
Hasibuan, Zainal	**C4.1**	517	***E-Business Framework for Small and Medium Enterprises: A Critical Review***
Hertiana, Sofia	**B3.2**	247	***Enabling Multipath Routing for Unicast Traffic in Ethernet Network***
Herutomo, Anton	**A1.2**	87	***Forest Fire Detection System Reliability Test Using Wireless Sensor Network and OpenMTC Communication Platform***
Heryadi, Yaya	**C4.4**	535	***American Sign Language-Based Fingerspelling Recognition Using k-Nearest Neighbors Classifier***
Hidayat, Syarif	**A2.4**	152	***Scheduler and Voice Recognition on Home Automation Control System***
Hu, Qingsheng	**B3.3**	253	***A High-Speed Gearbox Based on Phase Independent Architecture for 100G Ethernet Physical Coding Sublayer***
Hunaini, Fachrudin	**A4.4**	501	***Optimization of Active Steering Control on Vehicle with Steer by Wire System Using Imperialist Competitive Algorithm (ICA)***
	I		**A B C D E F G H I J K L M N O P R S T U V W X Y Z**
Imaduddin, Zaki	**C5.2**	610	***Automatic Detection and Measurement of Fetal Biometrics to Determine the Gestational Age***

Irawan, Indwiarti	E1.5	75	*Implementation of Decision Tree Using C4.5 Algorithm in Decision Making of Loan Application by Debtor (casC Study: Bank Pasar of Yogyakarta Special Region)*
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Jarot, Sigit	A2.2	142	*An Efficient Implementation of Sequential Detector in Spectrum Sensing Under Correlated Observations*
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	D5.3	576	*A Review for Gait Recognition Across View*
Karna, Nyoman	A1.3	92	*Autonomous Knowledge Based System for Sensor Network*
Kautsarina, Kautsarina	E4.2	467	*Towards Data Sovereignty in Cyberspace*
Kinasih, Sekar	B1.2	6	*Comparative Study of Grammatical Evolution and Adaptive Neuro-Fuzzy Inference System on Rainfall Forecasting in Bandung*
Kistijantoro, Achmad Imam	B4.2	428	*Performance Evaluation of Hybrid Parallel Computing for WRF Model with CUDA and OpenMP*
Kudsy, Mahally	B4.2	428	*Performance Evaluation of Hybrid Parallel Computing for WRF Model with CUDA and OpenMP*
Kuo, Chin-Fu	C3.5	344	*A Perl-based SNMP Agent of Networked Embedded Devices for Smart-Living Applications*
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	B3.7	360	*Modularizing RESTful Web Service Management with Aspect Oriented Programming*
Kwee, Ivo	A3.7	411	*A Matheuristic Algorithm for the Prize-collecting Steiner Tree Problem*
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Liew, Tze Hui	D5.2	570	*Preliminary Work on Rotation-Invariant Algorithms for Contactless Palm Vein Biometrics*
Liong, The Houw	B2.5	186	*Dimensionality Reduction for Association Rule Mining with IST-EFP Algorithm*
Listia Rosa, Sri	E4.4	479	*RFID Middleware for Fast Clearance in Container Terminal Management System*
	C5.4	620	*Application of NFC Technology for Premise Halal Certification*

Liyanthy, Mellia	D5.1	565	*Realistic Facial Animation of Speech Synchronization for Indonesian Language*
Lorn Jhinn, Wee	D5.2	570	*Preliminary Work on Rotation-Invariant Algorithms for Contactless Palm Vein Biometrics*
Lu, Yung-Feng	C3.5	344	*A Perl-based SNMP Agent of Networked Embedded Devices for Smart-Living Applications*
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Maharani, Warih	D5.1	565	*Realistic Facial Animation of Speech Synchronization for Indonesian Language*
Maulidevi, Nur	A1.3	92	*Autonomous Knowledge Based System for Sensor Network*
Md. Suhadi, Salihuddin	B1.3	11	*Online Learning and Socratic Method in Increasing Self-Motivation: A Literature Review*
Mei, Gang	D4.2	445	*Robust and Efficient Implementations of Angle-Based Mesh Smoothing on the GPU*
Mohamed, Hasnah	B1.3	11	*Online Learning and Socratic Method in Increasing Self-Motivation: A Literature Review*
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Mohd Zaid, Norasykin	B1.3	11	*Online Learning and Socratic Method in Increasing Self-Motivation: A Literature Review*
Montemanni, Roberto	D1.3	38	*Permutation Codes Via Fragmentation of Group Orbits*
	A3.7	411	*A Matheuristic Algorithm for the Prize-collecting Steiner Tree Problem*
Mulyana, Tatang	B1.4	17	*Website Design of EMS-SCADA for AC Usage on a Building*
	C5.3	615	*Monitoring and Controlling of EMS-SCADA Via SMS Gateway*
Munajat, Bayu	B3.7	360	*Modularizing RESTful Web Service Management with Aspect Oriented Programming*
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	C5.1	606	*Thin EM Wave Absorber Composed of Octagonal Patch Array and Its Characteristic Measurement*
Murti, Fahri	A1.5	102	*Enhancing Performance of Block Diagonalization Precoding in Multi User MIMO (MU-MIMO) Downlink*
Mustika, I Wayan	D3.4	280	*Seasonal Time-Series Model Using Particle Swarm Optimization for Broadband Data Payload Prediction*
Mutiah, Titik	A3.5	399	*A Classification of Polycystic Ovary Syndrome Based on Follicle Detection of Ultrasound Images*
Mutiara, Giva	B2.3	174	*Prototype of Microcontroller-Based Odometer Reading for Early Warning in the Vehicle Lubricants Replacement*
N			A B C D E F G H I J K L M N O P R S T U V W X Y Z
Napitupulu, Johanes Haposan	C3.6	511	*Kretschmer Complex Degree Centrality and Confidence Interval Estimation Implementation for Validating User Reports on Integrated Disaster Portal and Social Media Application*
Naqvi, Haidlir	B3.2	247	*Enabling Multipath Routing for Unicast Traffic in Ethernet Network*
Negara, Arjuna	D3.4	280	*Seasonal Time-Series Model Using Particle Swarm Optimization*

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Nengsih, Warnia	E4.1	462	*A Comparative Study on MBA and Apriori Tecnique*
Nhita, Fhira	B1.2	6	*Comparative Study of Grammatical Evolution and Adaptive Neuro-Fuzzy Inference System on Rainfall Forecasting in Bandung*
	A3.5	399	*A Classification of Polycystic Ovary Syndrome Based on Follicle Detection of Ultrasound Images*
Novita, Riasyah	A4.1	483	*Identifying Factors That Influence Student Failure Rate Using Exhaustive CHAID (Chi-Square Automatic Interaction Detection)*
Nugraha, Prastyawan	D2.2	197	*A Photo Composite Detection Based on Eye Specular Highlights Using Pixel-Based Approach*
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Nugroho, Hertog	D4.3	451	*Development of Word-Based Text Compression Algorithm for Indonesian Language Document*
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Nuha, Hilal	A5.2	592	*Fractional Fourier Transform for Decreasing Seismic Data Lossy Compression Distortion*
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O'Hara, Kieron	C2.5	236	*TWINE: Supporting Assessment of Trustworthiness of Web Information Using Linked Data*
Octavia, Johanna	A3.1	301	*Participatory Design of Interactive TV User Interface for Elderly People in Indonesia*
Olivia, Levy	A2.3	148	*Bandwidth Improvement of Square Patch Array-based AMC Using Multiple Slots Technique*
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	P		A B C D E F G H I J K L M N O P R S T U V W X Y Z
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	A5.4	602	*Pricing Bermudan Option Via Evolutionary Discrete Morse Flow Approach*
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Peng, Bo	D4.2	445	*Robust and Efficient Implementations of Angle-Based Mesh Smoothing on the GPU*
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Picariello, Antonio	**A2.6**	625	***Connecting Times: Using Smart Technologies for Enhancing Ancient DownTowns Experience***
Pinem, Asry Faidhul	**D3.2**	268	***Implementation of Classification and Regression Tree (CART) and Fuzzy Logic for Intrusion Detection System***
Prabowo, Sidik	**A1.2**	87	***Forest Fire Detection System Reliability Test Using Wireless Sensor Network and OpenMTC Communication Platform***
	A1.4	97	***(EDsHEED) Enhanced Simplified Hybrid, Energy-Efficient, Distributed Clustering for Wireless Sensor Network***
Prasetya, Wira	**C1.1**	108	***Exploring the Roles of Personality Factors on Knowledge Management System Acceptance***
Pratama, Heru	**B2.4**	180	***Text Data Compression for Mobile Phone Using Burrows-Wheeler Transform, Move-To-Front Code and Arithmetic Coding***
Prathiwi, Dwi	**B1.5**	23	***Watermarking Scheme for Authenticity and Integrity Control of Digital Medical Image Using Reed-Muller Codes and Hash Block Chaining***
Pratiwi MS, Putri	**C3.4**	338	***Conceptual Model of Citizen's Intention Associated to E-Government and Internet Behavior Why Do Bandung Citizens Follow the Mayor's Social Media?***
Pudjiastuti, Rina	**A1.5**	102	***Enhancing Performance of Block Diagonalization Precoding in Multi User MIMO (MU-MIMO) Downlink***
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Pudjoatmojo, Bambang	**D2.2**	197	***A Photo Composite Detection Based on Eye Specular Highlights Using Pixel-Based Approach***
Purnama, Bedy	**A3.5**	399	***A Classification of Polycystic Ovary Syndrome Based on Follicle Detection of Ultrasound Images***
Purnamasari, Rita	**B5.3**	550	***Design and Implementation of Regulatory Systems of Light, Temperature and Humidity Indoor Gardens Using Microcontroller***
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Pythaloka, Dyah	**D2.5**	439	***Artificial Fish Swarm Algorithm for Job Shop Scheduling Problem***
	R		**A B C D E F G H I J K L M N O P R S T U V W X Y Z**
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Rakhmatsyah, Andrian	**B2.3**	174	***Prototype of Microcontroller-Based Odometer Reading for Early Warning in the Vehicle Lubricants Replacement***
	A3.2	305	***Application of M2M to Detect the Air Pollution***
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Ridwan, Ridwan	**B4.2**	428	***Performance Evaluation of Hybrid Parallel Computing for WRF Model with CUDA and OpenMP***
Rinandhi, Avian	**C2.2**	218	***The Implementation User Experience Model in Applications Early Childhood Education Using Hierarchical Task Analysis Method (Case Study: Introduction Learning to Read)***

Rismawan, Wahyu	**D1.4**	44	***Differential Evolution for the Cryptanalysis of Transposition Cipher***
Riza, Tengku	**A2.5**	158	***An Implementation of Digital Advertising Board Using Mini PC***
Rizal, Achmad	**B2.2**	168	***Arrhythmia Detection Based on ECG Signal Using Android Mobile for Athlete and Patient***
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Rochimah, Siti	**E3.3**	296	***Source Code Retrieval on StackOverflow Using LDA***
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Rosyidi, Lukman	**B3.4**	257	***Performance Evaluation of Adaptive Network Tree Construction Mechanism for ZigBee Grid Router Network***
Ruan, Weihua	**B3.3**	253	***A High-Speed Gearbox Based on Phase Independent Architecture for 100G Ethernet Physical Coding Sublayer***
Rusdinar, Angga	**B5.3**	550	***Design and Implementation of Regulatory Systems of Light, Temperature and Humidity Indoor Gardens Using Microcontroller***
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Sa'adah, Siti	**D1.4**	44	***Differential Evolution for the Cryptanalysis of Transposition Cipher***
	D1.5	48	***Vomma:Android Application Launcher Using Voice Command***
	D3.1	263	***Speaker Recognition Implementation for Authentication Using Filtered MFCC – VQ and a Thresholding Method***
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Sabariah, Mira	**C2.2**	218	***The Implementation User Experience Model in Applications Early Childhood Education Using Hierarchical Task Analysis Method (Case Study: Introduction Learning to Read)***
	E3.5	388	***Sentiment Analysis on Twitter Using the Combination of Lexicon-Based and Support Vector Machine for Assessing the Performance of a Television Program***
	A4.1	483	***Identifying Factors That Influence Student Failure Rate Using Exhaustive CHAID (Chi-Square Automatic Interaction Detection)***
Sadewa, Reza Aulia	**D3.1**	263	***Speaker Recognition Implementation for Authentication Using Filtered MFCC – VQ and a Thresholding Method***
Saedudin, Rd. Rohmat	**B5.2**	545	***LCC Application for Estimating Total Maintenance Crew and Optimal Age of BTS Component***
Saepudin, Deni	**A5.3**	596	***Analysis and Implementation of Tracking Efficient Method to LQ45 Stock Index Portfolio Optimization***
Sandhyaduhita, Puspa Indahati	**C1.1**	108	***Exploring the Roles of Personality Factors on Knowledge Management System Acceptance***
Sanmugam, Mageswaran	**B1.3**	11	***Online Learning and Socratic Method in Increasing Self-Motivation: A Literature Review***
Saragih, Ariando	**B5.3**	550	***Design and Implementation of Regulatory Systems of Light, Temperature and Humidity Indoor Gardens Using Microcontroller***
Sari, Riri	**B3.4**	257	***Performance Evaluation of Adaptive Network Tree Construction Mechanism for ZigBee Grid Router Network***
Sastrosubroto, Ashwin	**E4.2**	467	***Towards Data Sovereignty in Cyberspace***
Satrya, Gandeva	**B3.1**	242	***The Detection of DDOS Flooding Attack Using Hybrid Analysis in IPv6 Networks***

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Selviandro, Nungki	**C1.2**	114	***Prelimenary Study for Determining BYOD Implementation Framework Based on Organizational Culture Analysis Enhanced by Cloud Management Control***
Septiana, Gia	**D1.4**	44	***Differential Evolution for the Cryptanalysis of Transposition Cipher***
	B2.4	180	***Text Data Compression for Mobile Phone Using Burrows-Wheeler Transform, Move-To-Front Code and Arithmetic Coding***
Setiawan, Erwin	**D3.2**	268	***Implementation of Classification and Regression Tree (CART) and Fuzzy Logic for Intrusion Detection System***
Setiawati, Cut Irna	**C3.4**	338	***Conceptual Model of Citizen's Intention Associated to E-Government and Internet Behavior Why Do Bandung Citizens Follow the Mayor's Social Media?***
Setiawati, Eni	**D3.6**	371	***Particle Swarm Optimization on Follicles Segmentation to Support PCOS Detection***
Shamsuddin, Siti Mariyam	**E4.4**	479	***RFID Middleware for Fast Clearance in Container Terminal Management System***
	C5.4	620	***Application of NFC Technology for Premise Halal Certification***
Shaufiah, Shaufiah	**B2.5**	186	***Dimensionality Reduction for Association Rule Mining with IST-EFP Algorithm***
Shihab, Muhammad Rifki	**C1.1**	108	***Exploring the Roles of Personality Factors on Knowledge Management System Acceptance***
Shrestha, Ranjan	**A1.1**	81	***A Solution for Provisioning Reliable M2M Infrastructures Using SDN and Device Management***
Sibaroni, Yuliant	**E1.5**	75	***Implementation of Decision Tree Using C4.5 Algorithm in Decision Making of Loan Application by Debtor (casC Study: Bank Pasar of Yogyakarta Special Region)***
Sidiq, Muslim	**D1.5**	48	***Vomma:Android Application Launcher Using Voice Command***
	D3.7	377	***Design and Implementation of Voice Command Using MFCC and HMMs Method***
Sinaga, Ardiles	**D4.3**	451	***Development of Word-Based Text Compression Algorithm for Indonesian Language Document***
Siswanto, Boby	**B2.5**	186	***Dimensionality Reduction for Association Rule Mining with IST-EFP Algorithm***
Sitorus, Indra	**A5.5**	505	***Using Least-Square Monte Carlo Simulation to Price American Multi Underlying Stock Options***
Skrbek, Jan	**B2.1**	162	***Increasing Effectiveness of Early Warning Through Smart ICT***
Smith, Derek	**D1.3**	38	***Permutation Codes Via Fragmentation of Group Orbits***
Sthevanie, Febryanti	**D3.5**	366	***Mobile OCR Using Centroid to Boundary and Backpropagation Neural Network***
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Suhendar, Restu	**D5.4**	580	***Scattered Object Recognition Using Hu Moment Invariant and Backpropagation Neural Network***
Sulistiyo, Mahmud	**D2.3**	203	***Face Image-Based Gender Recognition Using Complex-Valued Neural Network***
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Supriana, Iping	**A1.3**	92	***Autonomous Knowledge Based System for Sensor Network***
	E3.1	284	***Evaluation on Geospatial Information Extraction and Retrieval: Mining Thematic Maps From Web Source***
Suratman, Fiky	**A2.2**	142	***An Efficient Implementation of Sequential Detector in Spectrum Sensing Under Correlated Observations***
Suryabrata, Andri	**B5.2**	545	***LCC Application for Estimating Total Maintenance Crew and Optimal Age of BTS Component***
Sutantra, Nyoman	**A4.4**	501	***Optimization of Active Steering Control on Vehicle with Steer by Wire System Using Imperialist Competitive Algorithm (ICA)***
Suwastika, Novian	**A1.2**	87	***Forest Fire Detection System Reliability Test Using Wireless Sensor Network and OpenMTC Communication Platform***
	A5.2	592	***Fractional Fourier Transform for Decreasing Seismic Data Lossy Compression Distortion***
Suwawi, Dawam Dwi Jatmiko	**C2.3**	224	***Evaluation of Academic Website Using ISO/IEC 9126***
Syukriilah, Niila	**B1.1**	1	***Structural Similarity Analysis of Business Process Model Using Selective Reduce Based on Petri Net***
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Tarwidi, Dede	**A4.3**	495	***Godunov Method for Computerized Lung Cancer Cryosurgery Planning with Efficient Freezing Time***
	A5.1	586	***Modeling and Numerical Simulation of Solar Cooker with PCM as Thermal Energy Storage***
Tawakal, Hilmy	**C5.2**	610	***Automatic Detection and Measurement of Fetal Biometrics to Determine the Gestational Age***
Thuseethan, Selvarajah	**D1.2**	33	***Spider-Web Topology: A Novel Topology for Parallel and Distributed Computing***
Tiara, Tiara	**E3.5**	388	***Sentiment Analysis on Twitter Using the Combination of Lexicon-Based and Support Vector Machine for Assessing the Performance of a Television Program***
Trisnowianti, Ayunda	**A5.3**	596	***Analysis and Implementation of Tracking Efficient Method to LQ45 Stock Index Portfolio Optimization***
	U TOP		**A B C D E F G H I J K L M N O P R S T U V W X Y Z**
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	A5.5	505	***Using Least-Square Monte Carlo Simulation to Price American Multi Underlying Stock Options***
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Feature Extraction Analysis on Indonesian Speech Recognition System

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***Abstract*—Speech recognition is widely applied to speech to text, speech to emotion, in order to make gadget and computer easier to use, or to help people with hearing disability. Feature extraction is one of significant step in the performance of speech recognition. Therefore, the proper selection is really needed. In this paper, we analyze feature extraction that can have good performance for Indonesian speech recognition system. The feature extraction method that will be analyzed are Linear Predictive Coding (LPC) and Mel Frequency Cepstral Coefficient (MFCC). Meanwhile, PNN is used as classification method in this study. The testing results show that MFCC is faster than LPC, but LPC can have the better accuracy. The accuracy of system is influenced by feature extraction, number of class and smoothing parameter.**

Keywords- Speech Recognition System; Feature Extraction, LPC, MFCC.

I. INTRODUCTION

Along with advances in information technology, it has been developed the technology to facilitate human life, one of which is speech recognition. Speech recognition is widely applied to speech to text, speech to emotion, in order to make more easier for many users of gadget and computer. Moreover, the system can be used by people with hearing disability in the conversation. However, the development of speech recognition to produce the text from the input voice has not well developed in Indonesian. It is because in Indonesian there are many dialects that will effect performance of speech recognition system.

In the previous study, speech recognition has been developed using Hidden Markov Model and Multi Layer Neural Network for English [1]. Hidden Markov methods are easy to apply and have a training algorithm to estimate model parameters for the set of voice data. These methods have flexible architectures in both size and type which are appropriate to the type of words and sounds [3]. Speech recognition system has also been developed using Discriminant Feature Extraction – Neural Predictive Coding (DFE-NPC) as feature extraction and Probabilistic Neural Network as recognition method. However, DFE-NPC still have less performance for Indonesian speech recognition [13].

In this paper, we analyze feature extraction in order to have a good performance for Indonesian speech recognition system. The feature extraction method that will be analyzed include Linear Predictive Coding (LPC) and Mel Frequency Cepstral Coefficient (MFCC). In this this study, PNN is used as a classifier on recognition scheme. PNN is deterministic method that can be used as classifier of the system such that the feature extraction will be in the optimal performance. The speech data that use in this research is the names of city in Indonesia and spoken of many people.

The chapter is structured as follows : Chapter II will present the explanation of feature extraction algorithm, classification method, and speech data that will use in this research. Chapter III will present experiment and analysis results, and finally Chapter IV presents the conclusion of this research.

II. ALGORITHM

In this research, the speech recognition system is builded by using Linear Predictive Coding (LPC) and Mel Frequency Cepstral Coefficient (MFCC) as feature extraction method and Probabilistic Neural Network as a classifier.

A. Feature Extraction

Feature extraction method that used in this research are LPC and MFCC. The significant difference of LPC and MFCC is representation of voice signal that will be analyzed. LPC use spectral representation and MFCC use cepstral analysis methods. It will be difference after windowing step. Here is the algorithm of LPC and MFCC [2][7] :

1. Pre-emphasis :
   This process is used to equalize spectral signal and to omit top values in the spectral signal, so it will be easier to decide boundary of signal for next process.

$$\tilde{s}(n) = s(n) - \tilde{a}\, s(n-1) \quad (1)$$

where:
s(n) is n^{th} sample
$\tilde{a}$ is adjust parameter (default = 0,95)

2. Frame blocking :
   Frame blocking divides the result of pre-emphasis $\tilde{s}(n)$ into frames. Each frame has N sample and separate about M sample. If M<<N then the spectral prediction of frame by frame is better.
3. Windowing :
   This process minimizes discontinuity between start point and end point of each frame, by Hamming Window equation (2) and (3).

$$w(n) = 0.54 - 0.46\cos\left(\frac{2\pi n}{N-1}\right), 0 \le n \le N-1 \quad (2)$$

$$\tilde{x}(n) = s(n).w(n) \quad (3)$$

   where:
   w(n) is hamming window
   s(n) is sample frame

4. LPC and MFCC :
   ✓ LPC
   LPC is a model for speech signal production based on the assumption that the speech signal is produced by a very specific model. It is a model that based on parametric spectrum estimation, which greatly simplified the estimation of the vocal tract response from speech waveforms.
   Optimisation problem :

$$P_e = E\{e^2[n]\} = E\{(x[n] - \sum_{k=1}^{N} a_k x[n-k])^2\} \quad (4)$$

   where α_k is LPC coefficient

   ✓ MFCC :
   MFCC is based on human hearing perception which can not perceive frequencies over 1Khz. In other words, in MFCC is based on known variation of human ear's critical bandwidth with frequencies [1,5, 8-10]. The overall process of the MFCC is shown in Figure 1 as follows.

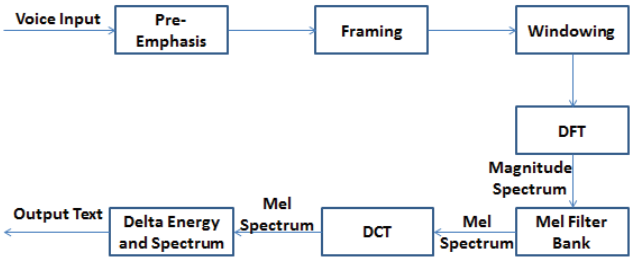

Figure 1 : MFCC Block Diagram [7]

B. Probabilistic Neural Network (PNN)

Probabilistic Neural Network (PNN) is one of artificial neural network model based on probabilistic density function. This classification model has a good performance in accuracy rates and training speed because it only needs one iteration. A smoothing parameter (σ) manages the network which is influenced by every pattern.

Bayes method classifies pattern using a decision rule that minimizes expectable risk. For example, there are n class, C_0, C, C_2,…,C_{n-1}, and observed pattern which is random variable x with m-dimension and conditional density function x. If the pattern is from C_k class, denoted by $p(x|C_k)$. By implementing the first rule of Bayes, then the probability of x in C_k class, denoted by:

$$P(C_k|x) = \frac{p(x|C_k)}{p(x)} \quad (5)$$

where:
p(x) is probability of x

From that case, it can be formulated by the common way to minimize the risk is by minimizing the probability. Bayes decision rule is used to decide class C_k by choosing the highest $Pr(C_k|x)$.

$$d(x) = C_k \; if \; p(x|C_k)\Pr(C_k) > p(x|C_j)\Pr(C_j), for\ all\ j \neq k \quad (6)$$

The probabilistic neural network model made by Cain allows each class to have a smoothing parameter, σ_k, which is different from other and implement learning algorithm to obtain σ_k automatically. If each class has a smoothing parameter, then the probabilistic density function is denoted by:

$$p(x|C_k) = \frac{1}{(2\pi)^{m/2}\sigma_k{}^m|C_k|}\sum_{\rho_i \epsilon C_k} \exp\left[-\frac{||x-w_i||^2}{2\sigma_k{}^2}\right] \quad (7)$$

or:

$$p(x|C_k) = \left(\frac{m}{|C_k|}\right)(\sigma_k{}^m|C_k|)^m(1-(\sigma_k{}^m|C_k|)^{(m-|x-w_i|)} \quad (8)$$

where $|C_k|$ is the number of training pattern in class C_k, m is vector dimension input pattern, and w_i is weight vector in i^{th} training pattern.

The training algorithms that can adjust value of σ_k automatically create the network form parameter for each class in second step of training process. This is the training algorithm of probabilistic neural network.

```
{First Step}
For each pattern of ρi
        wi = ρi
        Build pattern unit with input weight vector wi
        Connect pattern unit to summing unit for each class
End
Calculate |Ck| for each summing unit

{Second step}
For each pattern ρi
        k = class ρi
        Find shortest distance, di, to pattern in class k
        dtot[k] = dtot[k] + di
End
For each class k
        σk = (g . dtot[k]) / |Ck|
        Calculate probabilistic density function
End
Find the highest probability from all class
```

Where:

ρ_i : input pattern
w_i : weight vector
$|C_k|$: sum of input pattern for each class
d_i : shortest distance
dtot[k] : sum of shortest distance in class k
σ_k : smoothing parameter for class C_k
g : a constant of smoothing parameter
i, k : natural number for iteration

Smoothing parameter of each class is the multiplication between a constant and the average of minimum distance of training pattern in same class. So, the average of minimum distance between pattern vectors in class C_k is:

$$d_{avg}[k] = \frac{1}{|C_k|}\sum_{\rho_i \in C_k} d_i \quad (9)$$

where d_i is nearest distance pattern ρ_i with other pattern in class C_k. So that, smoothing parameter σ_k for class C_k is:

$$\sigma_k = g \,.\, d_{avg}[k] \quad (10)$$

where g is a constant of smoothing parameter and d_{avg} is average distance.

Choosing constant g is used to create high classification accuracy on the network, because constant g is affected by the number of class, training pattern dimension, and number of training set.

The architecture of probabilistic neural network has 4 layers, contained of:

1. Input layer, that contain m unit and receive x input vectors.
2. Pattern unit layer that has full connection to input pattern.
3. Summing result unit layer that has full connection to each class.
4. Decision layer to choose the highest values. [12]

In the Figure 2 is presented an architecture of probabilistic neural network:

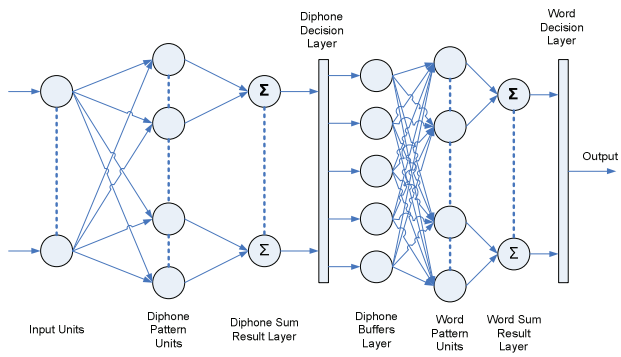

Figure 2. Probabilistic Neural Network Architecture

C. Speech Data

The speech data that use in this research is the names of city in Indonesia and spoken of many people, and the comparison is 85% for training data and 15% for testing data. The set of data which is used in the experiment scenario are provided in the Table 1.

Table 1. The set of speech data

Number of Class	Words
2	Aceh, Bandung
3	Aceh, Bandung, Jakarta
4	Aceh, Bandung, Jakarta, Klaten
5	Aceh, Bandung, Jakarta, Klaten, Majalengka
6	Bandung, Aceh, Jakarta, Klaten, Majalengka, Padang

III. EXPERIMENT AND ANALYSIS RESULTS

This experiment is conducted to compare performance of LPC and MFCC, as testing accuracy and training time processing. In this experiment, there are some variables that used to gain the best performance:

- Number of class: 2, 3, 4, 5, 6.
- Number of cluster: 5, 10, 15, 20, 25, 30, 35, 40, 45, 50.
- Smoothing parameter: [0, 1], that increase 0.01 for each observation. So, each variation of number of class and number of cluster will be evaluated about 100 times.

Here is the result:

- Testing accuracy and training time processing:

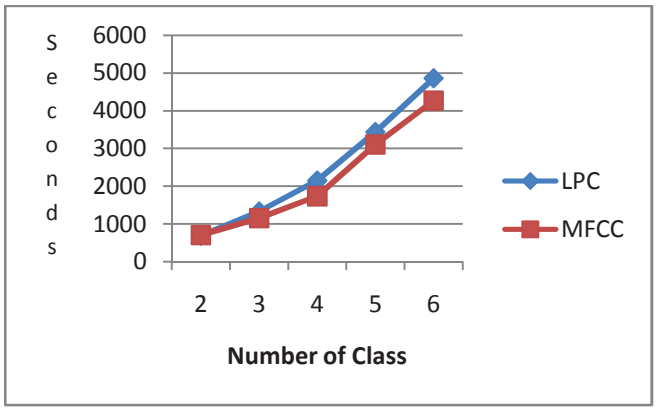

Figure 3. Comparison of time on training process, the axis x denote number of class, axis y denote the time processing (seconds), blue line is result of LPC, and red line is result of MFCC.

After conduct the training phase, the system get the best parameter that used in the testing phase. The testing phase only need below 0.15 second to have the accuracy. Here is the result of testing phase:

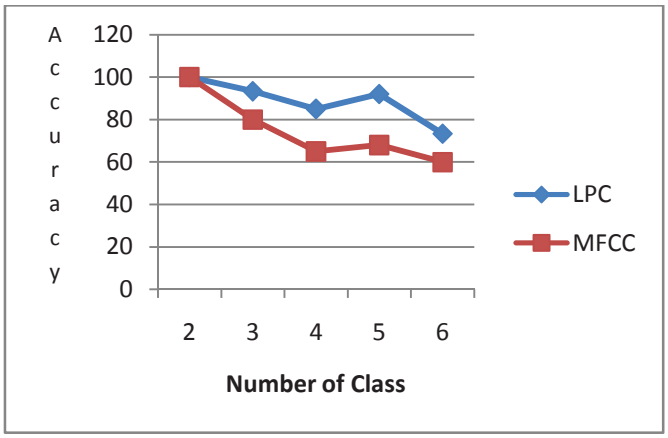

Figure 4. Comparison of testing accuracy, the axis x denote number of class, axis y denote testing accuracy, blue line is result of LPC and red line is result of MFCC.

Based on the comparison result in the figure 3 and Figure 4, training time processing of MFCC is faster than LPC, but LPC can have the better accuracy. It's because LPC is efficient in exploiting the parametric redundancy. Also, LPC can difference the voice and unvoiced frames.

- The Smoothing Parameter of PNN:

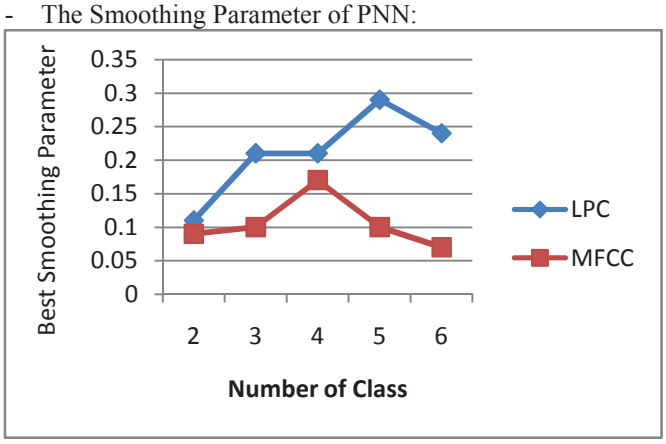

Figure 5. Result of Smoothing Experiment, the axis x denote number of class, axis y denote the smoothing parameter, blue line is result of LPC and red line is result of MFCC.

Smoothing parameter is a parameter that affects classification capability of probabilistic neural network. Based on the Figure 5, LPC need higher smoothing parameter than MFCC. But, the most optimal smoothing parameter is just obtained about 0.07 until 0.17 for MFCC and 0.11 until 0.29 for LPC. It shows that in this research, the higher the smoothing parameter, the rougher the classification and the lower the accuracy will be acquired.

IV. CONCLUSSION

Based on the experiment results and analysis, the research can be summarized into several conclusions as follow. MFCC is more efficient (fast) than LPC, but LPC can have the better accuracy. If number of class increase, then the accuracy of system decreases. The time processing is linearly increased in proportion to the number of data. The accuracy of system is influenced by feature extraction, number of class and smoothing parameter. The best accuracy of the system is 100% when number of class is 2, and the worst one is 73% when number of class is 6 for LPC and 60% when number of class is 6 for MFCC.

REFERENCES

[1] B.H. Juang and Lawrence R. Rabiner: Automatic Speech Recognition – A Brief History of The Technology Development. Georgia Institute of Technology and Rutgers University and The University Of California, 2004.

[2] Breebaart, Jeroen, Martin McKinney, "Features for Audio Classification", Philips Research Laboratories.

[3] Chetouani, M., B. Gas, J.L. Zarader, "Maximization of the Modelization Error Ratio for Neural Predictive Coding", Universite Paris VI, 2003.

[4] Chetouani, M., B. Gas, J.L. Zarader, "Learning Vector Quantization and Neural Predictive Coding for Nonlinear Speech Feature Extraction", Universite Paris VI, 2003.

[5] Gupta, Shikha, Jafreezal Jaafar, Wan Fatimah wan Ahmad, and Arpit Bansal, "Feature Extraction using MFCC", Signal & Image Processing : An International Journal (SIPIJ) Vol.4, No.4, August 2013.

[6] Kocsor, Andras, Gabor Gosztolya, "The use of Speed-up Techniques for a speech Recognizer System", Springer Science+Bussiness Media, LLC 2008.

[7] Muda, Lindasalwa, Mumtaj Begam, and I. Elamvazuthi, "Voice Recognition Algorithms using Mel Frequency Cepstral Coefficient (MFCC) and Dynamic Time Warping (DTW) Techniques", Journal of Computing Volume 2 Issue 3, March 2010

[8] Rabiner, Lawrence, Biing-Hwang Juang, "Fundamentals of Speech Recognition," Prentice-Hall International, 1993.

[9] Rabiner, Lawrence R.: A Tutorial on Hidden Markov Models and Selected Applications in Speech Recognition, Procedings Of The IEEE,, Vol. 77, No.2, February 1989.

[10] Sharma, Shachi, Krishna Kumar Sharma, and Himanshu Arora, " A Natural Human-Machine Interaction via an Efficient Speech Recognition System", International Journal of Applied Information System (IJAIS) – ISSN : 2249-0868, Foundation of Computer Science FCS, New York, USA, Volume 4-No.9, December 2012.

[11] Stephen E. Levinson, Lawrence R. Rabiner, Aaron E. Rosenberg, and Jay G. Wilpon: Interactive Clustering Techniques for Selecting Speaker-Independent Reference Templates For Isolated Word Recognition.

IEEETransactions on Acoustics, Speech, and Signal Processing, Vol. Assp-27, 1979.
[12] Suyanto, "Artificial Intelligence, Searching, Reasonning, Planning, and Learning", Informatika Bandung, 2007.
[13] Wisesty, Untari N., Thee Houw Liong, Adiwijaya, "Indonesian Speech Recognition System using Discriminant Feature Extraction – Neural Predictive Coding (DFE-NPC) and Probabilistic Neural Network", COMNETSAT 2012.
[14] Yulita, Intan Nurma, Houw Liong The, Adiwijaya, Fuzzy Hidden Markov Models for Indonesian Speech Classification, Journal of Advanced Computational Intelligence and Intelligent Informatics, Vol.16, No.3 pp. 381-387, 2012.