ASOSIASI SAINS DAN TEKNOLOGI
PERGURUAN TINGGI MUHAMMADIYAH (AST-PTM)

Certificate

Nomor : 022/STF-ICEAT/AST-PTM/II.3.AU/F/2020

Certified that

Retnani Latifah, S.Kom., M.Kom

Universitas Muhammadiyah Jakarta

has presented a paper entitled

"Three Dimensional Salah Guide Application based on Augmented Reality"

in The 2020 4rd International Conference on Engineering and Applied Technology (ICEAT)
held on October 27th, 2020 in Magelang, Central Java, Indonesia

Ketua

Ir. Teguh Marhendi, S.T., M.T., ASEAN.Eng., IPM.

Secretary General

Yun Arifatul Fatimah, S.T., M.T., Ph.D.

Jointly Organized with :

BOOK OF ABSTRACT & PROGRAM

2020 4th International Conference on Engineering and Applied Technology (ICEAT)

October, **27-28**, 2020

Magelang, Jawa Tengah
Indonesia

Organized by :

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Book of Abstract and Program

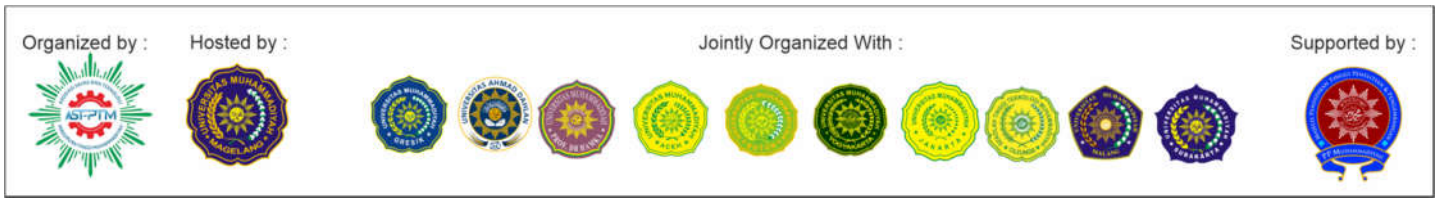
2020 4th International Conference on Engineering and Applied Technology (ICEAT)

Resource - Based Sustainable Engineering Science and Technology:

A New Direction of 4.0 Research and Development.

Magelang, October 27th, 2020

Partner and Sponsor



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Welcome Message from
Rector of Universitas Muhammadiyah Magelang

Assalamualaikum wr. wb.

Greetings to all of us,
Welcome to Universitas Muhammadiyah Magelang (UNIMMA).

First of all, let us praise and thank Allah SWT, Almighty God, for His grace, we are all in good health so that we can attend "the 4th International Conference on Engineering and Applied Technology (ICEAT) 2020 ". This activity is held in the form of a Blended Learning Conference, in which some participants attend offline and some online.

The activity of the 4th International Conference on Engineering and Applied Technology (ICEAT) 2020 which was originally held on June 29 - June 30 2020 in Magelang, coincided with the 48th Muhammadiyah Congress in Solo. However, due to the Covid'19 outbreak that hit the Indonesian nation starting in March 2020, ICEAT activities were postponed.

The 4th International Conference on Engineering and Applied Technology (ICEAT) 2020 was finally held on 26-27 October 2020 in Magelang, Indonesia. This conference was organized by the Universitas Muhammadiyah Magelang and Asosiasi Sains dan Teknologi Perguruan Tinggi Muhammadiyah (AST-PTM). This conference aims to discuss various times. development and innovation in advanced research in the field of Engineering and Applied Technology as well as providing an attractive forum for engineering scientists to share knowledge and expertise in related issues.

In line with the vision of the University of Muhammadiyah Magelang (UNIMMA) to "Become a superior and Islamic University in the development of science and technology-based on Islamic values for the benefit of the Ummah", and UNIMMA's mission "to organize quality and relevant ***Caturdharma*** activities with national challenges and global". So, UNIMMA will be active through education, research, and community service in providing solutions for the development of Indonesian society.

To achieve that, UNIMMA made a strategic step with efforts to 1) improve the culture and quality of research, entrepreneurial spirit, innovation, and community service to support national independence and provide solutions to national and global problems, 2) and strengthen collaboration and partnerships in education, research, and community service in a dynamic academic climate without boundaries. This is the reason UNIMMA is actively involved in AST-PTM.

AST-PTM is an association of technical personnel who are members of the Muhammadiyah Higher Education Science and Technology Association, intended to advance the engineering and science faculties of Muhammadiyah universities with various activities including Dean Forums, Study Program Forums, ICEAT, SNTT, PKMM, and product exhibitions. The program is packaged in a National Coordination Meeting (Rakornas) every year and a National Conference (Munas) every four years.

As the Rector of UNIMMA and the host of AST-PTM 2020, we wish you a happy activity, hopefully, you will produce the best works in engineering for the progress of the nation and state. From Muhammadiyah for the nation.

Thus, Wassalamu'alaikum wr. wb.

Dr. Suliswiyadi, M.Ag
Rector of Universitas Muhammadiyah Magelang
Yogyakarta, October 27th 2020

Welcome Message from
General Chair ICEAT 2020

Assalamu'alaikum Wr. Wb.

It my pleasure to warmly welcome all of you to the 4th ICEAT 2020 at Magelang, West Java, Indonesia

The International Conference on Engineering and Applied Technology (ICEAT) has been held annually starting from 2017 to 2019 hosted by Universitas Muhammadiyah Mataram, Universitas Muhammadiyah Aceh, and Universitas Muhammadiyah Sorong. Currently, the fourth ICEAT 2020 present is hosted by the Faculty of Engineering, Universitas Muhammadiyah Magelang, Central Java, Indonesia thought Virtual Conference posture in light of the COVID-19 pandemic that we face as a global community.

The 4th ICEAT 2020 is organized by Science and Technology Association of Muhammadiyah Higher Education (AST-PTM) as well as jointly with 11 University; Universitas Ahmad Dahlan, Universitas Muhammadiyah Jakarta, Universitas Muhammadiyah Aceh, Universitas Muhammadiyah Surakarta, Universitas Muhammadiyah Gresik, Universitas Muhammadiyah Buton, Universitas Muhammadiyah Prof Dr Hamka (UHAMKA), Universitas Muhammadiyah Yogyakarta, Universitas Muhammadiyah Purwokerto, Universitas Muhammadiyah Malang, and STT Muhammadiyah Cileungsi. On behalf of the organizing committee, I cordially welcome to all the delegates of the 4th ICEAT 2020.

Being in the fourth event, the 4th ICEAT 2020 is aimed at keeping abreast of the current development and innovation in the advanced research area on Engineering and Applied Technology as well as providing an engaging forum for participants to share knowledge and expertise in related issues. In this conference, we received 74 papers which were covered in five conference tracks. The committee member blindly reviewed as well as provided technical comments to all the submitted papers before ensuring that the submitted paper is qualified. Finally, we are accepting 62 papers to be presented at this conference.

Last but not least, I would like to use this opportunity to express our sincere gratitude to keynote speakers: Minister of Education and Culture of Indonesia Nadiem Anwar Makarim, B.A., M.B.A., Prof. Ismail Rakip Karas, Prof. Morten Holm Van Donk, Prof. Kun Harismah, M.Si., Ph.D., Prof. Dr. Kamarul Hawari Bin Ghozali as well as all the participants for joining and sharing of ideas, knowledge, and friendship in a relaxing environment. I would like to express great appreciation to the organizing team from Universitas Ahmad Dahlan as well as all scientific committees for all their solidity, harmony, and synergy work. We do hope all participants are going to enjoy the conference in terms of both its academic and social atmosphere. Finally, Please stay safe to everyone!

Aster Rahayu, Ph.D.
General Chair
2020 4th International Conference on Engineering and Applied Technology (ICEAT)
Faculty of Industrial Technology, Universitas Ahmad Dahlan
Yogyakarta, October 27th 2020

Conference Committee

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Aster Rahayu (Universitas Ahmad Dahlan, Indonesia)

Co-Chair
Yun Arifatul Fatimah (Universitas Muhammadiyah Magelang, Indonesia)
Andri Pranolo (Hohai University, China)

Technical Program Committee
A. Electronics, Electrical, Informatics, Computer Engineering
TPC Chair

Andri Pranolo (Hohai University, China)

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Yezid Donoso (Universidad de los Andes, Colombia)
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Adhi Prahara (Universitas Ahmad Dahlan, Indonesia)
Ahmad Azhari (Universitas Ahmad Dahlan, Indonesia)
Aji Prasetya Wibawa (Universitas Negeri Malang, Indonesia)
Emanuele Menegatti (Universita degli Studi di Padova, Padua, Italy)
Haviluddin (Universitas Mulawarman, Indonesia)
Anusua Ghosh (Univeristy of South Australia, Adelaide, Australia)
Abdulrazak Yahya Saleh (Universiti Malaysia Sarawak, Malaysia)
Arda Yunianta (Faculty of Computing and Information Technology, King Abdul aziz University, Saudi Arabia)
Sunardi (Universitas Ahmad Dahlan, Indonesia)
Moslem Yousefi (Korea university, Korea)

B. Industrial Engineering

TPC Chair

Yun Arifatul Fatimah (Universitas Muhammadiyah Magelang, Indonesia)

TPC Member

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Wolfgang Keller (University of Colorado, Colorado, US)
Hari Prasetyo (Universitas Muhammadiyah Surakarta, Indonesia)
Eko Setiawan (Universitas Muhammadiyah Surakarta, Indonesia)
Ilyas Mas'udin (Universitas Muhammadiyah Malang, Indonesia)
Siti Mahsanah (Universitas Ahmad Dahlan, Indonesia)
Herry Purnama (Universitas Muhammadiyah Surakarta, Indonesia)

C. Mechanical Engineering

TPC Chair

Dan Mugisidi (UHAMKA Jakarta, Indonesia)

TPC Member

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Sudarisman (Universitas Muhammadiyah Yogyakarta, Indonesia)
Aris Widyo Nugroho (Universitas Muhammadiyah Yogyakarta, Indonesia)
Muji Setiyo (Universitas Muhammadiyah Magelang, Indonesia)
Marwan Effendy (Universitas Muhammadiyah Surakarta, Indonesia)

D. Chemical Engineering

TPC Chair

Tri Widayatno (Universitas Muhammadiyah Surakarta, Indonesia)
Tri Yuni Hendrawati (Universitas Muhammadiyah Jakarta, Indonesia)

TPC Member

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Agus Aktawan (Universitas Ahmad Dahlan, Indonesia)

E. Civil Engineering and Architecture

TPC Chair

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TPC Member

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Nurul Hidayati (Universitas Muhammadiyah Surakarta, Indonesia)
Samin (Universitas Muhammadiyah Malang, Indonesia)
Jazaul Ikhsan (Universitas Muhammadiyah Yogyakarta, Indonesia)

F. Architecture

TPC Chair

Ade FAH Alhashimy (Universias Muhammadiyah Sumatera Utara, Indonesia)

TPC Member

Gunawan (Universitas Muhammadiyah Surabaya, Indonesia)
Wisnu Setiawan (Universitas Muhammadiyah Surakarta, Indonesia)

G. Applied Science

TPC Chair

Imam Azhari (Universitas Ahmad Dahlan, Indonesia)

TPC Member

Iwan Tri Riyadi Yanto (Universitas Ahmad Dahlan, Indonesia)
Damar Yoga Kusuma (Universitas Ahmad Dahlan, Indonesia)
Rita Maliza (Universitas Ahmad Dahlan, Indonesia)

2020 4th International Conference on Engineering and Applied Technology (ICEAT)

Program in Glance

Tuesday, October 27th, 2020

08.00 - 08.05 WIB	**Video profile**
08.00 - 09.25 WIB	**Opening Ceremony:** Recite of the Holy Quran The Indonesian National Anthem Report from Head of AST-PTM **Welcome Message** 1. Rector of Universitas Muhammadiyah Magelang 2. Governor of Central Java, Indonesia
09.25 - 12.00	**Keynote Speech** 1. Keynote I : Nadiem Anwar Makarim, B.A, M.B.A 2. Keynote II : Prof. Ismail Rakip Karas 3. Keynote III : Prof. Morten Holm Van Donk 4. Keynote IV : Prof. Kun Harismah, M.Si., Ph.D 5. Keynote V : Prof. Dr. Kamarul Hawari Bin Ghozali
12.00 - 13:00	**Lunch Break**
13.00 - 17.00	**Parallel Session** 1. Mechanical Engineering Track 2. Industrial Engineering Track 3. Civil and Architecture Track 4. Electronic, Electrical, Informatics, Computer Engineering Track 5. Chemical Engineering Track
19.00 - 20.10	**Closing Ceremony and Gala Dinner** 1. Best Paper Award 2. Closing Remark

Parallel Session Program in Detail

13.00 – 17.00	**Parallel Session: Mechanical Engineering Track** **Moderator: Dan Mugisidi**
13.00 - 13.10	(#5) The influence of cutting parameters of conventional lathe on the dimension precision of door hinge product *Alviani Hesthi Permata Ningtyas (Universitas Muhammadiyah Gresik), Moh Jufriyanto (Universitas Muhammadiyah Gresik)*
13.10 - 13.20	(#19) Flow numerical analysis in the process of pouring resin on pelton turbine blade molds using solidworks software *Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Munawar Alfansury Siregar (Universitas Muhammadiyah Sumatera Utara), Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara)*
13.20 - 13.30	(#20) Exergy analysis desalination of single slope solar still *Munawar Alfansury Siregar (Universitas Muhammadiyah Sumatera Utara), Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara), Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Farel H Napitupulu (North Sumatera University), Himsar Ambarita (North Sumatera University), Jandri Fan HT Saragi (Universitas HKBP Nommensen Pematangsiantar)*
13.30 - 13.40	(#21) Effect of solar intensity on performance desalination single slope solar still *Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara), Munawar Alfansury Siregar (Universitas Muhammadiyah Sumatera Utara), Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Jandri Fan HT Saragi (Universitas HKBP Nommensen Pematangsiantar)*
13.40 - 13.50	(#24) Effect of soluble oil emulsion (SOE) oil coolant on surface roughness material steel ST37 in lathe grinding machine *Nasution (Universitas Muhammadiyah Sumatera Utara), Arya R (Universitas Muhammadiyah Sumatera Utara), B. Suroso (Universitas Muhammadiyah Sumatera Utara), M. Rizky (Universitas Muhammadiyah Sumatera Utara), I.Tanjung (Universitas Muhammadiyah Sumatera Utara), Affandi (Universitas Muhammadiyah Sumatera Utara)*

13.50 - 14.00	(#31) Hydrogen gas generation through water electrolysis with fragaria catalyst *Sudarman (Universitas Muhammadiyah Malang), Herry Suprianto (Universitas Muhammadiyah Malang), Achmad Fauzan Hery Soegiharto (Universitas Muhammadiyah Malang), Yepy Komaril Sofi'I (Universitas Muhammadiyah Malang)*
14.00 - 14.10	(#33) Thermoelectric utilization uses parabolic reflektors as an energy source *Faisal Irsan Pasaribu (Universitas Muhammadiyah Sumatera Utara), Noorly Evalina (Universitas Muhammadiyah Sumatera Utara), Partaonan Harahap (Universitas Muhammadiyah Sumatera Utara)*
14.10 - 14.20	(#41) Characterization of heat transfer enhancement and pressure drop in rectangular channel featuring different V-ribs construction *K. Umurani (Universitas Muhammadiyah Sumatera Utara), Muharnif M (Universitas Muhammadiyah Sumatera Utara), Rahmatullah (Universitas Muhammadiyah Sumatera Utara), I.Tanjung (Universitas Muhammadiyah Sumatera Utara)*
14.20 - 14.30	(#42) Performance of SI engine using blended fuel from waste plastic pyrolysis *Eqwar Saputra (Universitas Muhammadiyah Purwokerto), Marwan Effendy (Universitas Muhammadiyah Surakarta)*
14.30 - 14.40	(#45) An experimental study of a sawdust machine feeder performance on a roof tile furnace *Mulyono (Universitas Muhammadiyah Malang) , Achmad Fauzan Hery Soegiharto (Universitas Muhammadiyah Malang), Murjito(Universitas Muhammadiyah Malang), Bayu Sandy Tia(Universitas Muhammadiyah Malang)*
14.40 - 14.50	(#46) Effect of tempering process to the hardness and impact strength on NS 4340 steel *Affandi (Universitas Muhammadiyah Sumatera Utara), I Tanjung (Universitas Muhammadiyah Sumatera Utara), A R Nasution (Universitas Muhammadiyah Sumatera Utara)*
14.50 - 15.00	(#73) An-Nahl, The multifunction transportation system *Gunawan (Universitas Muhammadiyah Surabaya)*

15.00 - 15.10	(#60) Optimization of the type-L savonius wind turbine design *Firmansyah Azharul (Sekolah Tinggi Muhammadiyah Cileungsi), M. Dwi Trisno (Institute Sains and Teknologi Nasional), Dahmir Dahlan (Pancasila University), Wilarso (Sekolah Tinggi Muhammadiyah Cileungsi)*
15.10 - 15.20	(#58) Study of the utilization of thermoelectric generator and thermocline for improvement of solar still performance *Dan Mugisidi (Universitas Muhammadiyah Prof. DR HAMKA), Berkah Fajar (Diponegoro University), Syaiful (Diponegoro University) and Tony Utomo (Diponegoro University)*
13.00 – 17.00	**Parallel Session: Industrial Engineering Track** **Moderator: Ilyas Masudin**
13.00 - 13.10	(#2) Literature review business process management (BPM) level of maturity in msmes in Indonesia *Umi Chotijah (Universitas Muhammadiyah Gresik)*
13.10 - 13.20	(#4) Factor analysis that affects work productivity (case study: employee PDAM pamekasan district) *M Jufriyanto (Universitas Muhammadiyah Gresik), AW Rizqi (Universitas Muhammadiyah Gresik), Hidayat (Universitas Muhammadiyah Gresik), R M Yusron (University of Trunojoyo Madura)*
13.20 - 13.30	(#7) Proposed material requirement planning on slippers products with lot for lot approach *A W Rizqi (Universitas Muhammadiyah Gresik), M. Jufriyanto (Universitas Muhammadiyah Gresik), Hidayat (Universitas Muhammadiyah Gresik)*
13.30 - 13.40	(#10) Optimizing time and cost of project using critical path method in the making “lintel set point” (case study: Ravana jaya co. ltd.) *Muhammad Zainuddin Fathoni (Universitas Muhammadiyah Gresik)*
13.40 - 13.50	(#12) The safety culture in shipbuilding industries *Wisda Mulyasari (Universitas Muhammadiyah Gresik)*
13.50 - 14.00	(#13) Fiber natural powder engineering as a composite alternative material *Mochammad Nuruddin (Universitas Muhammadiyah Gresik)*

14.00 - 14.10	(#15) Hospital performance measurement based on intangible assets using Skandia Navigator model: A case study *Eko Budi Leksono (Universitas Muhammadiyah Gresik)*
14.10 - 14.20	(#16) Instrument to assess supply chain performance for broiler plasma farms *Elly Ismiyah (Universitas Muhammadiyah Gresik)*
14.20 - 14.30	(#17) Manufacturing industry strategy to improve the development of calcium carbonate products with quality function deployment techniques at PT. saribumi gresik- Indonesia *Moh. Dian Kurniawan (Universitas Muhammadiyah Gresik)*
14.30 - 14.40	(#34) Comparative analysis of academic website quality using the webqual method and modified importance performance analysis (MIPA) *DP Restuputri (Universitas Muhammadiyah Malang), A Kariono (Universitas Muhammadiyah Malang), SK Dewi (Universitas Muhammadiyah Malang), I Masudin (Universitas Muhammadiyah Malang)*
14.40 - 14.50	(#38) Manufacturing processes: Skate board from oil palm empty fruit bunch fiber composite *M Yani (Universitas Muhammadiyah Sumatera Utara), B Syam (University of Sumatera Utara), B Wirjosentono (University of Sumatera Utara), R W Lubis (Universitas Muhammadiyah Sumatera Utara), and B Suroso (Universitas Muhammadiyah Sumatera Utara)*
14.50 - 15.00	(#59) The strategy of small auto parts industries in responding to the market demand dynamics *A Efendi (Universitas Muhammadiyah Buton)*
15.00 - 15.10	(#61) Engineering of multicore type cable isolation machine with the DMAIC method to reduce product scrap *Miftahul Imtihan (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Suryanto (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Wilarso (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)*

15.10 - 15.20	(#62) Failure bushing small end connecting rod diesel engine 3500 series *Wilarso (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Firmansyah Azharul (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Awang Surya (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Asep Dharmanto (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)*
15.20 - 15.30	(#63) Reduction losses rate in filling process of stick ice product using the six sigma approach *Suwaryo Nugroho (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Miftahul Imtihan (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)*
15.30 - 15.40	(#65) Evaluating the service quality of third-party logistics service provider using importance-performance analysis *A K Garside (Universitas Muhammadiyah Malang)*
15.40 - 15.50	(#68) Designing System of Performance Measurement and Evaluation of Green Industry for Improving Industrial Sustainability *Ahmad Mubin (Universitas Muhammadiyah Malang)*
15.50 – 16.00	(#32) Student perceptions of supply chain manager skills and competency: comparative study of industrial engineering and management *Ilyas Masudin (Universitas Muhammadiyah Malang), Alfian Alif (Universitas Muhammadiyah Malang), Mohammad Fatkhur Rozi (Universitas Muhammadiyah Malang), Azizatur Ristanti (Universitas Muhammadiyah Malang), Dian Palupi Restuputri (Universitas Muhammadiyah Malang)*

13.00 – 17.00	**Parallel Session: Civil Engineering Track** **Moderator: Meillyta**
13.00 - 13.10	(#8) Application of AHP and TOPSIS methods for optional transportation cargo by freight forwarder (Route: Surabaya - Jakarta) *Rezki Setya Irsadi (Universitas Muhammadiyah Gresik)*
13.10 - 13.20	(#1) Identifying construction waste using lean management in a delay project: Case of emergency department building in Pidie Jaya Regency Hospital, Aceh Province, Indonesia *Hafnidar A Rani (Universitas Muhammadiyah Aceh), Aulina Adamy (Universitas Muhammadiyah Aceh), M Afifuddin (Syiah Kuala University), and Sheragizca Yolanda Situmeang (Syiah Kuala University)*
13.20 - 13.30	(#18) The effect of faunus ater shell as filler in asphalt concrete wearing course (AC-WC) mixtures *Firmansyah Rachman (Universitas Muhammadiyah Aceh), Tamalkhani Syammaun (Universitas Muhammadiyah Aceh), Ramadhansyah Putra Jaya (University of Malaysia Pahang) and Raihan Akmal (University Muhammadiyah Aceh)*
13.30 - 13.40	(#29) Analysis of concrete mixture with marble waste material as sand filler and bagasse ash as cement filler *Fahrizal Zulkarnain (Universitas Muhammadiyah Sumatera Utara), Sri Frapanti (Universitas Muhammadiyah Sumatera Utara), Alamsyah Putra Munthe (Universitas Muhammadiyah Sumatera Utara)*
13.40 - 13.50	(#44) Compare brick calculation as load and as structure with nonlinear analysis of soft storey behavior on buildings *Sri Frapanti (Universitas Muhammadiyah Sumatera Utara), Fahrizal Zulkarnain (Universitas Muhammadiyah Sumatera Utara), Sri Asfiati (Universitas Muhammadiyah Sumatera Utara)*
13.50 - 14.00	(#47) The effect of using silica fume on medium strength concrete *Husnah1, D R Basri (University of Abdurrab), P Ningrum (University of Abdurrab), H Mubarak (University of Abdurrab), M Yazid (University of Abdurrab), M Toyeb (University of Abdurrab), R Tisnawan (University of Abdurrab), R R Husaini (University of Abdurrab), F Ramdhani (University of Abdurrab), and C Veddayana (University of Abdurrab)*

14.00 - 14.10	(#49) Study on river morphology in Pabelan river after the Merapi eruption in 2010 *J Ikhsan (Universitas Muhammadiyah Yogyakarta), U I Rahmawati (Universitas Muhammadiyah Yogyakarta) and A Hairani (Universitas Muhammadiyah Yogyakarta)*
14.10 - 14.20	(#52) Design of sheet metal roll machine for Making Corrugated tile model *B Suroso1 (Universitas Muhammadiyah Sumatera Utara), M Muharnif (Universitas Muhammadiyah Sumatera Utara), M Yani (Universitas Muhammadiyah Sumatera Utara), Nasution, Arya R (Universitas Muhammadiyah Sumatera Utara)*
14.20 - 14.30	(#54) Erosion analysis with USLE model on Sermo Reservoir Catchment Area *Iskahar (Universitas Muhammadiyah Purwokerto)*
14.30 - 14.40	(#66) Level of land degradation in West Lombok *Barzian Ali Aktab (Universitas Muhammadiyah Mataram), Febrita Susanti (Universitas Muhammadiyah Mataram), and Sri Apriani Puji Lestari (Universitas Muhammadiyah Mataram)*
13.00 – 17.00	**Parallel Session: Electronic, Electrical, Informatics, Computer Engineering Track** **Moderator: Ronny Dwi Agusulisty**
13.00 - 13.10	(#9) Literature review of regression testing technique as one of the ways of treatment software *Putri Aisyiyah Rakhma Devi (Universitas Muhammadiyah Gresik)*
13.10 - 13.20	(#25) Improving sustainability performance metrics using usability framework and WCAG 2.0 standard *Gita Indah Marthasari, Yufis Azhar, and Elza Norazizah*
13.20 - 13.30	(#40) A digital forensic analysis on mozilla firefox browser in android operating system *Mukhlis Prasetyo Aji (Universitas Muhammadiyah Purwokerto), Dimara Kusuma Hakim (Universitas Muhammadiyah Purwokerto)*

13.30 - 13.40	(#43) Three dimensional salah guide application based on augmented reality *Y H Winata (Universitas Muhammadiyah Jakarta), R Latifah (Universitas Muhammadiyah Jakarta), and Y Adharani (Universitas Muhammadiyah Jakarta)*
13.40 - 13.50	(#50) Implementation of the multi-factor process evaluation method to determine *mustahiq* priorities *Rita Dewi Risanty (Universitas Muhammadiyah Jakarta), Jumail (Universitas Muhammadiyah Jakarta), Rully Mujiastuti (Universitas Muhammadiyah Jakarta)*
13.50 - 14.00	(#71) Implementation of GPS for tracking of street vendor *Irvan Nauval (Universitas Muhammadiyah Magelang), R Arri Widyanto (Universitas Muhammadiyah Magelang), Agus Setiawan1, Nuryanto (Universitas Muhammadiyah Magelang), Nugroho Agung Prabowo (Universitas Muhammadiyah Magelang), Tuessi Ari Purnomo (Universitas Muhammadiyah Magelang)*
14.00 - 14.10	(#72) Implementation of hajj and umrah Q&A system using case-based reasoning (CBR) *F S Bachtiar (Universitas Muhammadiyah Malang), S Basuki (Universitas Muhammadiyah Malang) and G W Wicaksono (Universitas Muhammadiyah Malang)*
14.10 - 14.20	(#70) IT-based education online learning in the middle of covid-19 pandemic *Doddy Teguh Yuwono (Universitas Muhammadiyah Palangkaraya), Muh. Azhari (Universitas Muhammadiyah Palangkaraya), Siti Juhairiah (Universitas Muhammadiyah Palangkaraya)*
14.20 - 14.30	(#11) Vocal letter classification with audio processing for nursing room notification system with "mel frequency cepstrum coefficient and backpropagation-neural network methods” *Y. A. Suryo (Universitas Muhammadiyah Gresik), J. Siswanto (Universitas Muhammadiyah Gresik), Misbah (Universitas Muhammadiyah Gresik), P. P. S. Saputra (Universitas Muhammadiyah Gresik)*

14.30 - 14.40	(#26) Experimental study of titl angles on the performance of solar panels in Medan *C A Siregar (Universitas Muhammadiyah Sumatera Utara), M A Siregar (Universitas Muhammadiyah Sumatera Utara), A M Siregar (Universitas Muhammadiyah Sumatera Utara), Partaonan Harahap (Universitas Muhammadiyah Sumatera Utara)*
14.40 - 14.50	(#36) The using of ATMega 2560 micro-controller for LPG leakage detection *Noorly Evalina (Universitas Muhammadiyah Sumatera Utara), Faisal Irsan Pasaribu (Universitas Muhammadiyah Sumatera Utara), Abdul Azis H (Universitas Muhammadiyah Sumatera Utara), Zuli Agustina Gultom (Universitas Muhammadiyah Sumatera Utara)*
14.50 - 15.00	(#74) Cellular BTS traffic characterization based on covariance and correlation *Indar Surahmat (Universitas Muhammadiyah Yogyakarta)*
15.10 - 15.10	(#6) Three phase radial generator knock down *Ronny Dwi Agusulistyo (Sanata Dharma University), Martanto (Sanata Dharma University), Dwiseno Wihadi (Sanata Dharma University), Tjendro (Sanata Dharma University)*
13.00 – 17.00	**Parallel Session: Chemical Engineering Track** **Moderator: Rachma Tia Evitasari**
13.00 - 13.10	(#48) The effect of acrylic acid on the characteristics of chitosan based superabsorbent hydrogel *Haryanto (Universitas Muhammadiyah Purwokerto), Angga Yuli Setiawan (Universitas Muhammadiyah Purwokerto)*
13.10 - 13.20	(#51) The characteristics of porous asphalt using styrofoam substitution on 60/70 asphalt with rice husk ash with rock ash filler *Cut Nawalul Azka (Universitas Muhammadiyah Aceh), Rifki Hidayat (Universitas Muhammadiyah Aceh), Tamalkhani Syammaun (Universitas Muhammadiyah Aceh), Suci Mustikasari (Universitas Muhammadiyah Aceh)*
13.20 - 13.30	(#53) The effect of clay and SiO_2 composition on the physical properties of wall tile ceramic body *I Purnawan (Universitas Muhammadiyah Jakarta), A T Prabowo (Universitas Muhammadiyah Jakarta), and S E Rudiatin (Universitas Muhammadiyah Jakarta)*

13.30 - 13.40	(#55) Modification of PVC mechanical and migration properties by substitution of DOP plasticizer with epoxidized rice bran oil *Ahmad M R Triaji (Universitas Muhammadiyah Jakarta), Nurul H Fithriyah (Universitas Muhammadiyah Jakarta), and Ratri A Nugrahani (Universitas Muhammadiyah Jakarta)*
13.40 - 13.50	(#56) Carbon intensity-based approach for analyzing the environmental performance of nickel production in Indonesia *J S Adiansyah (Universitas Muhammadiyah Mataram), D Rahmawati (Universitas Muhammadiyah Mataram), A Alpiana (Universitas Muhammadiyah Mataram)*
13.50 - 14.00	(#64) Effect of temperature on brackish water adsorption in Kemudi village using activated zeolite *F Y Purwaningtyas (Universitas Muhammadiyah Gresik), Z Mustakim (Universitas Muhammadiyah Gresik), and Z N A C Rohmah (Universitas Muhammadiyah Gresik)*
14.00 - 14.10	(#22) Application of chitosan and catechin to improve color intensity and UV protection in the dyeing of cotton fabrics with natural dyes from *Peristrophe bivalvis* *R T Evitasari (Ahmad Dahlan University), E Rahayuningsih (Gadjah Mada University) and A Mindaryani (Gadjah Mada University)*

Abstract of Papers

Parallel Session: Mechanical Engineering Track
Moderator: Dan Mugisidi

(#5) The influence of cutting parameters of conventional lathe on the dimension precision of door hinge product

Alviani Hesthi Permata Ningtyas (Universitas Muhammadiyah Gresik), Moh Jufriyanto (Universitas Muhammadiyah Gresik)

In the manufacturing process, the usability of lathes to produce products very diverse, one of which is to produce door hinges. The precision on the door hinges is one form of maintaining product quality. This research was conducted to determine the effect of spindle rotational speed, depth of cut (feeding motion), and chisel geometry angle on the precision of the door hinge. The method used is the RAL Factorial experiment. There are 3 factors namely factor A (spindle speed), factor B (depth of cut), and factor C (chisel geometry angle). Each factor has 2 factor levels. From the results of the study, there is one indicator that is the interaction between factor A (spindle speed), factor B (depth of cut), and factor C (chisel geometry angle) which significantly affects the dimensional precision of the door hinge product. The value of F calculates the indicator at 6.26 > F of the table = 5.31. From the result of the interaction plot can be stated that all factors occur interactions that describe that each factor has a dependency on other factors in determining the dimensions of the precision door hinges product

(#19) Flow Numerical Analysis In The Process of Pouring Resin on Pelton Turbine Blade Molds Using Solidworks Software

Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Munawar Alfansury Siregar (UniversitasMuhammadiyah Sumatera Utara), Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara)

To see flow pattern that occurs in the pelton turbine blade mold, it is seen by comparing of the preassure drop and the comparison of the preasure drop with the speed using solidworks software. The moving fluid makes the propeller rotate and produces energy to move the rotor. The research was conducted to see the process of resin pouring in the pelton turbine blade mold using solidworks software. From the simulation results, the velocity value is 0.0003 m/s, the pressure drop is 35495.65 Pa at 0.000475 m/s velocity pressure drop = 52012.65 Pa and 0.00065 m/s = 77152.41 Pa at velocity 0.00825 m/s obtained pressure drip =115700.58 Pa. the velocity value with the pressure drop value is directly proportional, that is,if the velocity value is greater, the pressure value is also greater and the comparison value between pressure drop with the incoming velocity value from the Z axis (vertical) is also directly proportional. The appropriate speed for numerical analysis using solidworks software is 0.0003 m/s.

(#20) Exergy Analysis Desalination of Single Slope Solar Still

Munawar Alfansury Siregar (Universitas Muhammadiyah Sumatera Utara), Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara), Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Farel H Napitupulu (Sumatera Utara University), Himsar Ambarita (Sumatera Utara University), Jandri Fan HT Saragi (Universitas HKBP Nommensen Pematangsiantar)

Solar desalination technology is a technology that utilizes sunlight as the main energy source that produces clean water by heating the seawater inside the evaporator until it evaporates and condensation produces fresh water which can separate the salt content from sea water. In this study, the authors used the passive single slope method which did not use a pump to circulate and also inject because the passive single slope method does not require a lot of additional materials such as the pump used in the active single slope system. The model is planned for a passive single slope system with a glass surface area of 1 m² with a thickness of 3 mm and a tilt angle of 30º. The water level from the bottom is 20 mm and tested for 7 days starting at 08.00 AM - 17.00 PM. From the results of data processing carried out, it can be concluded that the high and low intensity and weather factors greatly affect the results of the test. The highest exergy energy evaporator occurs on the fourth day until it reaches 12.82 kWh at 15:00 PM, and the lowest evaporator energy exergy on day five is 3.27 kWh at 14:00 PM. The highest exergy energy in occurred on the fifth day reaching 0.68 kWh at 13:00 PM, and the lowest exergy energy in on the seventh day was 0.51 kWh at 11:00 AM.

(#21) Effect of Solar Intensity on Performance Desalination Single Slope Solar Still

Wawan Septiawan Damanik (Universitas Muhammadiyah Sumatera Utara), Munawar Alfansury Siregar (Universitas Muhammadiyah Sumatera Utara), Sudirman Lubis (Universitas Muhammadiyah Sumatera Utara), Jandri Fan HT Saragi (Universitas HKBP Nommensen Pematangsiantar)

In recent years, clean water treatment methods have discussed desalination as a technique for separating impurities from contaminated water. This looks good considering the desalination process is an effective way besides using solar / renewable energy which is also environmentally friendly. In this study the authors used a single passive slope method that does not use a pump to circulate and also injects because the single passive slope method does not require a lot of additional materials such as pumps used in active single slope systems. The test results show that the change in the results of clean water and energy absorbed depends on how big the sun's intensity is on that day. The high intensity of the sun shows that it is bright during the day when testing and the energy absorbed by the water evaporates faster and produces clean water. The highest sun intensity is seen on the fourth day of 457.26 W/m^2 with the amount of clean water produced by 0.25 kg, and the lowest sun intensity occurs on the sixth day, namely 276.65 W/m^2 with the amount of clean water 0.12 kg.

(#24) Effect of soluble oil emulsion (SOE) oil coolant on surface roughness material steel ST37 in lathe grinding machine

Nasution (Universitas Muhammadiyah Sumatera Utara), Arya R (Universitas Muhammadiyah Sumatera Utara), B. Suroso (Universitas Muhammadiyah Sumatera Utara), M. Rizky (Universitas Muhammadiyah Sumatera Utara), I. Tanjung (Universitas Muhammadiyah Sumatera Utara), Affandi (Universitas Muhammadiyah Sumatera Utara)

The objective of this study was to determine the influence of spindle speed and soluble oil emulsion coolant (SOE) on the surface roughness value of ST37 steel. In this study, the grinding process was perform using a lathe machine with a variety of spindle speed and feeding depths are set i.e. 260, 440 rpm for the spindle and 0.1, 0.2, 0.3 mm for feeding depth. Base on the experimental result the speed spindle variation and coolant used throughout the grinding process affect the surface roughness on the ST 37 steel. The grinding process result with spindle 440 rpm has a roughness value better than spindle 260 in each depth variation. Furthermore, the grinding process using coolant also has surface roughness getting smooth be compared without coolant. In conclusion, the SOE used during the grinding process successfully decreases the

surface roughness value of the workpiece on the grinding turning process, at a spindle speed of 260 rpm the lowest roughness was 0.683 µm at a depth grinding of 0.1 mm, the highest roughness was 0.997 µm in a depth grinding of 0.3 mm. Whereas to the spindle speed 440 rpm the lowest surface roughness was 0.316 µm at a depth of 0.1 mm, the highest roughness was 0.551 µm, the grinding depth was 0.3 mm. Based on the experiment results, we concluded that the workpiece surface has better roughness when the depth of the grinding process is slight with a higher rpm. This is made so that these results become give contribute to the metal machining industry.

(#31) Hydrogen Gas Generation through Water Electrolysis with Fragaria Catalyst

Sudarman (Universitas Muhammadiyah Malang), Herry Suprianto (Universitas Muhammadiyah Malang), Achmad Fauzan Hery Soegiharto (Universitas Muhammadiyah Malang), Yepy Komaril Sofi'I (Universitas Muhammadiyah Malang)

Hydrogen is one of the promising alternative energies. It has about 3 times the energy content of gasoline. This study aims to generate hydrogen gas with Fragaria solutions through an effective electrolysis process with environmentally friendly and low-cost materials. The MQ-8 was used as a hydrogen gas detector. The MQ-8 was connected to the Arduino Uno microcontroller. The detected hydrogen gas data was recorded on the computer via the Arduino Uno software. The results show electrolysis using a Fragaria solution can increase hydrogen gas 6x compared to using water only. This is due to Fragaria contains anthocyanins which consist of the C-H, C = C, and O-H functional groups. On the other hand, water consists of two hydrogen atoms and one oxygen atom. In terms of their charges, water consists of H+ and OH-. Fragaria disrupts the balance of covalent bonds in water. When H+ and OH- are disturbed by the C = C groups in Fragaria, OH- tends to be attracted by the C = C groups. This indicates that the Fragaria can be an alternative catalyst in generating hydrogen gas by electrolysis.

(#33) Thermoelectric Utilization uses Parabolic Reflektors as an Energy Source

Faisal Irsan Pasaribu (Universitas Muhammadiyah Sumatera Utara), Noorly Evalina (Universitas Muhammadiyah Sumatera Utara), Partaonan Harahap (Universitas Muhammadiyah Sumatera Utara)

The use of thermoelectric as an energy source has not been optimally implemented, this is the main problem. In this study, using a parabolic reflector as a medium for thermoelectric devices, 6 peltiers, which can be adjusted towards the sun, so that the peltier can absorb the sun's heat energy optimally. The method is carried out by assembling 6 thermoelectric pieces on a parabolic reflector, from the measurement results for 7 consecutive days the voltage and current results are obtained based on the influence of weather factors measured at the highest and lowest temperatures on that day for one week, namely Monday 4.169 V and 0.55 A with a hot temperature of 55 ^{o}C and a cold temperature of 32 ^{o}C, Tuesday 9.114 V and a cold temperature of 0.59 A with a hot temperature of 70 ^{o}C and a cold temperature of 32 ^{o}C, Wednesday 16.58 V and 0.71 A with a hot temperature 110 ^{o}C and temperatures cold 32 ^{o}C. Thursday 18.207 V and 1,10 A hot temperature 115 ^{o}C and cold temperature 41 ^{o}C, Friday 22,453 V and 1,42 A hot temperature 118 ^{o}C and cold temperature 36 ^{o}C, Saturday 18.33 V and 0.85 A with hot temperature 115 ^{o}C and cold temperatures of 40 ^{o}C, week 14.81 V and 0.95 A with hot temperatures of 95 ^{o}C and cold temperatures of 38 ^{o}C. From the results of the thermoelectric test, it can be concluded that the findings by using a parabolic reflector obtained a maximum voltage of 22.453 V with a maximum current of 1.42 A.

(#41) Characterization of heat transfer enhancement and pressure drop in rectangular channel featuring different V-ribs construction

K. Umurani (Universitas Muhammadiyah Sumatera Utara), Muharnif M (Universitas Muhammadiyah Sumatera Utara), Rahmatullah (Universitas Muhammadiyah Sumatera Utara), I.Tanjung (Universitas Muhammadiyah Sumatera Utara)

In the internal cooling channel of gas turbine blades, the rib structure is practiced extensively to increase the heat transfer rate bypassing the cooling fluid that finishes the rib surface. This research aims to determine the characterization of heat transfer and pressure drop in the cooling duct with a rectangular cross-section with solid V-rib and perforated V-rib. This research has been conducted using numerical analysis with the standard k-ω model. The channel to be tested is rectangular, with a width of 320 mm x 120 mm in height. The Reynold number ranging from 570, 1,300, 2,900, 3,700, 20,000, 40,000, 60,000 and 80,000. Construction ribs, rib height 10 mm, pitch 50mm solid V-ribs, and variations of perforated V-ribs with hole diameters of 2 mm, 3mm, 4mm, 5mm. The laminar and transition flow regimes have not significantly affected the solid V-rib and perforated V-rib configurations on heat transfer. For turbulent flow, heat transfer in perforated V-rib configuration is higher than in solid V-rib configuration. In the laminar flow regime, which is 500 < Re < 1300, the solid V-rib's pressure drop is lower than that of the perforated V-rib. In the transition flow regime of 2700 < Re <3700 and turbulent flow of 20,000 < Re <80,000, pressure drop for solid V-rib configuration is higher than for perforated Vrib.

(#42) Performance of SI Engine using Blended Fuel from Waste Plastic Pyrolysis

Eqwar Saputra (Universitas Muhammadiyah Purwokerto), Marwan Effendy (Universitas Muhammadiyah Surakarta)

The paper presents the evaluation of SI engine performance in various blended fuel by adding up to 30% of plastic pyrolysis oil (PPO) from low-density polyethylene (LDPE). The production of PPO was referred to that carried out by another researcher. The investigation was realised by using a single-cylinder engine test-bed with speed ranging from 1000-4000 rpm. As a baseline, the first experiment applied pure gasoline to have the brake torque (BT) and brake specific fuel consumption (BSFC) at various engine speeds. The next step is pure gasoline was blended with PPO by adding 10% and 30%, the result in a new mixture of fuel called PPO10 and PPO30, respectively. At the same procedure, the using both of them was carefully investigated to advance analysis. Performance testing of SI engine showed that the maximum of brake torque PPO10 type is lower by 1.7% (1.011 Nm at 2722 rpm), and the PPO30 lower by 7.3% (0.953 Nm at 2722 rpm) when compared to gasoline fuel at 1.029 Nm at 2722 rpm. Maximum brake power is 0.286 kW at 2722 rpm for the using of PPO10, and PPO30 is 0.27 kW at 2722, where this value is 3.3% and 8.6% lower than gasoline (0.296 kW at 2722 rpm). Other results showed that the using of both blended fuels is more efficient in fuel consumption than gasoline.

(#45) An Experimental Study of a Sawdust Machine Feeder Performance on a Roof Tile Furnace

Mulyono (Universitas Muhammadiyah Malang), Achmad Fauzan Hery Soegiharto (Universitas Muhammadiyah Malang), Murjito(Universitas Muhammadiyah Malang), Bayu Sandy Tia(Universitas Muhammadiyah Malang)

Sawdust, in a factory and firm, has been commercially produced in the form of an activated carbon briquette. Researches on this ‘waste’ raw material become gradually interesting for

finding out the alternative fuel for the roof tile furnace. The bio-conversion can be conducted to transform the sawdust into heat energy. The quality of a good roof tile is influenced by the flame stability in the furnace. The method to conduct this research was the true experimental research as the data gained was the result of the experiments conducted. This experimental study was selected to test the hypothesis properly. The result of this study shows that opening the valve in 3 mm wide during 480 seconds and 0.0063 kg of sawdust as the fuel gives optimum calorific energy, 53.307 kj. Meanwhile, the calorific energy of 7.6152 kj is obtained with 0.0036 kg sawdust as the fuel and opening time of the valve within 120 seconds.

(#46) Effect of Tempering Process to the Hardness and Impact Strength on NS 4340 Steel

Affandi (Universitas Muhammadiyah Sumatera Utara), I Tanjung (Universitas Muhammadiyah Sumatera Utara), A R Nasution (Universitas Muhammadiyah Sumatera Utara)

All human needs cannot be separated from the metal element, metal is one of the supporting technologies at this time, so that metal properties engineering is one of the promising topics. Tempering is a process used to change the properties of steel, this process aims to change several important parameters in the material such as hardness and toughness. The objective of this research was to determine the differences in hardness and strength values of NS-4340 steel before and after tempering. The test specimens used following the ASTM E-23 standard. The heating process is perform using a heating furnace, the test specimens were heated at a temperature of 650 °C for 15 minutes. Furthermore, the specimens were cooled using water media with variations in cooling time of 15, 20, and 25 minutes. The test results show that the tempering process with variations in cooling time has an influence to the hardness and toughness of the material. NS-4340 steel has a higher hardness value and becomes softer as a result of this process.

(#73) An-Nahl, The Multifunction Transportation System

Gunawan (Universitas Muhammadiyah Surabaya)

If the traffic congestions are a common sight. How the solution is of this problem? We cannot continuing increase the length of the road because one day it is not possible. Many experts argue that the existence of mass transportation must be optimized. We know that the mass transportation modes of buses or trains have been around for a long time, but until now their existence has not been optimal enough to resolve traffic congestion due to the fragmented position of each, therefore innovation is needed to integrate them. This article introduces an innovation to combine multi-mode (rail, public and private transportation) and road infrastructure (drainage system, piping and cabling) called the An-Nahl Fly Over. What is feasible to cross over rivers and conventional railroads (single track), thus economizing development investment costs. An-Nahl Fly Over can also reduce the number of accidents between land vehicles and trains because the train's position is always on a elevated track. This idea is based on efficiency so that it can overcome traffic congestion and air pollution in cities and urban villages.

(#60) Optimization of The Type-L Savonius Wind Turbine Design

Firmansyah Azharul (Sekolah Tinggi Muhammadiyah Cileungsi), M. Dwi Trisno (Institute Sains and Teknologi Nasional), Dahmir Dahlan (Universitas Pancasila), Wilarso (Sekolah Tinggi Muhammadiyah Cileungsi)

Small-scale power plants that can be used by the community in villages, cities and remote areas to meet their needs for electrical energy. Currently, environmentally friendly energy sources are needed to reduce exhaust emissions from fossil fuels. The purpose of this research is to create a small-scale power generator. The method used in energy source research, observation, literature review, and laboratory scale testing. From the results of research, the vertical axis wind turbine is suitable for use, with the type L savonius. Where the wind turbine has a vertical shaft using two blades facing each other to form the letter L. Savonius rotor type is able to operate in areas with low wind speeds of less than 4 m/s and can generate large torque. In the research on the optimization of the L-type Savonius rotor design, treatment was given in the form of overlapping blade distances from the shaft 0 mm, 35 mm and 70 mm and the addition of a wind guide (fin) which was tested using an experimental method by taking data at a speed of 2 m/s, 2.5 m/s, 3.5 m/s, 4 m/s, and 4.5 m/s. The tests carried out include force (N) and rotation (rpm). The results of the tests carried out showed that the turbine rotation at a wind speed of 2 m/s was 32,472 rpm and a wind speed of 4.5 m/s 45,673 rpm, while at the wind speed of 4.5 m/s, the overlap was 0 mm without a guide, while at 70 mm overlap with the fin steering. With a wind speed of 2 m/s 40.344 rpm and a wind speed of 4.5 m/s 164.28 rpm. Tests were carried out using a fin guide, at a wind speed of 2 m/s of 35.568 rpm and 88.728 rpm at a wind speed of 4.5 m/s at an overlap of 0 mm with the guide, while at an overlap of 70 mm (with a guide/fin), the wind speed 2 m/s at 85.92 rpm and 188.4 rpm at a wind speed of 4.5 m/s.

(#58) Study of the Utilization of Thermoelectric Generator and Thermocline for Improvement of Solar Still Performance

Dan Mugisidi (Universitas Muhammadiyah Prof. DR HAMKA), Berkah Fajar (Diponegoro University), Syaiful (Diponegoro University) and Tony Utomo (Diponegoro University)

Solar stills generally work because they are energized by solar energy, making them very economical. Unfortunately, solar still productivity is still low and lowers further when solar irradiance decreases. This is one of the reasons for the low efficiency of solar stills. To overcome this inefficiency, this study uses a thermoelectric generator attached to the solar still. The heat temperature for the thermoelectric generator is obtained from the outer side of the solar still heat absorber, while the cold temperature is from the thermocline layer. The heat absorber of the solar still size is 400mm x 300mm using 3mm of aluminium material. The thermoelectric generator uses 48 pieces of TEHP1-1263-1.5-1.3A type, and the thermocline is set at a temperature of 5 °C. The results show that the efficiency of the solar still increased by 129% with the addition of a thermoelectric generator and thermocline.

Parallel Session: Industrial Engineering Track
Moderator: Ilyas Masudin

(#2) Literature Review Business Process Management (BPM) Level of Maturity in MSMEs in Indonesia

Umi Chotijah (Universitas Muhammadiyah Gresik)

Knowledge of park visitor behavior needs to be owned by architects or public facilities designers. This is so that they can predict how visitors will behave in the park they designed. On the other hand, research on the behavior of park visitors is still rare in Indonesia. This research is located in Taman Bungkul and Taman Flora Surabaya and aims to find behavior patterns of park visitors. The research uses a qualitative descriptive approach, with behavior mapping techniques whose data is mostly obtained from direct observation in the field. The results of the

observations show that park facilities act as stimuli to visitor's behavior pattern. In addition, it was also found that the strength of stimuli changing time to time depends on density in the park

(#4) Factor Analysis That Affects Work Productivity (Case Study: Employee PDAM Pamekasan District)

M Jufriyanto (Universitas Muhammadiyah Gresik), AW Rizqi (Universitas Muhammadiyah Gresik), Hidayat (Universitas Muhammadiyah Gresik), R M Yusron (University of Trunojoyo Madura)

Work productivity is a work done efficiently and effectively and following the right target and timing. The PDAM Pamekasan is a branch of BUMN engaged in the production of clean water for society. The problem occurred, decreased productivity of work from the employee of PDAM Pamekasan, so there is a complaint that causes society satisfaction decreases. Besides, the PDAM Pamekasan also wanted to apply good management to its employees. Based on the problem, the research aims to determine the factors that affect work productivity. The method used is factor analysis. Factor analysis is one of the techniques of multivariate statistics. In factor analysis, variables will be reduced and grouped in several factors formed. The results of the study gained that three factors affect work productivity. These factors include the first factor (the motivation factor), consisting of wages, a good working environment, involvement in organizational activities, caring for fellow employees, working discipline. The second factor (service factor), consists of interesting job, security and protection works, employee loyalty. The third factor (personality factor), consists of work ethic, and promotion and employee development.

(#7) Proposed Material Requirement Planning on Slippers Products with Lot For Lot Approach

A W Rizqi (Universitas Muhammadiyah Gresik), M. Jufriyanto (Universitas Muhammadiyah Gresik), Hidayat (Universitas Muhammadiyah Gresik)

The Inventory is essential for supporting the production process of a company. SMEs (small and medium enterprise) of Annas is a business that moves on the production of slippers. The business problems are the lack and excess of material requirements and uses the estimations. The purpose of research aims to material requirement planning to be ordered to produce of goods. The method used is Material Requirement Planning (MRP) with the technique of Lot For Lot (LFL). The results of research are obtained for the inventory of selop materials and soul carried out ordering materials as much as 12 times and no holding costs. On the materials of footwear makes an order 11 times and there is a holding cost. The total cost of inventory of slippers material is IDR 31,400,000.

(#10) Optimizing Time and Cost of Project Using Critical Path Method in The Making "Lintel Set Point" (Case Study: Ravana Jaya Co. Ltd.)

Muhammad Zainuddin Fathoni (Universitas Muhammadiyah Gresik)

The planning or scheduling process is one important factor in determining project success. If project scheduling is done properly, the likelihood of success of a project will be even greater because scheduling is an important element in project success. Therefore, it is necessary to optimize the project so that it can be seen how long a project can be completed and look for the possibility of accelerating the project implementation time with the project objectives can be completed on time and at an economical cost. The application of the critical path method (CPM)

in project scheduling is expected to produce a time schedule with the right duration of work and has a high probability of success. Making a network diagram is needed to determine the interrelationships between activities so that the critical path of the lintel set point project will be identified. The use of the concept of cost slope is applied by taking into account the existence of normal costs and acceleration costs to determine project optimization. From the results of the data processing, this project can normally be carried out with a duration of 171 days and requires a fee of IDR 431.185.000. The application of the CPM method gets the optimal solution where the project can be done in 155 days with a project cost of IDR 429.171.000.

(#12) The Safety Culture in Shipbuilding Industries

Wisda Mulyasari (Universitas Muhammadiyah Gresik)

The shipbuilding industry is one of the construction activities that can cause injury and death. Even be the most dangerous in terms of work. One of the causes of the funeral is the low safety climate. However, there are gaps in measuring the safety climate. Various levels of safety climate can be found between different workgroups in one organization. Therefore, it needs to be measured in a broader scope, namely, safety culture covering the entire organization. Safety culture is a reasonably recent regulatory construct. Because it has been used among regulators from various sectors in only recent years, in this study, a questionnaire was developed that can measure safety culture developed from three dimensions related to the causes of accidents and occupational diseases that have been proven theoretically and empirically, such as the climate of safety, safety behavior, and safety communication. Questionnaires were distributed to 260 workers in the shipbuilding industry in Indonesia. The results of processing factor analysis included 36 items on the questionnaire, which were found as robust indicators of the 14 factors formed. We conclude that this questionnaire is a valid and reliable instrument that can assess safety culture and identify the most appropriate strategies to strengthen safety culture that effectively influences practices, behaviors, and decisions that can influence processes to assure safety in the shipbuilding industries.

(#13) Fiber Natural Powder Engineering as A Composite Alternative Material

Mochammad Nuruddin (Universitas Muhammadiyah Gresik)

Raw materials or composite natural powder as an alternative to non-metallic raw materials have been selected in industries because they have better corrosion resistance properties, controllable characteristics and lighter weight and cost cheap production. The efforts made are through the engineering of composite natural powder raw materials which have advantages and are safer and more environmentally friendly. Composite is an engineered material consisting of two or more materials in which the properties of each material differ from one another, both chemical and physical in nature and remain separate in the final result of the material. Fibers generally consist of two types, namely synthetic fibers and natural fibers. Synthetic fibers are fibers made from inorganic materials with certain chemical compositions, while natural fibers are obtained from pure organic material from nature. This research utilizes raw material for natural fiber powder which is a potential sugar cane (baggase) with a combination of banana stem fiber and coconut fiber / fiber, where the fibers contain cellulose and hemicellulose fibers which are quite high in nature. Based on the description above, it is necessary to conduct research, in order to obtain optimal composite engineering results and better resulting composite production. The result of special treatment of the optimal composition of composite material composition of the *Three in one of the composite natural fiber powders* (sugar cane fiber, coconut fiber and banana stem fiber) is 70%: 10%; 20%, the position of the structure is powder with epoxy resin adhesive obtained average bending strength of 2.992 MPa and average tensile strength of 8.240 MPa.

(#15) Hospital performance measurement based on intangible assets using Skandia Navigator model: A case study

Eko Budi Leksono (Universitas Muhammadiyah Gresik)

The aim of this article is to introduce of intellectual capital performance measurement by Skandia Navigator performance measurement model. Intellectual capital performance measurement very relate with human resource and information as intangible assets. A case study as research object is a private hospital at Gresik, East Java. This study using eighteen performance indicators based on literature review. Based on measurement, indicator of innovation is not good. The innovation usually relate of human creativity. Besides, performance indicator of organization behaviour, customer satisfaction, stakeholder satisfaction and quality service need more attention from management because have performance decrease from period to period. Generally, all of focus performance is good, but there need continuous improvement, especially for financial focus, customer focus and renewal and development focus because this focuses has performance decrease from period to period.

(#16) Instrument to Assess Supply Chain Performance for Broiler Plasma Farms

Elly Ismiyah (Universitas Muhammadiyah Gresik)

Data from the east java animal husbandry service shows that broiler production continues to increase every year, many small-scale farmers cooperate with core companies called plasma farms. To be able to continue to collaborate, of course, good performance is needed, but so far performance measurement has only been carried out by core companies, plasma breeders do not yet have performance appraisal instruments to evaluate their performance. This study aims to design a supply chain performance assessment instrument for broiler plasma farms using the SCOR method and the *Analytical Hierarchy Process* (AHP). *Key Performance Indicator* (KPI) will be formed based on the elaboration of the five core processes which are then weighted by AHP, both the weight of the core processes, performance attributes, and performance metrics in a definitive performance attribute. From the formed KPI, the biggest weight is on the core process *Make.* In the core process *Plan* the biggest weight on the KPI "Time to clean and prepare the cage until ready for chick in". In the core process *Source* the biggest weight on KPI "Livestock Production Facilities procurement costs borne by the farmer". In the core process, *Make* the biggest weight on the KPI “% of profit to initial capital”. In the core process of *Deliver,* the largest weight is on the KPI "Harvest costs borne by farmers in 1 cycle". In the core process of *Return,* there is only the KPI "Tonnage of chickens that are sold at postponed prices".

(#17) Manufacturing Industry Strategy to Improve the Development of Calcium Carbonate Products with Quality Function Deployment Techniques at PT. Sari Bumi Gresik - Indonesia

Moh. Dian Kurniawan (Universitas Muhammadiyah Gresik)

PT. Saribumi Sidayu is a manufacturing industry company in the field of calcium carbonate production, so far, the sales target of its products has not reached the expected increase. In the course of producing calcium carbonate, the company has not shown satisfactory results. That is because the production results are not good and have some weaknesses from the imperfect production of raw materials. In this case the company develops Calcium Carbonate products as an effort to increase company productivity and to meet consumer needs for the products produced. In this study, it is formulated which attributes the company needs to improve and design product development on calcium carbonate in order to produce a quality product. Then

the product development method that will be applied in this research is the Quality Funtion Deployment technique. Then analyzed, the results of this study found that 3 attributes have high values of 18 attributes that must be improved, namely the product adhesion capability 3,9 and the safety of the material composition 3.77 and the addition of other materials 3.76. This resulted in a recommendation to improve the company's calcium carbonate product development according to development priorities on the attributes considered important by customers based on technical response with the highest score of 2.28 on the adhesive content attribute. So that the calcium carbonate product produced by PT. Sari Bumi has high quality and competitiveness in the market.

(#34) Comparative analysis of academic website quality using the webqual method and modified importance performance analysis (MIPA)

DP Restuputri (Universitas Muhammadiyah Malang), A Kariono (Universitas Muhammadiyah Malang), SK Dewi (Universitas Muhammadiyah Malang), I Masudin (Universitas Muhammadiyah Malang)

A and the B are two Private Universities (PTS) established by Persyarikatan Muhammadiyah. A and B have an official website that is a source of information and services for the academic community and prospective community members. A and B's official website service is expected to facilitate various groups who need information and educational services. Therefore the quality of information and services available must be available properly to obtain information and services quickly and precisely. In the development of tertiary institutions, official websites' role has an essential role as the face of these universities in cyberspace. Almost all universities in Indonesia have used official websites because there will be a competition between universities in terms of website quality. In this study, researchers compared the quality of the A's website with B's website based on the user's perspective using the WebQual 4.0 method and Modified Importance Performance Analysis (MIPA). The sample selection uses a Purposive Sampling approach and uses the Bernoulli formula. Respondents who participated in this study were 80 respondents. As a result, the B's website is better than the A's website. This result is evidenced by the 16 attributes of the 23 A's website attributes superior. And as many as eight attributes need to be repaired immediately by the A's website manager. From the analysis of the factors of use of technology, human resources, and website work units, B is superior to the A's website.

(#38) Manufacturing processes: Skate board from oil palm empty fruit bunch fiber composite

M Yani (Universitas Muhammadiyah Sumatera Utara), B Syam (University of Sumatera Utara), B Wirjosentono (University of Sumatera Utara), R W Lubis (Universitas Muhammadiyah Sumatera Utara), and B Suroso (Universitas Muhammadiyah Sumatera Utara)

The aims of the research to manufacture of skate board from natural composite. The constituent elements of this composite are unsaturated polyester resin as a matrix and the Oil Palm Empty Fruit Bunch (OPEFB) fiber as a filler. Mixing both of these materials with a ratio of OPEFB fiber and polyester resin composition is made based on volume fraction 20:80. The OPEFB fiber is arranged in longitudinal with one layer according to the thickness of skate board mold. The mold is made of metals, it has no cover. The manufacturing process by using hand lay-up. The result is skate board product has a smooth surface on one side, it depends position of the base plate. To make finishing product required grinding process, painting and assembling.

(#59) The strategy of small auto parts industries in responding to the market demand dynamics

A Efendi (Universitas Muhammadiyah Buton)

The small-auto parts industry's main problem is the inability of the sector in West Java to meet market demand as a reflection of the difficulty of accessing capital and the limited human resources that are ready and fully trained. This study aims to determine the strategy of Small auto parts industries in response to market demand dynamics. This research uses a system dynamics approach that analyzes the different variables that make up the complex industrial network of automotive components. This research seeks to see the patterns and responses of small industries to market demand through a dynamic system approach. The results show that small enterprises are responding to market demand by increasing the quantity of production. Increasing the production quantity is a strategy for using funds and rising labor productivity owned by small industries.

(#61) Engineering of Multicore Type Cable Isolation Machine with The Dmaic Method to Reduce Product Scrap

Miftahul Imtihan (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Suryanto (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Wilarso (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)

The process of industrial development is always dynamic, so it must have a high commitment so that companies in the industrialization process should be oriented towards customer desires. A reliable product planning design must maintain quality standards starting from the beginning of the process to the finished product so that the product unit is still in a good category when it reaches the customer because it is a major part so that sustainability can be maintained consistently. Isolation machine engineering is carried out through Six Sigma which is an overall approach to improve quality through the DMAIC method (Define, Measure, Analyze, Improve, and Control). At the Define stage using the Pareto diagram that the highest product scrap is Pure Cu 51.70%, the measuring stage obtained a sigma value of 3.14, and the Analyze stage uses a hypothesis test on vital factors so that the tub-Jig Printing Roll Single is obtained with the Improve stage which is carried out with a replacement of tub-Jig Printing Roll Double obtained a sigma value of 3.99 with efficiency 84.38% and at the control stage using SPC (Statistical Process Control) so that the product looks in a good control chart.

(#62) Failure bushing small end connecting rod diesel engine 3500 series

Wilarso (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Firmansyah Azharul (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Awang Surya (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Asep Dharmanto (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)

The diesel engine unit at PLTD Sintang had a broken cylinder block, an indication that before the damage occurred there was a loud sound and a high vibration. The purpose of this study is to determine the root cause of the failure of the broken cylinder block so that it does not happen again in other units. The method used in this research is to test the broken rod eye connecting rod in the laboratory and test the small end bushing which is suitable for use. In the analysis of the test results, there is wear on the small end connecting rod so that the bushing space is enlarged due to the age of the piston rod, when the small end bushing is reconditioned, the pressure is not considered. The pressure when removing the bushing is below the minimum

value of 24706 kPa, the process of removing the bushing will be faster, with this condition affecting the working process of the piston rod, especially the small end, and the impact of causing damage to other components. The technician's precision when reconditioning the piston rods causes the piston rod to malfunction.

(#63) Reduction Losses Rate in Filling Process of Stick Ice Product Using The Six Sigma Approach

Suwaryo Nugroho (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi), Miftahul Imtihan (Sekolah Tinggi Teknologi Muhammadiyah Cileungsi)

Nowadays, firm face uncertainty external environment such as demand, political situations, pandemic, among competitors, and that why need consistency of quality performance of products in order to compete the competition. There are several big food and beverage manufacturing in Indonesia as supply ice cream products to market and seized same market shared. PT. XYZ as one of food manufacturing to be best in operational excellence by reducing defects product as big problems to this company. As daily report production show that defects of finished product of ice cream especially stick ice product very high due to improperly filling process in one of machines. Annual losses of stick in filling process raised to 60600 pcs per year and equivalence with 35.299.500 rupiahs exclude price of mix (work in process) attached in those stick. High defects in this process make production cost high and impact to manufacturing performance. This study purpose to find root cause of the defects then analyze problems occurred by DMAIC methodology six sigma approached as tool to making better improvement. Six sigma approached to this problems comprise define problems, measures, analyze, improvement and control. Main causes of the defects was several factors especially come from technical factors such as improper stick position, and brine as chemical compositions. Analyze step used to test hypothesis testing by two proportions in Minitab software. Purpose of this step was to find where hypothesis of variables as critical factors. This research using DOE (Design of Experiment) because there are more than two variables identified as critical factors. Result of this research was increased sigma level from 3.23 to 4.3. it is mean that capability process of filling machines being improved and can reduce number of defects and reduced losses quality annual cost till 1.853.299.500 IDR.

(#65) Evaluating the service quality of third party logistics service provider using importance-performance analysis

A K Garside (Universitas Muhammadiyah Malang)

The purpose of this research is to evaluate service quality of third party logistics providers and to prioritize which logistics service quality attributes to be improved. The LSQ scale developed by Mentzer is validated to obtain these attributes. By using the importance performance analysis, it can be indicated that there are four attributes that should be improved immediately.

(#68) Designing System of Performance Measurement and Evaluation of Green Industry for Improving Industrial Sustainability

Ahmad Mubin (Universitas Muhammadiyah Malang)

An effort in order to make the industry to be sustainable is by applying the concept of green industry that is a part of Industrial Ecology. The main objective of this article is to design measurement and performance evaluation systems of green industry. Weighting aspect and KPI based on the Green Industry Reward Guidelines from the Ministry of Republic of Indonesia.

From the results of the analysis, it can be obtained that there are 3 the aspects: process production aspect, aspects of waste/emission management performance, and company management aspect. The results of the KPI (*Key Performance Indicator*) determination based on strategic objective from each of process production aspects are 26 KPI, aspect of waste/emission management performance is produced 5 KPI, and company management aspect is produced 8 KPI, therefore from overall aspects, it can be obtained 39 KPI. While the weight of process production aspect is 70% with the weight of every KPI is 2.69%, the weight of waste/emission management performance aspect is 20% with the weight of every KPI is 4%, and the weight company management aspect is 10% with the weight of every KPI is 1.25%. Therefore, the biggest aspect weight is process production aspect.

(#32) Student perceptions of supply chain manager skills and competency: comparative study of industrial engineering and management

Ilyas Masudin (Universitas Muhammadiyah Malang), Alfian Alif (University of Muhammadiyah Malang), Mohammad Fatkhur Rozi (Universitas Muhammadiyah Malang), Azizatur Ristanti (Universitas Muhammadiyah Malang), Dian Palupi Restuputri (Universitas Muhammadiyah Malang)

This era has entered an era to compete in making it effective and efficient Supply chain. Therefore, supply chain manager skills need to be considered. In this research. The author compares the perceptions of students majoring in industrial engineering with management students of competency skills that should be possessed by the supply chain managers. The questionnaire was distributed and received a total of 223 respondents. The data is then processed with using descriptive statistical methods. The results of the questionnaire stated that Industrial engineering students with management agreed that the most important skill for supply manager 1 was analytical ability. Whereas the biggest difference of perception lies on communication skills. Communication skills got a score of 4.27 from industrial engineering respondents and got a score of 3.97 from management respondents.

Parallel Session : Civil Engineering Track
Moderator : Meillyta

(#8) Application of AHP and TOPSIS Methods for Optional Transportation Cargo by Freight Forwarder (Route: Surabaya - Jakarta)

Rezki Setya Irsadi (Universitas Muhammadiyah Gresik)

The mobilization of cargo from Surabaya to Jakarta is a reverse by 3 types of modes of transportation, trucks, trains and ships. However, the majority of cargo transportation in the corridors of Surabaya and Jakarta is still only served by truck transportation, which has an impact on the capacity of road sections, and the increasing road load. The purpose of this study is to determine the appropriate alternative decision to the modal choice based on the proposed opinion of the respondent, the Forwarder Company. The method used to analyze research data is the Analytic Hierarchy Process (AHP) and Technique for Order Preference by Similarity to Ideal Solution (TOPSIS). Analytic Hierarchy Process (AHP) is a method of decision making involving some criteria and alternatives chosen based on all criteria. TOPSIS uses the principle that the chosen alternative must have the shortest distance from the positive ideal solution and the farthest from the negative ideal solution from a geometric point of view by using Euclidean distance to determine the relative proximity of an alternative to the optimal solution. The results obtained by the AHP method show that the container train is the best alternative choice based on

criteria for cost, time, transportation efficiency, and security. Based on the analysis using TOPSIS method it show The Container Truck is ranking this can be understood in reality Container Truck is a mode of cargo which often used in the mobilization because this mode can serve door to door. The second ranking is Container Train in reality it use second alternative after Container Truck because the cost is cheaper than container truck.

(#1) Identifying Construction Waste Using Lean Management in a Delay Project: Case of Emergency Department Building in Pidie Jaya Regency Hospital, Aceh Province, Indonesia

Hafnidar A Rani (Universitas Muhammadiyah Aceh), Aulina Adamy (Universitas Muhammadiyah Aceh), M Afifuddin (Universitas Muhammadiyah Aceh), Sheragizca Yolanda Situmeang (Universitas Muhammadiyah Aceh)

There was a delay in the project schedule of Emergency Department construction in Pidie Jaya Regency Hospital located in Aceh Province, Indonesia and therefore potential to cause construction waste. Construction project activity is a long process of activity and everything in the project that adds costs is called waste. Theoretically, minimizing waste can be done using the Lean Management method. This study aims to identify the most influential waste on the project by applying Lean Management. Based on the literature review, there is eight waste used in this study: Defect, Overproduction, Waiting, Over-processing, Motion, Inventory, Transportation, and Design. Waste identification data were obtained from interviews with 4 key persons and questionnaires distributed to 16 respondents working in the project. Meanwhile, secondary data was obtained from Working Drawings, a list of core personnel of the contractor company, and S Curve (Schedule). Through descriptive analysis, this study found that the most influential waste is Waiting and Over-processing. With this finding, required a follow up to control the identified waste in order for the project back on schedule

(#18) The Effect of Faunus Ater Shell as Filler in Asphalt Concrete Wearing Course (AC-WC) Mixtures

Firmansyah Rachman (Universitas Muhammadiyah Aceh), Tamalkhani Syammaun (Universitas Muhammadiyah Aceh), Ramadhansyah Putra Jaya (University of Malaysia Pahang) and Raihan Akmal (Universitas Muhammadiyah Aceh)

In the composition of the asphalt mixture, the filler is vital to the aggregate skeleton. One of the filler functions is to increase the mixture's stability and density by filling the void in a bigger aggregate. However, since the filler requirement needs to be smaller than 0.075 mm, it isn't easy to collect enough quantity to fulfill the mixture requirement. Hence, this study aims to study the Faunus ater waste as filler in asphalt concrete wearing coarse (AC-WC) mixture, since it is a waste and has a little economic value. This study incorporates Bina Marga specifications and following the standard Marshall testing method to investigate the effect of utilizing Faunus ater (FA) shell as filler. The result shows that the addition of Faunus ater shell in the mixture shows an increase in both stability and flow testing results. Thus, Faunus after addition as filler may have a good impact on the pavement in terms of stability; however, it needs conservative treatment since the Marshall flow became high. It is not ideal for asphalt pavement.

(#29) Analysis of Concrete Mixture with Marble Waste Material as Sand Filler and Bagasse Ash as Cement Filler

Fahrizal Zulkarnain (Universitas Muhammadiyah Sumatera Utara), Sri Frapanti (Universitas Muhammadiyah Sumatera Utara), Alamsyah Putra Munthe (Universitas Muhammadiyah Sumatera Utara)

Recent studies show sugarcane bagasse ash and marble waste are used as fillers in concrete mixtures to produce a more environmentally friendly construction material. The characteristics of these inputs become the basis for their utilization. Marbles are known to contain silicon-dioxide/silica (SiO_2), calcium oxide (CaO), and magnesium oxide (MgO) as the primary chemical components. Meanwhile, the bagasse possess similar content as the main constituents of Portland cement, including silica (SiO_2) and ferrit (Fe_2O_3) believed to increase the compressive strength of concrete. The aim of this study, therefore, was to determine the effects of the quality of marble waste and bagasse ash on the compressive strength of concrete. This paper applied SNI 03-2834-2000 standard with compressive strength of 30 MPa, cube specimen with 15cm side measurement, and test age of 14 and 28 days. In addition, the composition of the mixture was varied at 12% marble waste, 6% bagasse ash and 12% marble waste mixture +6% bagasse ash. The results showed the 12% marble waste mixture expressed the highest compressive strength of 39.93 MPa or an increase of 25.37% against normal concrete, while the 6% bagasse ash decreased to 26.68 MPa or an estimated -13.25%. This decline is due to corrosion observed in the bagasse, and therefore tends to alter the quality of the concrete mixture. Furthermore, the 12% marble

(#44) Compare Brick Calculation as Load And as Structure with Non Linear Analysis of Soft Storey Behavior On Buildings

Sri Frapanti (Universitas Muhammadiyah Sumatera Utara), Fahrizal Zulkarnain (Universitas Muhammadiyah Sumatera Utara), Sri Asfiati (Universitas Muhammadiyah Sumatera Utara)

Designing an earthquake resistant building is a strong column of weak beams. Collapse of the building due to the earthquake one of which is the selection of soft storey structure. The purpose of research is to know the addition of stiffness, maximum capacity load due to brick as load, structure, .The method used in solving this thesis is a numerical simulation with an element method up to. From the results of data analysis, can be concluded: basic sliding style maximum directional brick-X obtained: Vmaks I = 147,88 kN (as load), max II = 148,59 kN (as structure). As well as the basic sliding force of the maximum directional brick-Y obtained: 156,10kN (as load), max II = 158,32 kN (as structure). From the results of data analysis obtained the maximum rigidity of bricks, namely: Reviewed X-directional brick, amounting to = 11,73 kN/mm (as load), 11,28 kN/mm (as structure). is reviewed in the direction brick-y, amounting to =8,68 kN/mm (as load), 9,01 kN/mm (as structure). Basic shear forces increased by Reviewed the direction-X: 1.01 times (brick as structure). Reviewed Direction-y: 1,015 times (brick as structure). If we are compared with brick as a burden, then the maximum rigidity, increased by: Reviewed the direction-X: 0,96 times (brick as structure). Reviewed Direction-y: 1,044 times (brick as structure).

(#47) The effect of using silica fume on medium strength concrete

Husnah1, D R Basri (University of Abdurrab), P Ningrum (University of Abdurrab), H Mubarak (University of Abdurrab), M Yazid (University of Abdurrab), M Toyeb (University of Abdurrab), R Tisnawan (University of Abdurrab), R R Husaini (University of Abdurrab), F Ramdhani (University of Abdurrab), and C Veddayana (University of Abdurrab)

Silica fume is a fine powder additive consisting of amorphous microspheres with diameters ranging from 0.1 to 0.2 μm, which important role of the concrete chemical and mechanical properties effect. Mechanical properties when view on geometrically, silica fume is known as a pozzolanic material to fill the cavities on the concrete material. In this paper, to determine the optimum composition of using the silica fume on medium strength concrete from Kampar district local materials, Riau Province. The design of this study used 20 Mpa strength concrete with addition of Silica fume. The used amounts of silica fume content to increase mechanical properties are 0–15% from concrete weight and there are 24 pieces sample. The concrete compressive strength test was carried out at 14 and 28 days of soaked, and the test object uses a cylinder. This test on concrete soaked representing each design age. The results of this study, the addition of silica fume has the optimum composition on 5% for 14 days of age, the compressive strength of the concrete is 31 MPa. And for 28 days of age, the compressive strength of concrete is 26 Mpa.

(#49) Study on River Morphology in Pabelan River After the Merapi Eruption in 2010

J Ikhsan (Universitas Muhammadiyah Yogyakarta), U I Rahmawati (Universitas Muhammadiyah Yogyakarta) and A Hairani (Universitas Muhammadiyah Yogyakarta)

Mount Merapi is the most active volcano in Indonesia. The dangers posed by Mount Merapi were hot clouds, incandescent lava, and cold lava. Cold lava floods will transport enormous volcanic material, causing an impact on the area around the downstream river. The main purpose of this study is to analyze changes in cross-section and longitudinal sections after the 2010 eruption, to analyze the value of aggradation and degradation. The method used is the method of analysis using DEM in 2008, and the Cross-Section of the Pabelan River in 2012 and 2015. Based on the result shows that significant changes in cross-sectional and longitudinal sections occur at point 52 + 0. Changes in elevation of point 52 + 0 have decreased in elevation from 2008 to 2012. The aggradation volume of sediment at point 33 + 0, at point 50 + 0 and at point 52 + 0 are 1,700,595 m^3, 2,385,226 m^3 and 1,354,799 m^3, respectively. The degradation volume of sediment at point 57 + 0, at point 59 + 0 and at point 67 + 0 are 4,607,479 m^3, 4,639,474 m^3 and 19,431,948 m^3, respectively. The degradation tends to take place in the upstream area and aggradation occurs in the point that sabo dam was contracted.

(#52) Design of sheet metal roll machine for Making Corrugated tile model

B Suroso1 (Universitas Muhammadiyah Sumatera Utara), M Muharnif (Universitas Muhammadiyah Sumatera Utara), M Yani (Universitas Muhammadiyah Sumatera Utara), Nasution, Arya R (Universitas Muhammadiyah Sumatera Utara)

Technological developments are evident in the industrial sector, where in general an industry will try to produce products in large quantities so that they can meet consumer needs. We have felt the impact of industrial technology advances in our daily lives. The need for metal is very fast, one of the uses of metal in everyday life is in making roofs / tiles. A roll machine is a tool used to change the shape and cross-section of a workpiece by reducing it. The design of the roll sheet metal machine aims to make corrugated metal roof tiles with a plate thickness capacity of

0.2 mm to 0.8 mm and a width of 800 mm x 2,000 mm in length. The design of a roll sheet metal machine for making corrugated metal roof tiles is designed using SolidWorks 2014 software by following the type and shape of the selected material sample. The simulation results on the roll machine frame are, strees 83,425,808 N/m², yield strength 620,422,000 N/m², displacement 2.5 mm and strain 1,786e-004. From the results of the frame strength simulation, it can be concluded that the maximum stress that occurs in the engine frame is subject to a force loading of 10,000 Newton. The safety factor of the roll machine frame due to the stress value is still below the yield strength of the material used with a safety factor value of 7.43, it is still elastic and the frame is still safe to use.

(#54) Erosion Analysis with USLE Model on Sermo Reservoir Catchment Area

Iskahar (Universitas Muhammadiyah Purwokerto)

Reservoirs have an important role to play in the management of water resources. Excessive sedimentation of reservoirs occurs in reservoirs in Indonesia. Reservoir sedimentation problems are related to erosion problems that occur in the catchment area. In conditions where reservoir sedimentation occurs excessively, it is necessary to control erosion appropriately, in order for the reservoir to remain operational and utilized according to the plan. The purpose of this study is to analyze the erosion that occurs in the catchment area of Sermo reservoir. The method used is USLE (Universal Soil Loss Equation). From the results of the erosion analysis, it is known that the rate of surface erosion in Sermo reservoir catchment area is quite large, which is about 8,379 mm/year or yil sediment of 161,668 m^3/year. With vegetative handling directives (i.e. by replacing some types of plants that are prone to erosion, will decrease the C factor) and mechanical handling (i.e. by improving the existing terrace system, will decrease the P factor) is expected to decrease the rate of erosion in the Basin Sermo Reservoir

(#66) Level of Land Degradation in West Lombok

Barzian Ali Aktab (Universitas Muhammadiyah Mataram), Febrita Susanti (Universitas Muhammadiyah Mataram), and Sri Apriani Puji Lestari (Universitas Muhammadiyah Mataram)

Critical land is land that is caused by a decrease in the quality of the land as a medium for vegetation and a medium for water management, which causes the land to be degraded due to various types of land resource use that do not pay attention to the land. continuity. This study aims to analyze and map the level of criticality of land in the spatial pattern of West Lombok Regency. by referring to the Regulation of the Minister of Forestry of the Republic of Indonesia Number: P.9 / Menhut-II / 2013 concerning Implementation Procedures, Support Activities and Incentives for Forest and Land Rehabilitation Activities. The analytical method used in determining the critical level of land in this study is the overley method of spatial data based on parameters from the Regulation of the Director General of Watershed Management and Social Forestry Number: P.4 / V-SET / 2013 Regarding Technical Guidelines for Compiling Spatial Data for Critical Land, which consists of: indicators of land cover, slope, erosion hazard level, productivity, and management. The results of this study are the classification of the criticality level of land in protected forest areas, agricultural cultivation areas and areas outside forest areas which consist of lands with critical, moderately critical, potentially critical, and non-critical calcifications.

Parallel Session: Electronic, Electrical, Informatics, Computer Engineering Track
Moderator: Ronny Dwi Agusulisty

(#9) Literature Review of Regression Testing Technique as One of The Ways of Treatment Software

Putri Aisyiyah Rakhma Devi (Universitas Muhammadiyah Gresik)

Regression testing is an important and expensive part of software maintenance. The purpose of regression testing is to examine the modified program, verify the error and maintain the reliability of the software. The various regression testing techniques discussed in this paper are: (1) Retest, (2) Regression Test Selection, (3) Priority Test Cases, and (4) Hybrid Approaches. This testing challenge chooses an algorithm to reorder the test. Research development shows the emergence of new techniques to reduce the stage of regression testing and improve the quality of testing, making it more effective. Then, the level of error detection is measured by guaranteeing the effectiveness of regression testing. Maintenance of the system used to keep the system running properly, there will usually be a defect in the system due to the use and length of time of use of the software.

(#25) Improving Sustainability Performance Metrics using Usability Framework and WCAG 2.0 Standard

Gita Indah Marthasari (Universitas Muhammadiyah Malang), Yufis Azhar (Universitas Muhammadiyah Malang), and Elza Norazizah (Universitas Muhammadiyah Malang)

Sustainability has been included to the Sustainable Development Goals by the United Nations. Software sustainability shows the effect of its development and usage on the aspect of the economy, social, and society. One of the methods to measure the software sustainability is by using the Sustainability Performance Metric. This study conducted a sustainability evaluation towards Internship Management Information System (SIM-PKN) using the metric with a modification in the usability and accessibility measurement. The framework General Graphical and Structural Evaluation is used for evaluating usability aspect, while the accessibility evaluation is based on the WCAG 2.0 standard. Although the evaluation has proven that SIM-PKN has fulfilled the aspects of portability, support, performance, dependability, predictability, and efficiency, some problems for usability and accessibility aspect are identified.

(#40) A Digital Forensic Analysis on Mozilla Firefox Browser in Android Operating System

Mukhlis Prasetyo Aji (Universitas Muhammadiyah Purwokerto), Dimara Kusuma Hakim (Universitas Muhammadiyah Purwokerto)

Many people misuse their smartphones to commit cyber-crimes, one of the cases is use of web browser utilized as a medium to commit criminal acts such as drug trafficking, pornography or terrorism. Digital forensics can be used to reveal the crimes. Using digital forensics, the crimes can be traced so that the perpetrators can be caught and digital evidence can be found to ensnare them in the trial/court. This research method is in accordance with preliminary examinations based on the National Institute of Standards and Technology (NIST) including Collection, Examination, Analysis and Reporting. Files on the web browser are saved in org.mozilla.firefox-1.apk then after the analysis has been implemented, some data in folder files, cache, shared_prefts and app tmpdir will exist. There are several data that could be used as digital evidence, such as Cookies, Web Bookmarks, Web History and other data saved in the

database. This can be traced to the data needed to reveal cyber-crime cases.

(#43) Three dimensional Salah guide application based on augmented reality

Y H Winata (Universitas Muhammadiyah Jakarta), R Latifah (Universitas Muhammadiyah Jakarta), and Y Adharani (Universitas Muhammadiyah Jakarta)

Salah (Salat/Sholat/Shalat/Prayer) is the second of five Pillars of Islam which is a mandatory for Moslem. Salah is extremely important because it is the first deed that will be calculate in the afterlife. The gestures and postures need to follow the guidance practiced by Prophet Muhammad SAW. One way to learn about them is using guide books. For some people, especially children, learning them through books is difficult and boring because it only shows 2D images. Thus, this research developed a three dimensional animation Salah guide application based on Augmented Reality. It implemented a marker-based Augmented Reality with a QR-code to differentiate. Through this application, users could learn about Salah's gestures and postures in three dimensional animation, therefore they could clearly see the visualization of the gestures and postures. This application was built using Unity game engine. The assets were built using Audicity, GIMP, Inkscape and Blender. Black box testing shows that 92.307% functions of the application are running as they intended. Meanwhile, the application is considered as very good according to User Acceptance Test with 97.7% response percentage.

(#50) Implementation of the Multi-Factor Process Evaluation Method to Determine Mustahiq Priorities

Rita Dewi Risanty (Universitas Muhammadiyah Jakarta), Jumail (Universitas Muhammadiyah Jakarta), Rully Mujiastuti (Universitas Muhammadiyah Jakarta)

Zakat is one of the five pillars of Islam that is inseparable. Zakat becomes an Islamic philanthropy which has socio-economic values that important for Islamic community development, especially for middle and lower economic communities. The aim is to reduce social inequality, improve welfare and manifestation of belief of Islam itself. So that with Zakat, the assets owned will be cleaner, holier, more blessed and developed. However, in collecting and distributing Zakat to the Mustahik (people who are entitled to receive Zakat) it is still in problems, where the distribution is not on target. In Indonesia, Zakat in formally is managed by the trusted Amil Zakat Institution (LAZ). There are eight groups of Zakat recipients, namely needy, poor, amil, converts, riqab, gharim, fi sabilillah, and ibnusabil. The number of Mustahik in Indonesia based on data from the BPS referred to the poor population in March 2020 has total 26.42 million peoples, where specified in urban areas has reached 11.16 million peoples and in rural areas it has reached 15.26 million peoples. This number has increased significantly compared to September 2019; where the total poor population was reached 24.79 million consist of 9.86 million peoples in urban areas and 14.93 million peoples in rural areas. The occurrences of poor population (Mustahik)incrementin a region in where Zakat is always paid consciously by the community, indicating a problem in its management, because the purpose of Zakat is economic welfare and community development. As the solutionis proposed through this research was the Multi Factor Evaluation Process (MFEP) where suggest the comprehensive Zakat distribution evaluation method. The method is assigning six weighting criteria's namely family status, clothing, food, housing, health and education to define Zakat receiver priority scale. The score ranges from 1 to 10 are given to find the factor weights for each criterion. Then look for the Evaluation Factor Value by dividing the Subfactor Total Value by the Subfactor Maximum Total Value. According to the first test evaluation result, which is involved by 10 (ten) target of Mustahik is obtained various level of Mustahik based on the criterion are defined in the MFEP method, such for the highest score showing most priority target of Mustahik was

obtained by Ahmad with priority rank 0.74632. The study would be extending at the future to get more number of participants to get more variety of data and accuracy of defining priority of Mustahik target.

(#71) Implementation of GPS for Tracking of Street Vendor

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The Global Positioning System (GPS) and digital maps are standard features of mobile devices. This feature is used in applications such as Go-Jek, Grab and is applied to motorized vehicles. Nowadays, daily necessities such as food and drink need to be fulfilled quickly, without having to go far or leave the house. Ordering food and drinks can use the Go-Food and Grab Food applications. The problem that occurs is sometimes the food and drinks we need are not available in this application and are only available to street vendors. The arrival of street vendors is uncertain, and their location cannot be ascertained. Likewise, traveling traders sometimes do not find their customers, even though they have been around. This research uses the prototyping method with the stages are communication with users, planning and rapid design, a model built and review and feedback. The result of this research is a prototype of a mobile merchant location tracking system using GPS tracking. This system can be used by customers to track the whereabouts of sellers and sellers to determine their routes. This application makes it easy for customers to find the seller they want and can monitor the seller's whereabouts in real time.

(#72) Implementation of Hajj and Umrah Q&A System Using Case- Based Reasoning (CBR)

F S Bachtiar (Universitas Muhammadiyah Malang), S Basuki (Universitas Muhammadiyah Malang) and G W Wicaksono (Universitas Muhammadiyah Malang)

Hajj and umrah guidance is needed to help pilgrims increase their knowledge about the rituals. But sometimes after following the hajj and umrah guidance, many of them still had many questions that need an expert to answer it, but an expert sometimes not always be to help them. A question and answering system of Hajj and Umrah was developed to help pilgrims in answering their questions using Case-Based Reasoning (CBR) method. This research only implements the Retrieve and Reuse process from the all CBR life cycle to answer the question. We tested the system in 2 scenarios. Firstly, using K-Fold Cross Validation with the value of K is four and used 104 data that divided into 26 test data and 78 case base data. Second, using questions from outside the case base with a total of 26 data. Mean Reciprocal Rank used to measure all of the scenarios. First scenario shows Mean Reciprocal Rank value is 0.97, and for the second test, it shows the value is 0,16. It offers that the system can give a relevant answer if the question is provided from the case base, and if not so, the system provides the un-relevant solution. The system needs to be improved by adding the Revise and Retain process and question rules.

(#70) It-Based Education Online Learning in The Middle Of Covid-19 Pandemic

Doddy Teguh Yuwono (Universitas Muhammadiyah Palangkaraya), Muh. Azhari (Universitas Muhammadiyah Palangkaraya), Siti Juhairiah (Universitas Muhammadiyah Palangkaraya)

Education is a need of every individual / human. Environmental problems such as the ongoing Covid-19 pandemic require the right steps to get a good education, for example, such as educational information and learning. The strategy used to achieve education and information learning is to increase the role of technology. The research was conducted using a survey method and was carried out starting in 2020. The results obtained regarding the use of IT in the world of education were the increased use of the IT Zoom application, Hangouts Meet, Skype, Cisco Web Meeting and Go To Meeting in meeting information needs in all fields, especially in education and learning. Based on the results of research that has been done, it is found that the IT application that is often used by the public, especially in the fields of education and teaching and other activities is the use of the IT Zoom application with an average user for three months (February), namely 91,645 users, then followed by Skype IT usage with an average number of users of 51,061 users and followed by other similar applications such as Cisco Web Meeting, Hangouts and Go To Meeting applications

(#11) Vocal Letter Classification with Audio Processing for Nursing Room Notification System with "Mel Frequency Cepstrum Coefficient and Backpropagation-Neural Network Methods”

Y. A. Suryo (Universitas Muhammadiyah Gresik), J. Siswanto (Universitas Muhammadiyah Gresik), Misbah (Universitas Muhammadiyah Gresik), P. P. S. Saputra (Universitas Muhammadiyah Gresik)

This research is addressed to modern hospital with nurse call innovation invention to solve ordinary ways. However, this equipment is still not optimal because the patient's family can only make calls to nurses without being able to deliver the assistance they want, a research entitled "Vocal Letters Classification with Audio Processing for the Nurse Room Notification System with the Mel Frequency Cepstrum Coefficient and Back propagation Method" Neural Network". This study uses the microcontroller system which is divided into 2 parts, namely hardware design and software design. The results of this study are a speech recognition nurse room system based on speech recognition as a means of communication between patients and caregivers in hospital inpatient rooms. The results of this study are divided into 2 tests. First data training vocal a: 100%, I: 80%, U: 100%, E: 100%, O: 80% so that it obtained a total accuracy of 92%. The second test results of vocal test data: 100%, I: 100%, U : 0%, E: 100%, and O: 10% so that the total accuracy is 80%. The results of both tests concluded that the pattern could be recognized quite accurately.

(#26) Experimental Study of Titl Angles on The Performance of Solar Panels in Medan’s

C A Siregar (Universitas Muhammadiyah Sumatera Utara), M A Siregar (Universitas Muhammadiyah Sumatera Utara), A M Siregar (Universitas Muhammadiyah Sumatera Utara), Partaonan Harahap (Universitas Muhammadiyah Sumatera Utara)

The development of new and renewable energy is currently a popular issue due to the diminishing availability of fossil energy. The potential for abundant and sustainable new and renewable energy, one of which is solar energy. Indonesia is a tropical region that is exposed to sunlight all year round. This potential is very supportive for the development or utilization of solar energy directly as a generator of electricity (Photovoltaic). The research was conducted experimentally to test the optimal tilt angle in absorbing solar energy on solar panels. The slopes tested are 00, 400 and 600. The aim is to determine the effective slope of the angle in the application of solar panels. The research was conducted in Medan City, North Sumatra, Indonesia. As a result, the tilt angle of 400 is more effective at increasing the performance of the solar panel.

(#36) The Using of ATMega 2560 Micro-controller for LPG Leakage detection

Noorly Evalina (Universitas Muhammadiyah Sumatera Utara), Faisal Irsan Pasaribu (Universitas Muhammadiyah Sumatera Utara), Abdul Azis H (Universitas Muhammadiyah Sumatera Utara), Zuli Agustina Gultom (Universitas Muhammadiyah Sumatera Utara)

Gas leakage is aproblem that can occur in residential areas,this paper provides a solution so that the house is safe from gas leaks, The design of gas leak detection equipment is very important as an early warning system, so there are no accidents and fires due to gas canister explosions and residences can be protected from gas leaks, MQ-6 gas sensors as gas leak detection inputs. LCD as display output, bell as sound output, relay as solenoid gas valve controller as gas line safety when gas leakage. All of these components are connected to the main regulator ATMega 2560 Microcontroller, When the Gas Sensor Detects a Gas Leak, Then the Sensor Will Give The Command To Turn on the Bell, Show Warning On LCD screen, And Relay works ordered Solenoid Gas Disconnected, And Gas Line Closed, when the voltage on the sensor is 2.33 volts, the sensor will detect gas leakage and will transmit to the microcontroller ATMega 2560 Microcontroller to set the LCD and Buzzer to work and Solenoid will close the gas line, and if the sensor voltage below 2.33 sensor will not detect gas leakage, automatically the LCD and Buzzer will stop working

(#74) Cellular BTS tra_c characterization based on covariance and correlation

Indar Surahmat (Universitas Muhammadiyah Yogyakarta)

The development of wireless cellular networks has attracted attention because of their roles recently. Various services o_ered by the networks are the reason. Maintaining the networks performance in terms of their quality as well as their capacity is worthy. Some process that to be taken included planning, implementing, evaluating and optimizing become the key of the e_ort. In the fact, some external factors make the implementation of the networks does not follow the planning that based on theoretical approaches and in worst case, have a signi_cant di_erence. This paper underline some problems that may happen as the impact of the di_erence. Some research have addressed characterization of the performance in large clusters. However, this paper discuss the performance based on small clusters. Speci_cally, this study emphasizes the analysis of tra_c in terms of a single BTS (base transceiver station). The use of covariance and correlation is proposed for characterizing tra_c in a single BTS. Based on sample BTSs, the study can categorize tra_c of a BTS into some conditions, for instance, BTSs that have correlation value below 0.5 are classi_ed at the _rst category. It means the pattern of tra_c is di_erence between sectors. These classi_cations are bene_cial for further BTS optimization and can be used as one of consideration.

(#6) Three phase radial generator knock down

Ronny Dwi Agusulistyo (Sanata Dharma University), Martanto (Sanata Dharma University), Dwiseno Wihadi (Sanata Dharma University), Tjendro (Sanata Dharma University)

This paper offers the creation of a low-speed, three-phase knock-down radial generator with permanent magnets poles. The generator's design is an answer to the challenges in developing water extraction devices at the microscale, which needs generators able to work at shallow turns. The generator was the result of previous research, which will be improved, ready to be fabricated. The experimental laboratory data show that the generator ca produce AC 4.5 V to 65 V without load, and 4.5 V to 33 V with the load. The power generated b the generator for 100 rpm is around 3 W. At 320 rpm, the output power can reach 25 W.

Parallel Session: Chemical Engineering Track
Moderator: Rachma Tia Evitasari

(#48) The Effect of Acrylic Acid on The Characteristics of Chitosan Based Superabsorbent Hydrogel

Haryanto (Universitas Muhammadiyah Sidoarjo), Angga Yuli Setiawan (Madura State University)

Superabsorbent hydrogel is a hydrophilic polymer with high water absorption capability. The superabsorbent hydrogels have become a potential material for some applications e.g. waste treatment, agriculture media, and health care applications. The chitosanbased superabsorbent hydrogel were synthesized with the variation of acrylic acid concentrations from 0% to 2% (v/v). The effects of acrylic acid on the characteristics of superabsorbent were studied in this research. Superabsorbent hydrogels were successfully synthesized from chitosan and acrylic acid using glutaraldehid as a crosslinker agent and potassium persulfate as an inisiator. The results show that the addition of acrylic acid increased the tensile strength and swelling ratio but decreased the gel fractions and elongation percentage of hydrogel. The highest swelling ratio (608%) was obtained at 2% concentration of acrylic acid.

(#51) The Characteristics of Porous Asphalt Using Styrofoam Substitution on 60/70 Asphalt with Rice Husk Ash with Rock Ash Filler

Cut Nawalul Azka (Universitas Muhammadiyah Aceh), Rifki Hidayat (Universitas Muhammadiyah Aceh), Tamalkhani Syammaun (Universitas Muhammadiyah Aceh), Suci Mustikasari (Universitas Muhammadiyah Aceh)

Asphalt Porus is a flexible pavement technology that can be applied in areas of Indonesia which have a tropical climate with high rainfall which danger of water. One of the innovations that can be used is porous asphalt with styrofoam as polymer added material. The quality of bitumen can also be improved by using fillers in the mixture. The waste of rice husk ash is used as a filler to help the performance of asphalt mixture to improve quality and reduce the damage of environmental. The research is the characteristics of the porous asphalt mixture with the substitution of styrofoam into asphalt penetration of 60/70 with the variation of filler rice husk ash and rock ash.The specimens preparation of Optimum Asphalt Content (OAC) based on the Australian Method by some parameters namely; the value of Cantabro Loss (CL), Asphalt Flow Down (AFD), Voids in Mix (VIM) and Permeability. Open graded aggregate was used and substitution of styrofoam variations were 7%, 9% and 11% with the variation fillers. The results that the Optimum Asphalt Content was 5.58%. The asphalt with Styrofoam substitution with rice husk ash (RHA) and rock ash (RA) filler of the best with the value CL, AFD, VIM, and permeability at the Styrofoam content of 7% using the filler material (RA 25% - RHA 75%). Which all the parameters have required by AAPA (2004). The value of void in mix with substitution styrofoam 7% of filler in the mixture. The increase in asphalt content is the cantabro loss value can be increase, in other words, the resistance of the mixture to the release of grain is getting bigger, while the greater the asphalt content into the asphalt flow down value of the mixture to also increase so that the level of separation of asphalt with aggregate in the mixture is getting bigger.

(#53) The Effect of Clay and SiO2 Composition on the Physical Properties of Wall Tile Ceramic Body

I Purnawan (Universitas Muhammadiyah Jakarta), A T Prabowo (Universitas Muhammadiyah Jakarta), and S E Rudiatin (Universitas Muhammadiyah Jakarta)

Ceramics are used as a body, filler as well as coating material which is not only useful for strengthening but also beautifying buildings or filled/coated material. The material for the manufacture must be carefully selected in order to meet the predetermined criteria. The main ingredients for making ceramics are clay and feldspar which in this research uses SiO_2. The supporting ingredients added are waterglass and water. In this study, the effect of SiO_2 composition was observed in 6 samples, consist of 3 samples with additional SiO_2 composition and another 3 samples with additional clay. The physical tests performed were rheology, residues, shrinkage after drying and firing, water absorption, loss on ignition (LOI) and bending strength. The test results show that additional SiO_2 composition will reduce viscosity, LOI, shrinkage and bending strength, but increase the residue. On the contrary, additional clay composition will increase viscosity, LOI, shrinkage and bending strength, but decrease residue. The addition of SiO_2 as an additive in filler material at certain percentage is taking into account as it has lower LOI and shrinkage values. However, from an economic point of view, additional SiO_2 is also need to be considered as it is more expensive than clay.

(#55) Modification of PVC mechanical and migration properties by substitution of DOP plasticizer with epoxidized rice bran oil

Ahmad M R Triaji (Universitas Muhammadiyah Jakarta), Nurul H Fithriyah (Universitas Muhammadiyah Jakarta), and Ratri A Nugrahani (Universitas Muhammadiyah Jakarta)

Polyvinyl chloride (PVC) is one of widely used and versatile plastic materials. One phthalate plasticizer commonly used in PVC compounding is the toxic dioctyl phthalate (DOP). DOP is easily oxidized and non-renewable. Therefore a non-toxic bio plasticizer of epoxidized rice bran oil (ERBO) was employed to substitute DOP in PVC compounds by 0, 25, 50, 75, and 100 %w/w. Mechanical properties of casted PVC samples were then characterized in terms of hardness, tensile strength, and elongation. Migration property characterisation was also performed. It was revealed that all those properties were influenced by the substitution level of bio plasticizer (calculated *F* values were all higher than the tabulated ones). The influence was significant for hardness and elongation (calculated *t* values were higher than the tabulated ones), but not significant for solvent migration and tensile strength (calculated *t* values were lower than the tabulated ones).

(#56) Carbon intensity-based approach for analyzing the environmental performance of nickel production in Indonesia

J S Adiansyah (Universitas Muhammadiyah Mataram), D Rahmawati (Universitas Muhammadiyah Mataram), A Alpiana (Universitas Muhammadiyah Mataram)

Nickel is one of the mineral commodities that play an essential role in the metals trade. The demand for nickel worldwide trends to be increased year by year with total reserve recorded 89 million tons, and Indonesia currently has the highest nickel deposits. In addition, nickel production requires bulk energy for processing nickel ores, and subsequently, it would contribute to the increase of Greenhouse gas (GHG) concentration in the atmosphere. This study aims to estimate the carbon intensity per ton product of nickel in Indonesia and to identify its main contributors. A nickel processing plant in Indonesia with a production capacity of 250,000

tons that using RKEF technology was taken as a case study. The method that applied for estimating the GHG emission is adapted from the Intergovernmental Panel on Climate Change (IPCC). The result of GHG Emissions is divided by the total product of nickel to generate the carbon intensity per ton nickel product per year. The result showed that a total of 2.6 million tons of CO_2-e per year was generated for nickel production. The total carbon intensity of nickel production was 10.5 ton CO_2-e/ton nickel product that generated by five areas, namely power plant, construction and engineering, processing plant, auxiliary, and transport logistic. The carbon intensity of nickel production in Indonesia appears to be in the range of carbon intensity other nickel companies worldwide. In addition, hydrocarbon-based materials utilization such as coal, diesel fuel was found as the main contributor for generating high GHG emissions.

(#64) Effect of temperature on brackish water adsorption in Kemudi village using activated zeolite

F Y Purwaningtyas (Universitas Muhammadiyah Gresik), Z Mustakim (Universitas Muhammadiyah Gresik), and Z N A C Rohmah (Universitas Muhammadiyah Gresik)

Kemudi village is one of the villages in Gresik district where groundwater is brackish water. The water salinity in this village was 30.11 g / L with a chloride concentration of 9,128.4 ppm. The high concentration of chloride made the water in the village unfit for consumption. One of the desalination technologies that can be used to reduce chloride concentration in water is the adsorption method. The adsorbent used was in the form of natural zeolite that had been physically activated at a temperature of 400 ℃ with a size of 60 mesh. The adsorption temperatures used in this study were 30, 40, and 50 ℃. Activated zeolites had a higher ability to adsorb contaminants in water compared to non-activated zeolites. Activated zeolites could reduce concentration of chloride by up to 12.6% at an operating temperature of 30 ℃. Dissolved iron concentration deceased from 1.02 mg / L to 0.24 mg / L, turbidity decreased to 0 NTU, and the color scale decreased to <0.2 TCU.

(#22) Application of Chitosan and Catechin to improve color intensity and UV Protection in the dyeing of cotton fabrics with natural dyes from *Peristrophe bivalvis*

R T Evitasari (Ahmad Dahlan University), E Rahayuningsih (Gadjah Mada University) and A Mindaryani (Gadjah Mada University)

The use of natural dyes as textile dyes is increasingly in demand since public awareness of the dangers of synthetic dyes have been increasing. Natural dyes produce a weak color intensity and require repeated dyeing to produce the desired color. This paper studied the effect of chitosan and catechin on the intensity and protection of fabrics in natural dyes from *Peristrophe bivalvis* expressed by parameters of UV protection factor (UPF) and color difference values (ΔE). As the concentration of chitosan and catechin increased, the color intensity increased as evidenced by the increase in the ΔE value. The best UPF value was obtained by combination treatment of chitosan and catechin on cotton fabric with the concentration of chitosan and catechin, respectively 15 g/L and 0.5 g/L in the treatment before and after dyeing resulted in UPF value of 7.22 and a color difference (ΔE) of 36.09. The best lightfastness obtained by a combination treatment of chitosan and catechin with the results increased to 3-4 (good).

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Three dimensional Salah guide application based on augmented reality

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Abstract. Salah (Salat/Sholat/Shalat/Prayer) is the second of five Pillars of Islam which is a mandatory for Moslem. Salah is extremely important because it is the first deed that will be calculate in the afterlife. The gestures and postures need to follow the guidance practiced by Prophet Muhammad SAW. One way to learn about them is using guide books. For some people, especially children, learning them through books is difficult and boring because it only shows 2D images. Thus, this research developed a three dimensional animation Salah guide application based on Augmented Reality. It implemented a marker-based Augmented Reality with a QR-code to differentiate. Through this application, users could learn about Salah's gestures and postures in three dimensional animation, therefore they could clearly see the visualization of the gestures and postures. This application was built using Unity game engine. The assets were built using Audicity, GIMP, Inkscape and Blender. Black box testing shows that 92.307% functions of the application are running as they intended. Meanwhile, the application is considered as very good according to User Acceptance Test with 97.7% response percentage.

1. Introduction

Salah (Salat/Sholat/Shalat) is the second of five Pillars of Islam which is a mandatory for Muslims who have reached mukallaf (maturity or puberty). Salah is the first deed that will be calculated in the afterlife as stated in sahih hadith of Tirmidzi and An-Nasa'I [1]. In practice, Salah needs to be done as per Prophet Muhammad *Salallahu Allaihi Wassalam* (SAW) guidance. There are thirteen points in Salah that are necessary to perform such as Qiyam (standing) for those who are able to, niyyah (intention), takbirat al-ihram (consecratory magnification), Al Fatihah recitation in every rakaat (followed by other Qur'an verses in the first and second rakaat), ruku' (bowing) and tuma'ninah (stay for a while after ruku'), i'tidal (straightening up), sujud (prostration) while also doing tuma'ninah two times, sitting in between sujud (duduk dua sujud), final sitting (final tahiyat) while reading tasyahud and shalawat for Prophet Muhammad, reciting salam while facing right and left direction, and do all of them in order [2].

In Islam there are a lot of prayers, including Salah, and each Muslim is required to memorize each prayers along with the recitation and/or the gestures, which is difficult for those with bad memory [3]. Salah guide book is one medium to learn everything about Salah including gestures, postures and recitations. However, this guide book only provides the image of the gestures in two dimensional (2D) pictures which is difficult to understand and unattractive for some people. The learners have to imagine the gestures before trying to practice because the book only shows how certain gestures look like from certain angles, the front, the side or the back. Furthermore, in Salah, Muslims have to recite some surah

from Al-Quran according to the rules (Tajweed) and if people especially children learn from the book they might not know the right pronunciation. In a study with 33 children [4] showed that their accuracy of Al-Quran recitation was low and they are not interested in learning it. This applied not only for children but also for other age levels ranging from primary education to higher education.

There are many approaches that could be applied to make learning Salah more attractive. Children these days are more exposed to gadget, such as smartphone, tablet and smart watch, thus they are affect to learn something from the applications in gadgets [5]. The applications might come in 2D or 3D model and could be in a form of game applications, augmented reality applications, virtual reality applications etc. While 2D model is also good, but in learning Salah, it might be easier for people if the gestures could be shown in three dimensional model (3D model). This way, the learners could carefully examine the gestures and postures from every angle and would not need to imagine the gestures and could easily follow the instruction.

Augmented Reality (AR) is a technology that could be applied in gadgets and able to display objects in 3D. This technology works by combining virtual objects, either 2D or 3D, and real world in real time [6]. AR could be adopted as games, military use, medical use, entertainment use and also education use [7]. The number of studies related to AR application in education has rose considerably from 5% in 2012 to 30% in 2018, with the top three fields are natural science, mathematics and statistics with 49.2% [8]. One example of AR in natural science education is learning geometry molecule in chemistry which resulted in its feasibility as learning source [9]. Other AR study in natural science is learning human anatomy in 3D model where users (learners) could inspect the image of human's organs along with its description and rotate or zoom them so users could see the organs in different point of views [10]. Beside natural sciences, people also study about the use of AR in social sciences and other fields such as Islamic studies.

In Islamic studies, several studies about AR application has been conducted since 2012 including AR for Islamic Studies, AR Book for Wudhu/Wudlu, AR to memorize Al-Quran, AR to learn everyday's prayer and recitation, AR about short stories [11] and AR to teach and learn Islamic Legal Maxims [12]. In one study [13], the authors build an AR application to learn Wudhu (ritual before Salah prayer) and Salah. The application provides several pages about the definition, the basis, and the requirements of Wudhu and Salah, including the animation of each gestures and duá/recitation. Meanwhile, Rahayu and Denenty [14] had improved the previous application by adding Tayamum (another type of ritual before Salah if Wudhu could not be done), several short Surahs and every day's duá. However, this study provides no information about the animation inside the application. Both studies also did not explain about the use of marker or whether they are a marker-less application. AR is a marker determined technology and could only operate in specific virtual location that has been specified by the marker [7]. Another study about Salah AR application explained the use of marker, each Salah gestures had their own marker and the animation is in already in 3D model [15].

According to the study by Garzon et.al [8] children in primary education to upper secondary education are the common target for AR applications, although quite number of studies (29.5%) also had people in bachelor degree or equivalent as their target. Some benefits of AR are: more interactive, effective in using, could be implemented in wide variety of medium, simple object modelling, cost-effective and convenient. According to studies AR makes academic environments more enjoyable, effective, interactive, impressive and fun in the learning process and make students willing to learn and could improve their achievements [7][16][17][18][19][20]. However, AR also has some drawbacks such as, sensitive when the angle is changing and takes up considerably large space in device's memory [6].

The goal of this research is to build an AR application that could be utilized to learn Salah practice by visualizing the gestures and postures in 3D model animation. The different between this application and the previous studies is the additional QR code for marker with the expectation that it could make marker more readable. This three dimensional animation Salah guide application will be called Panduan Salat Tiga Dimensi (3D) berbasis Augmented Reality (AR) or shorten as PS3DBAR. Onward, the application will be called PS3DBAR. The target users for this application are children, teenagers and adults who want and/or need to learn Salah.

2. Methodology

The methodology to build PS3DBAR application are: 1) System Requirement analysis, 2) System design, 3) Making Assets, 4) Integration, 5) Testing

2.1 System Requirement Analysis

The first step in building PS3DBAR is system requirement analysis, both functional and non-functional. System requirement analysis allows software engineer to perfect software allocation, building data model and behavior which can be translated as data, architectures, interfaces and design components [21]. Functional requirement is about the capabilities and functions that have to be included in the system, thus users are able to finish their tasks. Non-functional requirement is about important behavior property that the system needs to possess [22].

Functional requirements for PS3DBAR are as follows:

1. Scan : Application will enable users to scan marker using device's camera
2. Display
   - Application will enable users to see the details of duá or recitation of each gestures and postures, such as the name of the duá or recitation, display duá or recitation in Arabic and Latin as well as the translation in Bahasa Indonesia. All duá and recitations had been consulted to an ustadz (Imam or someone knowledgeable in Islam).
   - Application will enable users to see the guide to use AR
   - Application will enable users to see the information about the application
3. Play sound
   - Application will enable users to hear audio of each duá or recitation used in Salah
   - Application will enable users to hear the explanation audio of gestures and postures as well as the recitation after users successfully scanned the marker
4. Download : Application will enable users to download the collection of markers through online storage

Non-functional requirements for PS3DBAR are as follows :

1. Operational
   - Application will runs in smartphone device with Android platform
   - The minimum requirement for Android is Android 5.0 (Lollipop)
   - Application could only run in a smartphone device which has camera, speaker and web browsers.
   - The minimum internal memory upon installation is 180Mb
2. Performance
   - Application is only able to scan one marker each time
   - Application is able to scan in 5 minutes
   - Application could run without internet connection, unless it needs to download the markers
   - Application could direct users to online storage when users are about to download the marker
   - Only one user is able to use the application in one device
3. Security
   - Users who access the application have full access of every function
   - Application will ask users for access of camera and web browser upon installation
4. Cultural and Political

- All information, animation and audio in this application is related to Salah practice and the application itself
- All information, animation and audio about Salah is in accordance with Himpunan Putusan Tarjih Muhammadiyah (a book released by Muhammadiyah)
- All information, animation and audio about Salah has been validated by an ustadz

2.2 System Designs

The second step is design system. One of system design is use case diagram. It can be constructed from functional requirements. Use case diagram is a modelling of system behavior and usually used to identify functions and which actor has access to those functions [23]. Figure 1 shows use case diagram of PS3DBAR. This application only have one actor which is the user of the application, while the functions are derived from functional requirements stated above. The functions are 1) display duá/recitation used in each gestures and postures while playing how they sound, 2) scan marker of each gestures and postures including showing the animation, explanation audio and the information, 3) display application guide including where to download the markers, and 4) display the information about application.

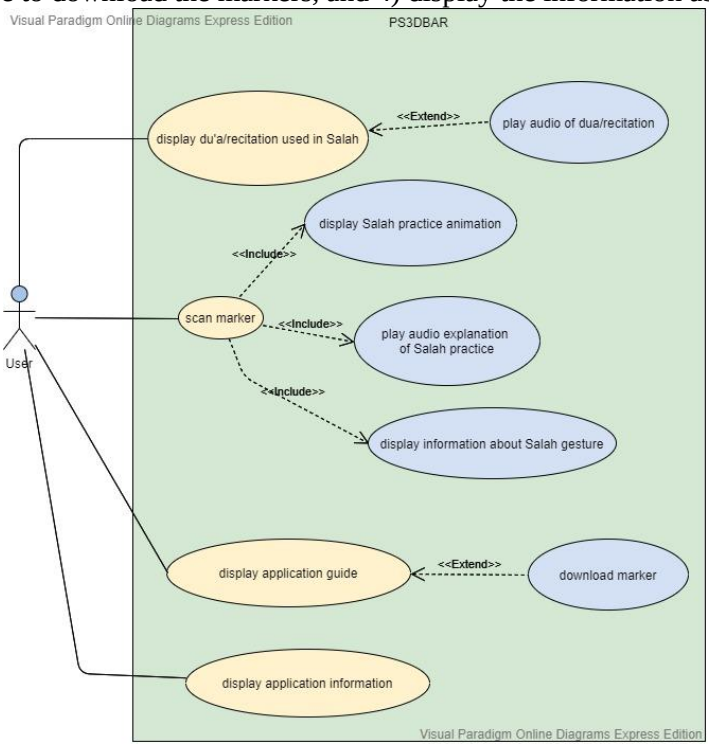

Figure 1. Use Case Diagram PS3DBAR

2.3 Making Assets

The third step is making assets. Asset is some components to build an application which could be in a form of a file that has been constructed inside or outside Unity game engine [24]. This research makes four assets to build PS3DBAR: audio, 3D model, element for User Interface (UI) and marker.

Audio asset is a set of audio that could be played by application. There are four type of audio for PS3DBAR. The first one is background music (BGM), an audio that played when application was open. Second is sound effect, the audio when certain action was done. Third is explanation audio when marker was successfully scanned. Last is duá/recitation audio when users push the play audio button in duá/recitation sub-menu. The audios were taken from internet. After getting the audios from the respective sources, the audios then processed using Audicity software.

The function of 3D Model function is to display the animation of Salah practice to users. These assets were build using Blender which can be divided as four process: 3D modelling, rigging, coloring and animating. In Blender, there are features named human model sheet and mirror modifier used to model human. Human model sheet is used as reference when making 3D model and mirror modifier used to divide model into two parts, thus when modifying one side, the other side will automatically modified. Rigging is a process of putting bone in 3D model so that the model can pose. To have human-like movement, the number and position of the bones have to be the same as human. Coloring is done after rigging. It will make the model more presentable and distinguishable. Before coloring, the 3D model have to disassemble into 2D (known as unwrapping) resulting in a black colored texture. Every color in 3D model will be copied upon respective texture. The last process is animating. Animation is a gesture movement of an object during certain interval (timeline). The process is recording the movement of the bones in 3D model in one unit time using key frame. There are three basic movements that can be utilized: grab, rotate and scale. To make 3D model move according to the correct gestures and postures of Salah practice, there is a need to precisely combine the three movements. The example of each process in 3D model assets can be seen in Figure 2.(a).

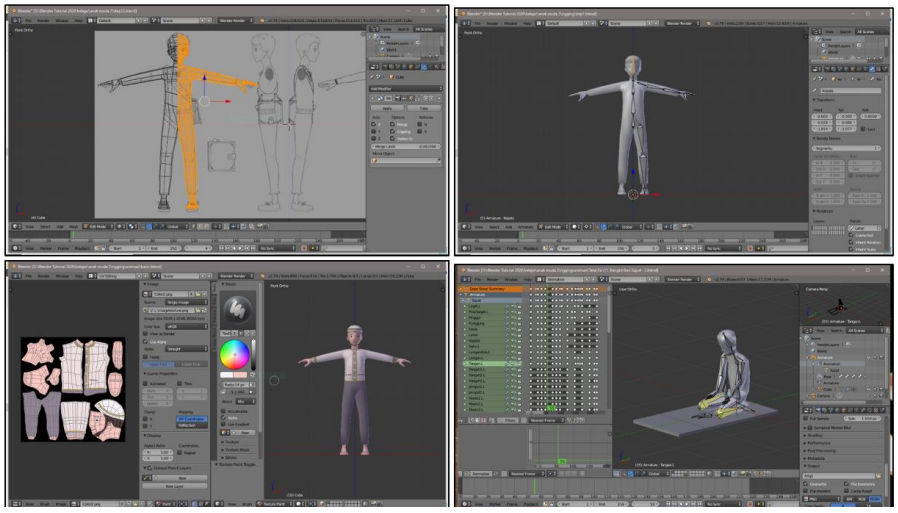

Figure 2. Example of Making 3D Human Model Asset

Element for UI is a set of graphical images connecting users and application. This research build two type of element, button and background. Button will be used as user input, while background is to provide interface and output. These two assets built with GIMP and Inkscape software.

Marker asset is the main asset in this PS3DBAR. In AR, there are two technique that could be used in tracking, marker-based tracking and marker-less based tracking [24]. PS3DBAR used marker-based tracking to display the virtual objects when the marker was scanned. The virtual objects are the animation of the gestures as well as the explanation audio. This asset was constructed using GIMP software. The design was taken from the animation of gestures and postures with the addition of QR code. The purpose of the QR code is to increase the rating of marker detection.

2.4 Integration.

The last step is integrating all assets into one application using Unity game engine. There are three process, import assets, construct scenes and build application. All assets will be import into Unity game engine then it will be arranged so it could build the desirable user interfaces and make necessary codes in C# using IDE Mono Develop.

2.5 Testing

The last step is testing. There are two types of testing, black box testing and user acceptance test (UAT). By using black box, we would know whether the functions, input and output, are match with the

specification requirements [23]. This test is done by trying out every function and observe whether the output is as expected. There will be 26 test case for black box testing. Meanwhile, UAT is needed to learn about whether the application could satisfy the targeted users [25].

There are six respondents that will try PS3DBAR and filling in the questionnaire. There are eight questions, as shown in table 2, and in each question there are five types of answer with each respective weight: A (5 point), B (4 point), C (3 point), D (two point), E (one point). A represents very good/easy/adequate/attractive/clear/capable. B represents good /easy/ adequate / attractive / clear/ capable, while C is quite good/easy/adequate/attractive/clear/capable. D represents poor/ difficult/inadequate/unattractive/unclear/incapable, while E is the worst version of D. The questionnaire will be analyzed using Cronbach Alpha reliability test and response percentage with the following equation [25]:

$$Response\ Percentage = \frac{Actual\ Score}{Ideal\ Score} \times 100\% \quad (1)$$

Table 2. Questionnaire

Symbol	Questions
P1	The application is easy to use?
P2	The design/interface is attractive?
P3	The sound played by the application can be heard?
P4	The text can be read easily?
P5	The 3D animation model could be seen clearly?
P6	The provided information/materials are easy to understand?
P7	The application gives adequate knowledge about gestures and postures in Salah?
P8	The application is capable to help someone in learning Salah?

The response percentage then fit into table 3 to identify the response of PS3DBAR users.

Table 3. Response Percentage Criteria [25]

Percentage Value	Criterion
20%-36%	Not Good (Poor)
36.01%-52%	Less Good
52.01%-68%	Pretty Good
68.01%-84%	Good
84.01%-100%	Very Good

3. Result And Discussion

From assets making, there are 29 audio consist of one background music, one sound effect as the button was pushed, 15 Salah recitation, and 12 explanation of Salah's gestures. From the making of 3D model asset, there is one 3D model along with 12 animation for Salah's gestures and the texture for 3D model and prayer mat as shown in Figure 3.

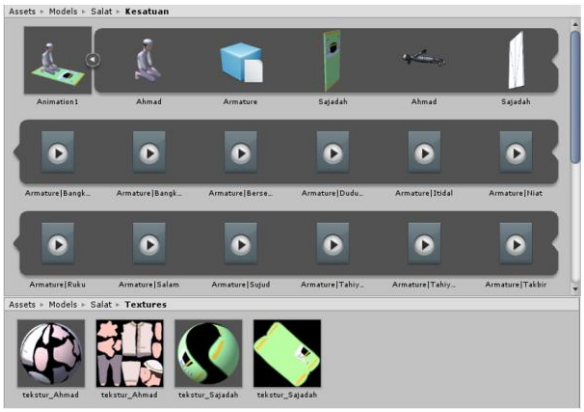

Figure 3. The 3D Model Asset

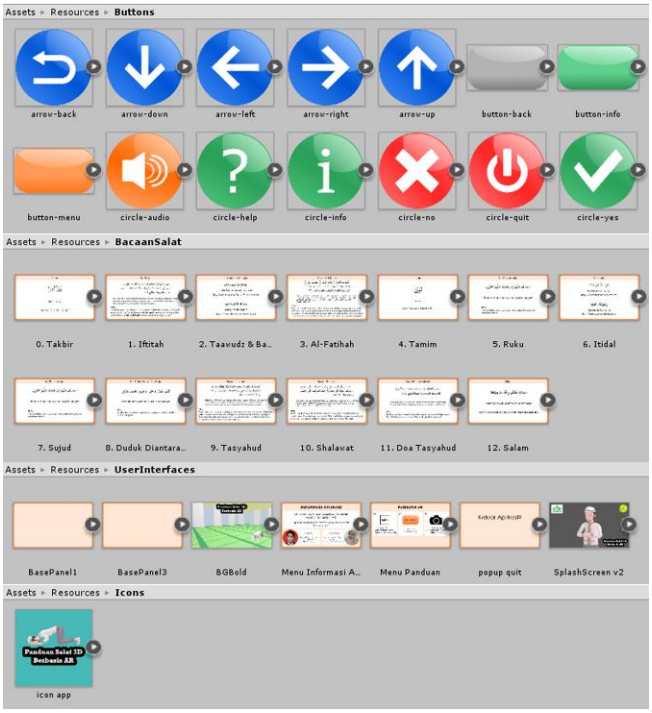

Figure 4. The Element of User Interface Assets

For UI's element assets , there are several buttons such as menu, submenu, navigation, verification, download, information and play audio, as well as 14 background for Salah recitation, basic background, main menu, help menu, information menu and icon for the application as shown in Figure 4. As for marker asset, there are 12 marker. Each marker has at least two images taken from the animation of each Salah gestures and a QR-code. The code was generated from QRCODEMONKEY. The 12 markers are applied and registered in Developer Vuforia site, in order to get the unity package, as shown in Table 1.

Table 1. Marker for PS3DBAR Application

Marker Name	Marker Display	Marker Name	Marker Display
01_niat (niyyah)		07_duduk_2_sujud (sitting between sujud)	
02_takbiratul_ihram		08_tahiyat_awal (first sitting)	
03_bersedekap (arm crossed)		09_tahiyat_akhir (final sitting)	
04_ruku		10_salam	
05_itidal		11_bangkit_sujud (stand after sujud)	
06_sujud		12_bangkit_iftirash (stand iftirash)	

After integration process, the application then build to make the android application (.apk). The final result of the application can be seen in figure 5, example of PS3DBAR user interfaces. There are buttons in the home display where users could choose whether to learn about duá/recitation, or to scan marker to learn Salah practice with virtual objects or to learn about the information of the application. In duá/recitation sub menu, there are 13 buttons representing all the things needed to perform Salah. When one of the buttons is clicked, it will display the duá in Arabic, romaji and the Indonesian translation. When the sound button is clicked, it will play the audio of correct pronounciation.

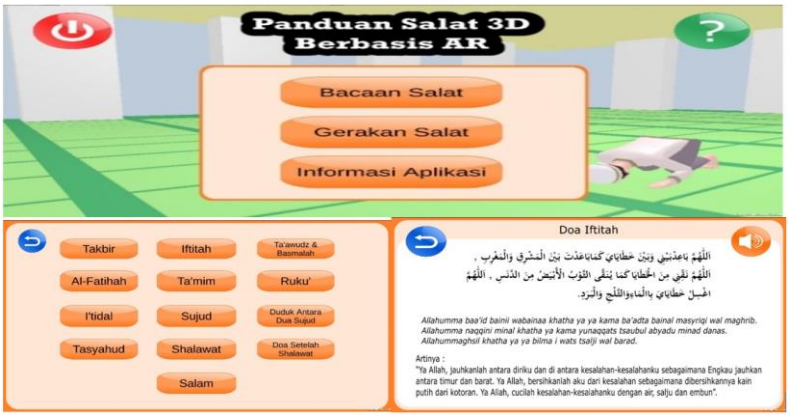

Figure 5. User Interface PS3DBAR

When the second button from the main menu is clicked, the application will automatically connected to camera and ready to scan the marker. The marker could be printed on papers or used other monitors to display the 3D model. Once the marker was detected, the virtual object, which is the animation of Salah gestures, will appear along with the explanation audio about the gestures and the recitation, as shown in Figure 6. The 3D model could be zoom in and zoom out, as well as rotate and shift as shown in Figure 7.

Figure 6. The Popping Virtual Object after Scanning the Markers

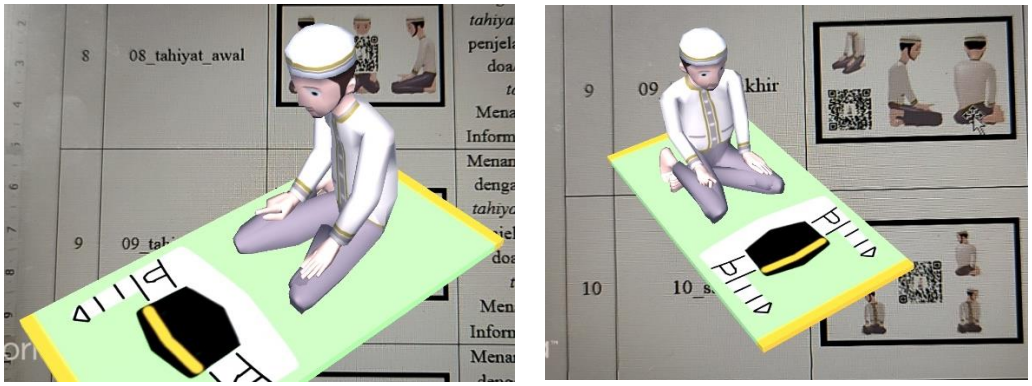

Figure 7. Example of Zooming and Rotating 3D Model

The application underwent a black box testing to learn whether it already function well and all the requirements stated in requirement analysis are fulfilled. The details of duá/recitation in Arabic and Latin can be found in sub menu "Bacaan Salat (Salah Recitation)", while the information about the application is available in sub menu "Informasi Aplikasi (Application Information)". The audio of duá/recitation is available in sub menu "Bacaan Salat" and "Gerakan Salat (Salah Gestures)", while explanation audio of each gestures is in "Gerakan Salat" after the marker was scanned. The application provides a link to download marker in the green question mark button along with the details of how to use the AR.

From the black box test, 92.307% of PS3DBAR functions have run according to the desired outputs. The application is able to run in Android platform and could be used without internet connection. Compare to previous studies [13][14], this application only focus on Salah. We could not compare about virtual objects because there are no data about it. Meanwhile compare to [15], the difference is on the marker. In PS3DBAR application, beside images of Salah's gesture, it also contain QR code. Although, the application could not identify it correctly, especially if we only scanned the QR code as marker. This drawback is due to the similarity of QR code patterns resulting the application to show wrong animation and explanation of the supposedly picked gestures. The similarity of the pattern hindered the recognition phase thus provide wrong virtual objects. Another drawback is the loading time between each action. It took a while to shift from one sub menu to another sub menu, which might due to the slightly heavy computation.

Beside black box test, this research also conducted UAT with 6 respondents, in which they are varies in age. Three of them said that the application could also be used for children, in addition to adult, to learn Salah. One of them said that the interface is too simple. All respondents said that the application is very easy to use. Meanwhile for the attractiveness of the interface 4 people thinks it is very attractive and the other two is attractive. He sounds coming out from the application are heard clearly by 5 of them. All respondents also agree that the text could be read very easily and the 3D animation could be seen clearly. 5 people said that the provided materials are easy to understand and gives adequate knowledge about Salah's gestures. Overall, all respondents agree that in learning Salah, the application is easy to use and understand, as well as helpful.

Table 4 shows the result of UAT Questionnaire and the actual score. The ideal score is 240, taken from the product of the score if every respondents pick A as answers (6 respondents x 8 questions) and the weight of A (5 point). Meanwhile the actual score is 235, thus the response percentage using equation (1) is 97.9%. According to table 4, 97.9% is considered as very good. In addition, the reliability analysis for UAT questionnaire result is 0.935 of Cronbach Alpha test which means the questionnaire is reliable.

Table 4. Actual Score of UAT Questionnaire

No	**Frequency answer**				
	A	**B**	**C**	**D**	**E**
1	6	0	0	0	0
2	4	2	0	0	0
3	5	1	0	0	0
4	6	0	0	0	0
5	6	0	0	0	0
6	5	1	0	0	0
7	5	1	0	0	0
8	6	0	0	0	0
Total	43	5	0	0	0
(Total*weight)	215	20	0	0	0
Actual Score	215 + 20 + 0 + 0 + 0 = 235				

4. Conclusions

Learning Salah can be difficult, boring and unattractive especially for children because they need to remember the gestures and the recitations correctly and accurately as per Prophet Muhammad guidance, which is hard if they learn through guide books. In order to make learning Salah more attractive and able to follow the correct gestures and recitation, this research developed a 3D augmented reality application called PS3DBAR. This application adopted a marker-based tracking technique to show virtual objects and was built by integrating four type of assets: audios, 3D model, elements for User Interface (UI) and markers. There are twelve markers of each Salah gestures which will trigger the animation to display and explanation audio to play. The black box test showed that 92.307% of the functions are running correctly and has fulfilled the needed requirements. In addition, the User Acceptance test from 6 respondents showed 97.9% as its response percentage, meaning the users thinks that the application was very good in general.

5. Acknowledgment

We would like to thank Fakultas Teknik Universitas Muhammadiyah Jakarta for the support in publishing this article.

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