



Dr. Abdul Adam bin Abdullah
Sr.Lecturer
Faculty of Mechanical Engineering,
Universiti Malaysia Pahang,
26600 Pekan, Pahang,
MALAYSIA.

Tel: 609-424 6353, Fax: 609-424 6345

Email: adam@ump.edu.my

http://scholar.google.com.my/citations?user=UOJWa_EAAAAJ&hl=en

Academic Qualification

Ph.D. Ecosystem Engineering , The University of Tokushima, Japan, 2010.

M.Eng. Ecosystem Engineering, The University of Tokushima, Japan, 2007

B.Eng. Mechanical Engineering, Akita University, Japan, 1995

Brief Profile

Dr. Abdul Adam Abdullah is a senior lecturer at Faculty of Mechanical Engineering, University Malaysia Pahang. He obtained his PhD in Ecosystem Engineering (Diesel Spray and Combustion) from Graduate School of Advanced Technology and Science, Tokushima University, Japan. His specialized areas are analyzing characteristic of diesel fuel spray and alternative fuel spray injected into diesel engine or optical accessible chamber. He is the member of professional body such as Society of Automotive Engineers (SAE), Japan Society of Automotive Engineers (JSAE) and The Japan Society of Mechanical Engineers (JSME).

Working Experiences / Appointment

1. July 2011 – Present Director of Automotive Engineering Centre (AEC), UMP.
2. Apr 2011 – Present Senior Lecturer – Faculty of Mechanical Engineering, UMP.
3. Feb 2008 – Mar 2011 Lecturer – Faculty of Mechanical Engineering, UMP.
4. Mar 2003 – Jan 2008 Academic Engineer – Faculty of Mechanical Engineering, UMP.
5. Feb 2000 – Feb 2003 Lecturer – Mechanical Engineering Department, IKIP College Kuantan
6. Dec1995 – Jan 2000 Design Engineer – NEC Machinery (M) Sdn. Bhd.

Expert Area

Fuel Spray and Combustion, Engine Performance Analysis, Shadowgraph Photography

Research Interest

Fuel Spray, Alternative Fuel, Combustion, Rapid Compression Machine

Research Project / Grant

1. Analysis of Tire Derived Fuel Spray and Combustion Characteristics Inside Optical Accessible Chamber by Using Schlieren Photography Technique (**RAGS-RDU121418**) Amount RM55,000, 2012~2014 (**Project Leader**).
2. Analysis of Diesel and Biodiesel Fuels Spray Characteristics for Clear Spray Images by Using Nano-Spark Shadowgraph Photography Technique (**FRGS-RDU110113**) Amount RM184,800, 2011~2013 (**Project Leader**).

3. Development of Optical Accessable High Pressure Fuel Combustion Chamber for Diesel Fuel and Alternative Fuel Combustion Efficiency Experiment (RDU110308) Amount RM36,500, 2011~2012 (**Project Leader**).
4. Development of New Lubricant Dispersed with Nanoparticles (RDU110336) Amount RM35,000, 2011~2012 (**Project Leader**).
5. Modeling of Human Physiological Implication Towards Whole body Vibration Exposure (RDU1303124) Amount RM20,250, 2012~2015 (**Project Leader**).
6. An Experimental Study of Performance and Exhaust Emission of an Internal Combustion Engine Fuelled with Diesel Fuel and Tire-Diesel Fuel Blend (GRS110363) Amount RM2,500, 2013~2015 (**Project Leader**).
7. Pembangunan Modal Insan ICoE Kluster Automotif (RDU141701) Amount RM18,800, 2014~2015 (**Project Leader**).
8. Fundamental Study Of Jatropha Biodiesel Oil On Ultra-Low Emission Homogeneous Charge Compression Ignition Engine Combustion (FRGS-RDU130131) Amount 115,200, 2013~2016 (Project Member).
9. The Effect of Steam Injection on Power and Emission of Hybrid Air-Diesel Engine Using Steam Injector (FRGS-RDU130134) Amount RM120,500, 2013~2016 (Project Member).
10. Characteristic of Engine Oil with Nano Particle as an Additives (RDU130393) (Project Member).
11. Development of Fuel Testing System on Chassis Dynamometer for Compressed Natural Gas Direct Injection Powered Vehicle (RDU130113) Amount RM35,000, 2013~2014 (Project Member).
12. Enhanced Cylinder Mixture Stratification Method Using Pre-Chamber Fuel Injection System For System Cylinder 4 Stroke Natural Gas Engine Gas (RDU120343) Amount RM36,500, 2012~2014 (Project Member).
13. Combustion Characteristic of Ammonium Per chlorate Base Solid Propellant at High Pressure (**RAGS-RDU121307**) Amount RM48,000, 2012~2014 (Project Member).
14. Combustion Characteristic of Emulsified Biodiesel (**FRGS-RDU120116**) Amount RM75,200, 2012~2014 (Project Member).
15. Experimental Investigation Of Tidal Current Energy Extraction Potential In Kuala Pahang (RDU120318) Amount RM28,000, 2012~2014 (Project Member).
16. Construct the Schlieren Optical Visualization and modelling on image processing technique for flame development and fuel-air mixture formation (**MTUN-RDU121201**) Amount RM12,000, 2012~2014 (Project Member).
17. Electrostatic Charging of Diesel Particulate Matter From Automobile Exhaust Gas (**FRGS-RDU110112**) Amount RM96,200, 2011~2013 (Project Member).
18. Sea Water Scrubber System for Reduction of Diesel Particulate Matter (RDU110318) Amount RM36,000, 2011~2013 (Project Member).
19. Development of High Energetic Material From Renewable Energy Resources (RDU110310) Amount RM32,500, 2011~2012 (Project Member).
20. Design of Portable Solar Assisted Diesel Burner Dryer Using Temperature Gradient PVT and Multidirectional Solar Thermal Collector, (UIA Short Grant EDW B 12-302-0780) Amount RM20,000, 2012~2014 (Project Member).
21. Design and Long Term Performance of 20 Watt Portable Solar Generator, (UIA Short Grant EDW A 11-035-0826) Amount RM5,000, 2011~2012, (Project Member).

Professional Qualification / Membership / Affiliation / Experience

A) Membership of Professional Body

1. Member, Society of Automotive Engineers (SAE)
2. Member, Japan Society of Automotive Engineers (JSAE)
3. Member, Japan Society of Mechanical Engineers, (JSME)

B) As a Journal & Paper Reviewer/ Exhibition

1. Reviewer Conference Papers, Automotive Innovation and Green Energy Vehicle Conference (AIGEV2014)
2. Reviewer Journal, World Applied Science Journal (WASJ 2013)
3. Judge Research, International Ibn Al-Haytham's Al-Manazir Innovation and Invention Exhibition (InEx 2011)
4. Reviewer Conference Papers, International Conference of Mechanical Engineering Research (ICMER2011)
5. Reviewer Conference Papers, National Conference in Mechanical Engineering For Research & Post Graduate Studies (NCMER 2010)

Teaching Experience

1. **Sep 2013/2014(2)**
BMM3513 Heat Transfer, 3 credit (16 students)
BMM4912 Final Year Project 1, 2 credit (5 students)
2. **Sep 2013/2014(1)**
BMM3513 Heat Transfer, 3 credit (26 students)
BMM4912 Final Year Project 1, 2 credit (5 students)
3. **Feb 2012/2013(2)**
BMM3513 Heat Transfer, 3 credit (30 students)
BMM4914 Final Year Project 2, 4 credit (5 students)
4. **Sep 2012/2013(1)**
BMM2533 Fluid Mechanics 1, 3 credit (30 students)
BMM4912 Final Year Project 1, 2 credit (5 students)
5. **Feb 2011/2012(2)**
BMM2533 Fluid Mechanics 1, 3 credit (60 students)
BMM1511 Engineering Mechanics Lab 1, 1 credit (30 students)
BMM4914 Final Year Project 2, 4 credit (5 students)
6. **Feb 2011/2012(1)**
BMM2533 Fluid Mechanics 1, 3 credit (58 students)
BMM4912 Final Year Project 1, 2 credit (5 students)
7. **Dec 2010/2011(2)**
BMM3663 CAE and Failure Analysis, 3 credit (71 students)
BMM4733 Power Plant Technology, 3 credit (1 student)
8. **Jul 2003 ~ Dec 2005**
Mechanical Engineering Lab

Post Graduate Supervision

A) PhD Students

1. Ahmad Fitri B. Yusop (2013-present) Thesis title: Study the Performance of Electrostatic precipitator (ESP) Device for Automobile Diesel Engine to Reduce Exhaust Particulate Matter. (Co-Supervisor)
2. Akasyah bin Mohd Khatri (2013-present) Thesis title: Modelling of Engine Performance of A Multi Cylinder Diesel Engine. (Co-Supervisor)
3. Muhammad Ehteshamul Haque (2013-present) Thesis title: Computational Fluid Dynamics (CFD) Study for Flow Patterns and Heat Transfer in Refrigeration and Air Conditioning Systems. (Co-Supervisor)

B) MEng Students

1. Nur Fauziah bt. Jaharudin (2012-present) Thesis title: Particulate Matters Emission Control in Diesel Engines using Different Feedstock.
2. Nur Atiqah bt Ramlan (2012-present) Thesis title: A Study on Diesel Engine Performance and Exhaust Emission using Waste Cooking Oil
3. Mohd Herzwan b. Hamzah (2012-present) Thesis title: An Experimental Study of Performance and Exhaust Emission of An Internal Combustion Engine Fuelled with Diesel Fuel and Tire-Diesel Fuel Blends.
4. Hasani bin Zaid (2013-present) Thesis title: Combustion Characteristic of Ethanol Blend Biofuel on Spark Ignition Engine.
5. Muhammad Fairuz bin Muhammad Nasir (2013-present) Thesis title: Emission Characteristic of A Multi Cylinder Spark Ignition Engine using Ethanol.
6. Akhmar Hisyam bin Sirat (2013-present) Thesis title: Combustion Characteristic of Emulsified Biofuel with Hydrogen Injection on Internal Combustion Engine.
7. Mohd. Shafiq bin Bustaamam (2013-present) Thesis title: Combustion Characteristic of Methanol-Gasoline Blend on Spark Ignition Engine
8. Zaidi bin Zaki (2013-present) Thesis title: A Study of Engine Cooling System of A Multi Cylinder Spark Ignition Engine using Ethanol
9. Mohd. Zakhwan bin Ali (2013-present) Thesis title: Cycle-to-cycle Variation of A Gasoline Engine Operating with Oxygenated Fuel (Co-Supervisor)
10. Nik Nasir bin Nik Mahat (2013-present) Thesis title: One-Dimensional Modelling of A Spark Ignition Engine Operating with Alternative Fuel (Co-Supervisor).

Degree / Final Year Supervision

1. Mohd. Firdaus b. Kamarudin (2012) Thesis title: Analysis of Emulsion Fuel Spray Characteristics using Optical Accessible Spray Chamber.
2. Adam Mohd. Izhan b. Noor Azam (2012) Thesis title: A Comparison Study of Liquid and Vapor Phase Development at Spray Boundary of Diesel Spray, BDF and SVO Spray.
3. Che Hanisah bt. Yaacob (2012) Thesis title: Analysis of Emulsion Fuel Spray Characteristics using Sac Nozzle and VCO Nozzle.

4. Nor Syamsul Syazwan b. Mohd. Nuji (2012) Thesis title: Analysis of Diesel Spray Characteristics at High Pressure Injection.
5. Mohd. Fazwan b. Ishak (2012) Thesis title: Analysis of Diesel Spray Characteristics using Multi Holes Sac Nozzle and VCO Nozzle.
6. Mohd. Affendi Bin Ibrahim (2013) A Study on Various Type of Rotor Disc Brake using FAE Analysis
7. Ahmad Aizuddin Faiz bin Che Jaafar (2013) A Study of The Spray Characteristics for Valve Covered Orifice
8. Mohd Khairi Bin Mohammad (2013) Analysis Of A Spur Gear In Automotive System Using Finite Element Software
9. Khalifaturrahim Bin Ab Rahman (2013) Experimental Study Of Alternative Fuel Performance Operating In Single Cylinder Diesel Engine
10. Mohammad Shafei Bin Ramli (2013) Experimental Study Of Diesel Fuel Performance Operating In Single Cylinder Diesel Engine
11. Mohd Fadli Fikri b. Mahadi (2014) Thesis title: A Study On Various Type Of Nozzle For Diesel Injector Unit
12. Ahmad Adlan b. Abdul Rashid (2014) Thesis title: Development Of Various Type Of Piston Head For Single Cylinder Diesel Engine
13. Amirul Azzadin b. Lizan (2014) Thesis title: A Study of piston movement inside Rapid Compression Machine using Inert Gas
14. Mohd Haniff b. Mohd Shariff Flow analysis of squish type single cylinder diesel piston head
15. Mohd Rafizi b. Salimin (2014) Thesis title: Development Of Controller For Diesel Engine Injector Timing

List of Publications

A) Journals

1. **Abdullah Adam**, Mamat Rizalman, Nur Atiqah, Yoshiyuku Kidoguchi, Azran Zafri, "Analysis of Straight Vegetable Oil (SVO) Spray Characteristics at End of Injection (EOI)", Journal of Medical and Bioengineering, , Vol. 1, No. 1, pp. 58-61, 2012.
2. Rafidah Rahim, Rizalman Mamat, Mohd. Yusof Taib, **Abdul Adam Abdullah**, "Influence of Fuel Temperature on A Diesel Engine Performance Operating with Biodiesel Blended", International Journal of Advanced Science and Technology (IJAST), Vol. 43, pp. 115-126, 2012.
3. Rizalman Mamat, Rafidah Rahim, **Abdul Adam Abdullah**, Amir Aziz, Nik Rosli Abdullah, "Characteristic of Biodiesel Fuel Derived from Palm Oil", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China & Journal of Biobased Materials and Bioenergy (IF 1.36), Vol. 7, No. 4, pp. 457-460, 2013.
4. Rizalman Mamat, Ahmad Fitri Yusop, **Abdul Adam Abdullah**, Amir Aziz, Nik Rosli Abdullah, "Effect of EGR and Air Temperature on Exhaust Emission of a Diesel Engine Operating with Biodiesel", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China. & Journal of Biobased Materials and Bioenergy (IF 1.36), Vol. 7, No. 4, pp. 461-463, 2013.
5. **Abdullah Adam**, Tomoaki Yatsufusa, Tomonori Gomi, Nobuyuki Irie, Yoshiyuki Kidoguchi, "Analysis of Droplets Evaporation Process of Diesel Spray at Ignition Delay Period using Dual Nano-spark Shadowgraph Photography Method", SAE International Journal of Engines, Vol. 2, No. 2, pp. 703-711, March 2010.
6. Tomoaki Yatsufusa, **Abdullah Adam**, Tomonori Gomi, Yoshiyuki Kidoguchi, "Measurement of Particle Diameter in Diesel Spray by Long Distance Microscope Shadowgraph Photography ", Atomization Journal, Vol. 18, No. 63, pp. 88-95, 2009

B) Conferences Papers

1. Mohd. Herzwan, Agung Sudrajad, **Abdullah Adam**, Mamat Rizalman, Nur Atiqah, Nur Fauziah, "Performance of Diesel Engine Operating With Waste Plastic Disposal", The 3rd International Conference on Mechanical Engineering (ICME 2013), 17-18 December 2013, Putrajaya, Selangor.
2. Nur Atiqah, Mohd. Herzwan, **Abdullah Adam**, Mamat Rizalman, , Nur Fauziah, "Analysis of Diesel Engine Performance Fueled with Waste Cooking Oil", The 3rd International Conference on Mechanical Engineering (ICME 2013), 17-18 December 2013, Putrajaya, Selangor.
3. Nur Fauziah , Ahmad Fitri, Mohd. Herzwan, **Abdullah Adam**, Mamat Rizalman, Nur Atiqah, "Study on Particulate Matter (PM) Emission of Diesel Engine using Palm Oil Methyl Ester", The 3rd International Conference on Mechanical Engineering (ICME 2013), 17-18 December 2013, Putrajaya, Selangor.
4. Ahmad Fitri, Mohd. Hafizil, **Abdullah Adam**, Mamat Rizalman, Amir Aziz, "Comparative Study of Particulate Matter (PM) Emissions in Diesel Engine using of Diesel-Methanol Blends", The 3rd International Conference on Mechanical Engineering (ICME 2013), 17-18 December 2013, Putrajaya, Selangor.
5. **Abdullah Adam**, Mamat Rizalman, Nur Atiqah, Yoshiyuku Kidoguchi, Azran Zafri, "Analysis of Straight Vegetable Oil (SVO) Spray Characteristics at End of Injection (EOI)", The 3rd International Conference on Environmental Engineering and Applications (ICEEA 2012), 4-4 August 2012, Dubai, UAE.
6. Rafidah Rahim, Rizalman Mamat, Mohd. Yusof Taib, **Abdul Adam Abdullah**, "Influence of Fuel Temperature on A Diesel Engine Performance Operating with Biodiesel Blended", International Journal of Advanced Science and Technology (IJAST), July 2012.
7. Rizalman Mamat, **Abdul Adam Abdullah**, Amir Aziz, "Performance and Emission of A Diesel Engine Operating with Palm Oil Methyl Ester (Palm Biodiesel)", XII International Symposium on Environmental Geotechnology, Energy and Global Sustainable Development (ISEG 2012), 27-29 June 2012, Los Angeles.
8. Rizalman Mamat, Rafidah Rahim, **Abdul Adam Abdullah**, Amir Aziz, Nik Rosli Abdullah, "Characteristic of Biodiesel Fuel Derived from Palm Oil", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China.
9. Rizalman Mamat, Cik Anuar Mohamed Yunus, **Abdul Adam Abdullah**, Amir Aziz, Nik Rosli Abdullah, "Design Criteria of a Portable Furnace Operating with Biodiesel", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China.
10. Rizalman Mamat, Ahmad Fitri Yusop, **Abdul Adam Abdullah**, Amir Aziz, Nik Rosli Abdullah, "Effect of EGR and Air Temperature on Exhaust Emission of a Diesel Engine Operating with Biodiesel", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China.
11. Makeen Amin, Rizalman Mamat, , **Abdul Adam Abdullah**, Amir Aziz, , Effect of Oxidizer and Fuel Ratio and Storage Time on Burning Rate of Solid Propellant", The International Conference of Agricultural, Food and Biological Engineering (ICAFBE 2012), 11-13 May 2012, Guangzhou, China.
12. **Abdullah Adam**, Mamat Rizalman, Yoshiyuki Kidoguchi , Tomoaki Yatsufusa, "Analysis of Straight Vegetable Oil (SVO) Spray Characteristics and Droplets Distribution by Using Nano-Spark Shadowgraph Photography Technique", The 3rd International Renewable Energy Congress (IREC2011), 20-22 December 2011, Hammamet, Tunisia.
13. **A. A. Abdullah**, R. Mamat, N.F. Jaharudin, "A Study on Spray Characteristics of Straight Vegetable Oil using Nano-Spark Shadowgraph Photography Technique", International Conference on Mechanical Engineering Research (ICMER2011), 5-7 December 2011, Kuantan, Malaysia.

14. Abdul Majid ZA, Hanafiah MAKM, Hazali N, **Abdullah AA**, Ismail AF, Ruslan MH, Sopian K, Mohd Azmi MS, "Design and Performance of 20 Watts Portable Solar Generator", International Conference on Mechanical Engineering Research (ICMER2011), 5-7 December 2011, Kuantan, Malaysia.
15. Cik Anuar Mohamed Yunus, Rizalman Mamat, Mohd Zaidi Sidek, Jasri Mohamed, **Abdul Adam Abdullah**, "Fluid Flow Analysis of a Portable Furnace Using Liquid Petroleum Gas (LPG)", Malaysian Technical Universities International Conference on Engineering & Technology (MUiCET 2011), Johor.
16. Mohd Hafizil Mat Yasin, Rizalman Mamat, K.V.Sharma, **Abdul Adam Abdullah**, "Effects of Exhaust Gas Recirculation (EGR) on a DI Diesel Engine operating with Palm Methyl Ester (PME)", Malaysian Technical Universities International Conference on Engineering & Technology (MUiCET 2011), Johor.
17. Rafidah Rahim, Rizalman Mamat, Mohd Yusof Taib, Amiruddin Abdul Kadir, **Abdul Adam Abdullah**, "Comparative Study of Biofuel and Biodiesel Blend with Mineral Diesel Using Fuel Spray Injection", 4th Engineering Conference, 2011 Kuching, Malaysia.
18. Makeen Mohd Amin, Rizalman Mamat, Amir Aziz, **Abdul Adam Abdullah**, "Design of a Load Cell for Rocket Engine", 4th Engineering Conference, 2011 Kuching, Malaysia.
19. Mohd Hafizil Mat Yasin, Rizalman Mamat, **Abdul Adam Abdullah**, K.V. Sharma, "Performance and Emission Characteristics of a DI Diesel Engine operating with Palm Methyl Ester (PME)", 4th Engineering Conference, 2011 Kuching, Malaysia.
20. **Abdul Adam Abdullah**, "A Comparative Study of Spray Characteristic inside High Pressure Spray Chamber with Straight Vegetable Oil (SVO) and Diesel Fuel", The 2nd National Conference in Mechanical Engineering For Research & Post Graduate Studies (NCMER 2010), Kuantan, Malaysia.
21. **Abdullah Adam**, Tomoaki Yatsufusa, Tomonori Gomi, Nobuyuki Irie, Yoshiyuki Kidoguchi, "Analysis of Droplets Evaporation Process of Diesel Spray at Ignition Delay Period using Dual Nano-spark Shadowgraph Photography Method", SAE Paper 2009-32-0017, *SAE International Journal of Engines*, Vol. 2 No. 2, pp. 703-711, March 2010
22. **Abdullah Adam**, Tomoaki Yatsufusa, Tomonori Gomi, Yoshiyuki Kidoguchi "Measurement of Particle Diameter in Diesel Spray by Long Distance Microscope Shadowgraph Photography", *Atomization Journal* No.63, Vol. 18, 2009.
23. **Abdullah Adam**, Tomonori Gomi, Yoshiyuki Kidoguchi, Kei Miwa, "Analysis of Droplet Evaporation Process of Diesel Spray during Ignition Delay Period", The 7th International Conference on Modeling and Diagnostics for Advanced Engine Systems (COMODIA), SC1-3, JSME No.08-202, Vol.7, 2008.
24. **Abdullah Adam**, Naoki Inukai, Yoshiyuki Kidoguchi, Kei Miwa, "A Study on Droplets Evaporation at Diesel Spray Boundary during Ignition Delay Period", International Fuels and Lubricant Meeting (JSAE/SAE), SAE Paper2007-01-1893, 2007.
25. **Abdullah Adam**, Naoki Inukai, Yoshiyuki Kidoguchi, Kei Miwa, "Evaporation of Droplets at Diesel Spray Boundary in a High Temperature Atmosphere", JSAE 129-20065896, pp.5-8, 2006.

List of Consultancy

1. Shock Absorber Testing on The Road within Daily Usage – SAPURA Technical Centre Sdn. Bhd. (UCT110131)
2. Electric Bus 1 Malaysia – Sync R&D Sdn. Bhd.
3. Acoustic Test inside Room Covered with Kevlar – Univ. Putra Malaysia

Awards / Research / Achievements

1. ITEX Gold Medal, 22nd International Invention, Innovation and Technology Exhibition (ITEX), 20-22 May 2011.
2. Association of Polish Inventors & Rationalizers, 22nd International Invention, Innovation and Technology Exhibition (ITEX), 20-22 May 2011.
3. 1st Prize Commercial Potential Award, IIUM Research, Invention and Innovation Exhibition (IRIIE), 9-10 February 2011.
4. IRIIE Silver Award, IIUM Research, Invention and Innovation Exhibition (IRIIE), 9-10 February 2011.
5. International Exchange Student Research Award, PhD Student, Graduate School of Advanced Technology and Science, The University of Tokushima, September 2010.
6. Best Paper Award, 15th Small Engine Technology Conference (SETC) / Society of Automotive Engineering (SAE) International Conference, 2009.
7. International Exchange Student Research Award, Master Student, Graduate School of Advanced Technology and Science, The University of Tokushima, September 2007.
8. Best Presenter Award, Faculty of Ecosystem Engineering Poster Presentation, Graduate School of Engineering, The University of Tokushima, 2006.