Journal Development Team

For journal related inquiries, please contact:

confproc@aip.org

Editorial Assistant: Francesca Tangreti

Manager, Conference Proceedings: Emily Prendergast

Director, Publishing Development: Bridget D'Amelio

Issues

Select Decade 2020

Select Year 2024

Issue 12 July - Volume 3077, Issue 1

PRELIMINARY

Preface: Proceedings of the Transdisciplinary Symposium on Engineering and Technology (TSET) 2022

AIP Conf. Proc. 3077, 010001 (2024) https://doi.org/10.1063/12.0024850

View article PDF

Committees: Proceedings of the Transdisciplinary Symposium on Engineering and Technology (TSET) 2022

AIP Conf. Proc. 3077, 010002 (2024) https://doi.org/10.1063/12.0026137

View article PDF

BIOLOGY

Postharvest technologies of celery (*Apium graveolens L.)* into powder: A comparison of conventional and modern methods

Faidliyah Nilna Minah; Dwi Ana Anggorowati; Cindy Mutiara Septani; Rini Kartika Dewi

AIP Conf. Proc. 3077, 020001 (2024) https://doi.org/10.1063/5.0201243

Abstract View article PDF

Effectiveness of areca *(Areca Catechu)* seed extract concentration as a green inhibitor and immersion time on steel corrosion control

Dewi Wahyuningtyas; Ayu Asmi Puspita; Eka Sulistyaningsih

AIP Conf. Proc. 3077, 020002 (2024) https://doi.org/10.1063/5.0203026

Abstract View article PDF

CHEMISTRY

Synthesis and characterization of SnO_2 nanoparticles using electrolysis methods

Yanatra Budi Pramana; Ilham Jangkit Pamuncak; Rusdiyantoro Rusdiyantoro; M. Nushron Ali Mukhtar; Sotyohadi Sotyohadi

AIP Conf. Proc. 3077, 030001 (2024) https://doi.org/10.1063/5.0205531

Abstract View article PDF

In situ functionalization of ZnO nanoparticles for enhancing UV-light fastness and antibacterial activity of natural dye-colored batik fabric

Istihanah Nurul Eskani; Edia Rahayuningsih; Widi Astuti; Bidhari Pidhatika

AIP Conf. Proc. 3077, 030002 (2024) https://doi.org/10.1063/5.0203268

Abstract View article PDF

Preparation of nickel hydroxide nanoparticles with the electrolysis method

Yanatra Budi Pramana; M. Sochibul A'lal Ma'arif; Nabilla Nur Afifah; Akhmad Solikin; Krisyanti Budipramana

AIP Conf. Proc. 3077, 030003 (2024) https://doi.org/10.1063/5.0206172

Abstract View article PDF

Production of biodiesel from used cooking oil with zeolite supported cao catalyst: Effect of catalyst mass and transesterification reaction time

Elvianto Dwi Daryono; Jimmy Jimmy; Ferry Setiawan; Siti Sri Wahyuni

COMPUTER SCIENCE AND TECHNOLOGY

Measuring Islamic boarding school website effectiveness using usability analysis

Agung Teguh Wibowo Almais; A'la Syauqi; Roro Inda Melani; Ainatul Mardhiyah; Agus Maimun

AIP Conf. Proc. 3077, 040004 (2024) https://doi.org/10.1063/5.0205500

Abstract View article PDF

A typical lymphocyte cell counting system in blood smears of dengue fever patients based on digital image processing using improved counting morphology algorithm

Ahmad Fahrudi Setiawan; Yuyun Yueniwati Prabowowati Wajib; Kusworini; Setyawan P. Sakti

AIP Conf. Proc. 3077, 040005 (2024) https://doi.org/10.1063/5.0215602

Abstract View article PDF

Recognizing acne Vulgaris severity levels: An application of faster R-CNN and YOLO methods on medical images

Flasma Veronicha Hendryanna; Yan Watequlis Syaifudin; Muhammad Afif Hendrawan; Nobuo Funabiki; Indrazno Siradjuddin

AIP Conf. Proc. 3077, 040006 (2024) https://doi.org/10.1063/5.0201131

Abstract View article PDF

Low-cost system for identification of cataract maturity using LeNet CNN

Radimas Putra Muhammad Davi Labib; Dwangga Rizqia Meidyan Syahputra; Ririn Katherina Maturbongs; Amandarika Widyatamara; Mochamad Bayu Aditama; Elvan Dwi Nur Asyifa

AIP Conf. Proc. 3077, 040007 (2024) https://doi.org/10.1063/5.0201807

Abstract View article PDF

Opinion mining on Indonesian tourism TikTok video content using fasttext and multilayer long short-term memory

Dony Ariyus; Danny Manongga; Irwan Sembiring

AIP Conf. Proc. 3077, 040008 (2024) https://doi.org/10.1063/5.0202656

Abstract View article PDF

Mapping technology of cultural heritage for sustainable urban area management at Indonesia

Lea Kristi Agustina; Agung Budi Harto; Deni Suwardhi; Ketut Wikantika

AIP Conf. Proc. 3077, 040009 (2024) https://doi.org/10.1063/5.0212752

Abstract View article PDF

Web-based GIS spatial decision support system for infrastructural maintenance of roads and irrigation facilities in Central and East Sumba

Togi Nainggolan; Silvester Sari Sai; Abraham Lomi; Adkha Yulianandha Mabrur; Ratri Andinisari

AIP Conf. Proc. 3077, 040010 (2024) https://doi.org/10.1063/5.0202467

Abstract View article PDF

Digital signage: Digital transforming content as an information service in society 5.0

Dimas Indra Laksmana; Sri Indriani; Kiswandono; Aria Dian Tri Wahyuni

AIP Conf. Proc. 3077, 040011 (2024) https://doi.org/10.1063/5.0202144

Abstract View article PDF

Technology and characteristics of intelligent tutoring system for air traffic controller surveillance training: A systematic review

Dian Anggraini Purwaningtyas

AIP Conf. Proc. 3077, 040012 (2024) https://doi.org/10.1063/5.0201749

Abstract View article PDF

Enterprise architecture design for startup companies using the application of the open group architecture framework architecture development method

Nyoman Ayu Nila Dewi; Riza Wulandari; I. Ketut Widhi Adnyana

AIP Conf. Proc. 3077, 040013 (2024) https://doi.org/10.1063/5.0201792

Abstract View article PDF

Effective machine learning techniques for brain pathology classification on mr images

Ruaa M. Mahmood; Nehad T. A. Ramaha; Ismail R. Karas

AIP Conf. Proc. 3077, 040014 (2024) https://doi.org/10.1063/5.0212771

Abstract View article PDF

Ve.Rubric: A rapid application development (RAD) for vocational education rubric assessment tool

Neni Rohaeni; Nenden Rani Renikasari; Yoyoh Jubaedah; Shofa Fithriturrohmi Yusuf

AIP Conf. Proc. 3077, 040015 (2024) https://doi.org/10.1063/5.0203219

Abstract View article PDF

Convolutional neural networks for text classification: A study on public activity restriction

H. Anggit Taba; Hari Suparwito

AIP Conf. Proc. 3077, 040016 (2024) https://doi.org/10.1063/5.0201145

Abstract View article PDF

Improving of anticancer compound identification model for medicinal plant's LCMS data

Iwan Binanto

AIP Conf. Proc. 3077, 040017 (2024) https://doi.org/10.1063/5.0201202

Abstract View article PDF

Preliminary research for provision of Javanese script image dataset from Javanese script printed book

Anastasia Rita Widiarti; Gabriel Ryan Prima; Ciprianus Kuntoro Adi

AIP Conf. Proc. 3077, 040018 (2024) https://doi.org/10.1063/5.0201159

Abstract View article PDF

Online course administration system with QR code

Boy Yuliadi; Magito Magito; Margono Sugeng; Herlinda Herlinda

AIP Conf. Proc. 3077, 040019 (2024) https://doi.org/10.1063/5.0202053

Abstract View article PDF

The last-ten years of big data in vocational education: A systematic review

Sherly Rahmawati; Theodore Oduro-Okyireh; Emmanuel Obbobi Tettehfio; Ade Gafar Abdullah; Budi Mulyanti; Ona Pebriani; Roni Arya Gunawan

AIP Conf. Proc. 3077, 040020 (2024) https://doi.org/10.1063/5.0202080

Abstract View article PDF

Triple filter test a simple technique preventing the spread of HOAX

Henri Septanto; Ari Hidayatullah; Ryani Dhyan Parashakti

AIP Conf. Proc. 3077, 040021 (2024) https://doi.org/10.1063/5.0203284

Abstract View article PDF

ENGINEERING

A modified iterative method for solving the Hamilton-Jacobi-Bellman equation

Hartono Hartono

AIP Conf. Proc. 3077, 050001 (2024) https://doi.org/10.1063/5.0201848

Abstract View article PDF

Alternating current electric generator design simulation using PhET simulator

Djoko Untoro Suwarno

AIP Conf. Proc. 3077, 050002 (2024) https://doi.org/10.1063/5.0201215

Abstract View article PDF

Analysis of electric protection system with arrester on catenary network for electric train power supply

Erfiana Wahyuningsih; Rizal Wahyu Fatoni; Dessy Kristyawati; Ganjar Febriyani Pratiwi

AIP Conf. Proc. 3077, 050003 (2024) https://doi.org/10.1063/5.0201163

Abstract View article PDF

Analysis of public transit system fare policy in Indonesia using big data on post Covid-19 pandemic: A case study of MRT Jakarta Indonesia

Mira Lestira Hariani; Fariz Ramadhan

AIP Conf. Proc. 3077, 050004 (2024) https://doi.org/10.1063/5.0201147

Abstract View article PDF

Analysis of the increasing runway's PCN value on the growth of aircraft movement (case study: I Gusti Ngurah Rai International Airport)

I. Putu Dika Irvayana; Yackob Astor; Atmy Verani Rouly Sihombing; Asep Sundara

AIP Conf. Proc. 3077, 050005 (2024) https://doi.org/10.1063/5.0201122

Abstract View article PDF

Analytical and dynamic loading test evaluation of fly over "X" foundations, Bandung city, Indonesia

Aditia Febriansya; Iskandar Iskandar; Mulyadi Yuswandono; Andri Krisnandi Somantri; Nadya Amelia; Rubinaufal Arfariq Yahya

AIP Conf. Proc. 3077, 050006 (2024) https://doi.org/10.1063/5.0203207

Abstract View article PDF

ASP.NET MVC web API as powerful IoT controller from cloud

Randy Rahmanto; Sulistyo Widodo; Belinda Ayuningtyas

AIP Conf. Proc. 3077, 050007 (2024) https://doi.org/10.1063/5.0202062

Abstract View article PDF

Abstract View article PDF

Flood vulnerability mapping in Cimahi city, Indonesia

Iin Karnisah; Enung Enung; M. Yusup; Beny Mulyana Sukandar; Yackob Astor; Ainnaya Sajida; Hana Fitri Khairani

AIP Conf. Proc. 3077, 050018 (2024) https://doi.org/10.1063/5.0201091

Abstract View article PDF

Guitar chord recognition using MFCC based feature extraction with Kaiser windowing

Linggo Sumarno

AIP Conf. Proc. 3077, 050019 (2024) https://doi.org/10.1063/5.0201877

Abstract View article PDF

The fit and predict COVID-19 using an extended compartmental model in the context of Indonesia

Indrazno Siradjuddin; Bella Cahya Ningrum; Inta Nurkhaliza Agiska; Arwin Datumaya Wahyudi Sumari; Yan Watequlis Syaifudin; Rosa Andrie Asmara; Nobuo Funabiki

AIP Conf. Proc. 3077, 050020 (2024) https://doi.org/10.1063/5.0201201

Abstract View article PDF

Optimizing the implementation of the XXX mall project with the integration of the earned value and time cost trade off methods

Rifaldi Adi Saputra; Era Agita Kabdiyono

AIP Conf. Proc. 3077, 050021 (2024) https://doi.org/10.1063/5.0201137

Abstract View article PDF

Pavement conditions evaluation based on guidelines for pavement condition index PCI) with the assistance of unmanned aerial vehicle (UAV)

Retno Utami; Iman Ruchiat; Yackob Astor; Atmy Verani Rouly Sihombing; R. Desutama Rachmat Bugi Prayogo; Dewi Amalia Pertiwi; Reghina Mulya Sari

AIP Conf. Proc. 3077, 050022 (2024) https://doi.org/10.1063/5.0201093

Abstract View article PDF

Road performance assessment after the existence fly over on roads in Indonesia

Alman Rahadiansyah Willianto; Muhammad Raihan Nugraha; Yackob Astor; Asep Sundara

AIP Conf. Proc. 3077, 050023 (2024) https://doi.org/10.1063/5.0201095

Abstract View article PDF

Planning of bicycle lane as sustainable transportation to support post pandemic adaptation in Cimahi city, Indonesia

Agah Muhammad Mulyadi; Anisa Mardiyanti Putri; Sally Nuraeni; Fairuz Albi Asyhari; Aldo Organami; Hanafi Hanafi

AIP Conf. Proc. 3077, 050024 (2024) https://doi.org/10.1063/5.0204807

Abstract View article PDF

Reverse engineering of steam turbines for national manufacturing industry independence

D. Febriansyah; R. Harmadi; K. Herbandono; Faisal Faisal; C. S. A. Nandar

AIP Conf. Proc. 3077, 050025 (2024) https://doi.org/10.1063/5.0201820

Abstract View article PDF

SCADA application for popcorn cooking and packaging system using PLC and internet

Theresia Prima Ari Setiyani; Geraldine Valda Prakusya Putri Ayu; Ignatia Diva Saniscara

AIP Conf. Proc. 3077, 050026 (2024) https://doi.org/10.1063/5.0201806

Abstract View article PDF

Analysis bending capacity of camphor wood-concrete composite beams with carbon fiber reinforced polymer

Pamella Meidina Sri Rezeki; Mujiman Mujiman

AIP Conf. Proc. 3077, 050027 (2024) https://doi.org/10.1063/5.0203212

Abstract View article PDF

The effect of adding marble dust on compressive strength and bearing capacity value for soft clay soil

Syahril Syahril; Agus Suyono; Hendry Hendry; Muchtar Muchtar; Muhammad Raihan Riandi

AIP Conf. Proc. 3077, 050028 (2024) https://doi.org/10.1063/5.0201795

Abstract View article PDF

The effect of atmospheric temperature on brine cooling performance using nylon tube on liquid line and suction line

Arda Rahardja Lukitobudi; Sugiyarto; A. P. Edi Sukamto; Triaji Pangripto Pramudantoro; Cindy Gamas; Verino Apriliano Prio Utomo

AIP Conf. Proc. 3077, 050029 (2024) https://doi.org/10.1063/5.0207227

Abstract View article PDF

The effect of austenization temperature variations on the mechanical properties of stainless steel

Janatika Putra Perdana; Margono Sugeng

AIP Conf. Proc. 3077, 050030 (2024) https://doi.org/10.1063/5.0203194

Abstract View article PDF

The effect of rice husk ash and phosphoric acid as soft soil stabilizing agent for plasticity index value

Muhammad Raihan Riandi; S. Syahril

AIP Conf. Proc. 3077, 050031 (2024) https://doi.org/10.1063/5.0201119

Abstract View article PDF

The effect of squeezing force to the shear strength of sengon wood and coconut wood using Poly Vinyl Acetate adhesive

Muhammad Taufan; Mujiman Mujiman; Yulianto Petrus Krisologus

AIP Conf. Proc. 3077, 050032 (2024) https://doi.org/10.1063/5.0214732

Abstract View article PDF

The implementation of MPPT incremental conductance method with boost converter on PV system

Dorothy Patricia Monique; Yehezkiel Krisma; Petrus Setyo Prabowo; Bernadeta Wuri Harini

AIP Conf. Proc. 3077, 050033 (2024) https://doi.org/10.1063/5.0201808

Abstract View article PDF

The implementation of MPPT Perturb and observe method with boost converter on PV system

Agnesia Felita; Yehezkiel Krisma; Petrus Setyo Prabowo; Bernadeta Wuri Harini

AIP Conf. Proc. 3077, 050034 (2024) https://doi.org/10.1063/5.0201805

Abstract View article PDF

Utilization of unmanned aerial vehicle for pavement condition evaluation with surface distress index method on the Bandung-Subang road, Indonesia

Yackob Astor; Retno Utami; Atmy Verani Rouly Sihombing; Rd. Bugi Prayogo Desutama; Saldila Pramestu; Syahreza Apriansyah

AIP Conf. Proc. 3077, 050035 (2024) https://doi.org/10.1063/5.0201319

Abstract View article PDF

Integrated tourism village system (IToViS) development for tourism village

Ni Luh Ayu Kartika Yuniastari Sarja; Made Riyan Adi Nugroho; I. Gde Agus Jaya Sadguna; I. Nyoman Meirejeki; Kadek Nita Sumiari; Ni Ketut Pradani Gayatri Sarja

AIP Conf. Proc. 3077, 050036 (2024) https://doi.org/10.1063/5.0201227

Abstract View article PDF

Quality improvement of fungicide products packaging using FMEA and continuous improvement

Alan Maulidan Firdaus; Ellysa Nursanti; Fuad Achmadi

AIP Conf. Proc. 3077, 050037 (2024) https://doi.org/10.1063/5.0203229

Abstract View article PDF

Determining preventive maintenance interval to increase the reliability of air turbine engine starter

Ellysa Nursanti; Sibut Sibut; Sunarjono Prijohutomo

AIP Conf. Proc. 3077, 050038 (2024) https://doi.org/10.1063/5.0203228

Abstract View article PDF

Land management in fisherman's settlement as slum control, in Tanah Laut Regency, South Kalimantan

Ghestiar Kharisma Kusumo; Agung Witjaksono; Maria C. Endarwarti

AIP Conf. Proc. 3077, 050039 (2024) https://doi.org/10.1063/5.0209768

Abstract View article PDF

Optimal integration of wind turbine into the grid with artificial intelligence-based microgrid controller

Ni Putu Agustini; I. Made Wartana

AIP Conf. Proc. 3077, 050040 (2024) https://doi.org/10.1063/5.0201349

Abstract View article PDF

Energy absorption and deformation pattern of honeycomb hybrid crash box under frontal load

Fina Andika Frida Astuti; Moch. Agus Choiron; Anindito Purnowidodo; Yudy Surya Irawan

AIP Conf. Proc. 3077, 050041 (2024) https://doi.org/10.1063/5.0201851

Abstract View article PDF

Landslide mitigation through NDSI-based soil erodibility value prediction on coffee land in Wajak subdistrict, Malang Regency, East Java

Dinna Hadi Sholikah; Kurniawan Sigit Wicaksono; Soemarno Soemarno; Istika Nita; Uci Riandayani Damanik; Muhammad Rifqi Al Jauhary; Raihan Naufal; Aldo Jetco Husada; Syifa Salsabilla Bratawijaya; Destantri Kridiati

AIP Conf. Proc. 3077, 050042 (2024) https://doi.org/10.1063/5.0209394

Abstract View article PDF

A medicine and food delivery robot for Covid-19 hospital using Labview MyRIO FPGA

Irmalia Suryani Faradisa; Agung Darmawan; Yudi Limpraptono; Abraham Lomi

AIP Conf. Proc. 3077, 050043 (2024) https://doi.org/10.1063/5.0201841

Abstract View article PDF

Design of solar panel for electric car power supply with four selenoid in-line engine

Aji Pranoto; Syafriyudin; Prastyono E. Pambudi; Venditias Yudha; Ellyawan S. Arbintasrso

AIP Conf. Proc. 3077, 050044 (2024) https://doi.org/10.1063/5.0202303

Abstract View article PDF

Spare parts inventory control to minimize total inventory cost using continuous review system and periodic review system approaches

Rahayu Khasanah; Masih Ingdana Fadillah; Imam Sodikin; Joko Susetyo

AIP Conf. Proc. 3077, 050045 (2024) https://doi.org/10.1063/5.0202654

Abstract View article PDF

Real-time structural health monitoring (SHM) using strain gauge Arduino sensor at reinfocement concrete under static and impact loading

Vega Aditama; Sri Murni Dewi; Ari Wibowo; Ming Narto Wijaya

AIP Conf. Proc. 3077, 050046 (2024) https://doi.org/10.1063/5.0202079

Abstract View article PDF

Participatory ergonomics-based work productivity strategy for Wijaya Kusuma bakery's home industry

P. Vitasari; Julian Candra Purnama; Sony Harianto; Fuad Achmadi; Suriya Kumar Sinnadurai

AIP Conf. Proc. 3077, 050052 (2024) https://doi.org/10.1063/5.0202517

Abstract View article PDF

The use of smart contracts for third-party comparison web logistics

Nataniel Albert Angstein; Joniarto Parung

AIP Conf. Proc. 3077, 050053 (2024) https://doi.org/10.1063/5.0202066

Abstract View article PDF

Implementation of a low-cost embedded multi-camera system for leaf plant monitoring in the greenhouse

Aryuanto Soetedjo; Evy Hendriarianti; Muhammad Suriansyah; M. Rifki Abdilah; M. Syahriel; H. M. Mohamad Khafil

AIP Conf. Proc. 3077, 050054 (2024) https://doi.org/10.1063/5.0202538

Abstract View article PDF

Voltage stability analysis using probability density function with real load on Karangploso's Feeder Singosari distribution system

Irrine Budi Sulistiawati; Ahmad Iqbal Zajuli; Sugeng Priyanto; Awan Uji Krismanto; Adlan Bagus Pradana; Aji Akbar Firdaus

AIP Conf. Proc. 3077, 050055 (2024) https://doi.org/10.1063/5.0202466

Abstract View article PDF

Rural thematic map based on a strategical issue approach

Muhammad Nelza Mulki Iqbal; Antonio Heltra Pradana; Debby Budi Susanti

AIP Conf. Proc. 3077, 050056 (2024) https://doi.org/10.1063/5.0201612

Abstract View article PDF

The first order Fischer-Tropsch reaction rate constant calculation from carbon monoxide based conversion data

Jimmy Jimmy; Elvianto Dwi Daryono; Harimbi Setyawati

AIP Conf. Proc. 3077, 050057 (2024) https://doi.org/10.1063/5.0203052

Abstract View article PDF

Blockchain technology in wood raw material supply chain management – A bibliometric analysis and review

Velicia Oktaviani Susanto; Joniarto Parung

AIP Conf. Proc. 3077, 050058 (2024) https://doi.org/10.1063/5.0202067

Abstract View article PDF

Absolute locations of earthquakes in eastern java determined by using a minimum 1D P-wave velocity model

Ratri Andinisari; Andrean V. H. Simanjuntak; Rahadatul A. N. Dhanarsari

AIP Conf. Proc. 3077, 050059 (2024) https://doi.org/10.1063/5.0201144

Abstract View article PDF

Utilization of automatic test case generation methods for various system specifications

Yuto Fujita; Kiyoshi Ueda

AIP Conf. Proc. 3077, 050060 (2024) https://doi.org/10.1063/5.0206062

Abstract View article PDF

Transforming blackwater into clean water – Is it possible?

Lies Kurniawati Wulandari

AIP Conf. Proc. 3077, 050061 (2024) https://doi.org/10.1063/5.0205542

Abstract View article PDF

Geometric quality of orthophoto from aerial images obtained by UAV's consumer grade camera: Lesson learnt

Silvester Sari Sai; Martinus Edwin Tjahjadi; Masrurotul Ajiza; Hery Purwanto

AIP Conf. Proc. 3077, 050062 (2024) https://doi.org/10.1063/5.0202468

Abstract View article PDF

Geometric quality of UAV's consumer grade camera: Lessons learnt

Silvester Sari Sai; Martinus Edwin Tjahjadi; Alifah Norani; Ketut Tomy Suhari

AIP Conf. Proc. 3077, 050063 (2024) https://doi.org/10.1063/5.0202469

Abstract View article PDF

Effect of the variation of composted solid waste treatment on the addition of bioactivators at Loka Bhakti 3R solid waste tratment facility, Pakisaji Malang, Indonesia

Ni Wayan Diana Apriani; Hardianto Hardianto; Anis Artiyani; Agung Witjaksono

AIP Conf. Proc. 3077, 050064 (2024) https://doi.org/10.1063/5.0201200

Abstract View article PDF

Potential of cheese waste (whey) as liquid organic fertilizer

Mohammad Istnaeny Hudha; Nanik Astuti Rahman; Anitarakhmi Handaratri; Feisal Adam Zulkarnaen; Bagas Swandana

AIP Conf. Proc. 3077, 050065 (2024) https://doi.org/10.1063/5.0203182

Abstract View article PDF

The effects of rail transport development to the residents

Nur Hafizah Juhari; Alain Tiew Kai Lun; Puteri Ameera Mentaza Khan; Nurhayati Khair; Amalina Azmi

AIP Conf. Proc. 3077, 050066 (2024) https://doi.org/10.1063/5.0203225

AIP Conference Proceedings

RESEARCH ARTICLE | JULY 12 2024

SCADA application for popcorn cooking and packaging system using PLC and internet

Theresia Prima Ari Setiyani; Geraldine Valda Prakusya Putri Ayu; Ignatia Diva Saniscara

AIP Conf. Proc. 3077, 050026 (2024)
https://doi.org/10.1063/5.0201806

SCADA Application for Popcorn Cooking and Packaging System Using PLC and Internet

Theresia Prima Ari Setiyani[1, a)], Geraldine Valda Prakusya Putri Ayu[1, b)] and Ignatia Diva Saniscara[1,c)]

[1]*Electrical Engineering Department, Universitas Sanata Dharma, Yogyakarta, Kampus III-USD, Paingan, Maguwoharjo, Depok, Sleman, Yogyakarta, Indonesia*

[a)] Corresponding author: ariprima@usd.ac.id
[b)] gervalda31@gmail.com
[c)] ignatiadivas@gmail.com

Abstract. The modern food industry requires real-time remote automation and monitoring processes. This paper develops automation for popcorn processing to packaging that can be monitored via the internet. The system is designed to monitor the temperature, quality of the popcorn and its packaging. The system is designed to be able to detect any anomalies in the process and alert operators via email or text message. The prototype consists of 2 containers of raw corn with 2 flavors, a cooking pot and its heating element, and a conveyor. Each container is equipped with a rotary vane feeder that can be adjusted the number of rotations to determine the volume of raw corn that is poured with certain variants into the cooking pan as desired by the user through the HMI. Detection of packaging position, rotary vane feeder, volume, and temperature carried out by a photodiode and thermocouple. Control system using PLC TM221CE40R which has an analog module and ethernet port. The result that system was able to cook and package 4 types of products, monitors the process that occurs in the plan remotely in real-time, and stores the daily number of products.

INTRODUCTION

Popcorn is a kind of snack that is not fried, nutritious, healthy, crunchy, savory, available in various flavors, so it is one of the most favorite recreational snacks for children as well as adults [1]. This corn kernel-based dish is usually prepared by heating it in a kettle over medium heat [2]. The home popcorn industry in Indonesia is growing quite rapidly because it only requires a small amount of capital, but the profit is good. The use of manual equipment in making popcorn takes a long time, the lack of guarantees for the cleanliness of the product and process monitoring must be carried out continuously [3-4]. Because of this, the popcorn industry requires the support of automatic popcorn machines that are used to simplify the production and control process.

Dong has conducted research on the application of mechanical automation for automatic control form of food packaging machinery, application of drive and sensor technology, and application of automatic identification technology. In order to better improve and give it better food packaging efficiency, the introduction of a complete monitoring system is good to achieve effective supervision of the operation of various packaging machinery and equipment end using intelligent technology [5].

SCADA (Supervisory Control and Data Acquisition) is an automation system that can supervise, control and acquire data on a plant. Data acquisition is carried out on electrical signals from sensors and other measuring instruments to be processed into actions according to the desired program. With SCADA users can monitor and control an industrial device remotely using certain software and transfer data in real-time. The controller components in SCADA usually use PLC (Programmable Logic Controllers) [6,7]. PLC have become the main controller of industrial equipment, such as modern packaging automation systems. Strong reasons have favored this trend, instead of using

Proceedings of the Transdisciplinary Symposium on Engineering and Technology (TSET) 2022
AIP Conf. Proc. 3077, 050026-1–050026-7; https://doi.org/10.1063/5.0201806
Published under an exclusive license by AIP Publishing. 978-0-7354-4964-0/$30.00

custom made controller systems: using a standard hardware assures rapid prototyping, quality parts at a reasonable cost, specialized maintenance support, availability of skilled programmers, and incremental upgrading to more powerful hardware that can increase the machine performance or add new capabilities such as internet connection, database logging of production data, or even flexible lines to follow closely changing production demands [8].

The growth of the Internet of Things (IoT) in the food industry offers many new paradigm shifts, mainly related to equipment automation management and production process supervision. IoT allows the system to be centralized in controlling, managing big data and monitoring all production processes remotely. This condition answers the companies need to monitor the progress of their production in real time via the internet. In the era of IoT technology, SCADA data can be routed via Ethernet or TCP/IP networks, thus enabling remote monitoring [9-10]. The construction of a Supervisory Control and Data Acquisition system (SCADA) and the corresponding Human-Machine Interface (HMI) for desalination plant using the MPI connection in main control loop instead of Ethernet connection the most important benefit from using SCADA system is decreasing the operation time [11].

Monitoring and controlling heating process using PLC and SCADA has been done. SCADA is used for the purpose to see the view of the full machine, display alarms, trends, reporting of the furnace in SQL server. By using this technique, it can be analyzed in terms of monitoring, controlling the furnace, efficiency, avoiding waste energy, accuracy, fault history industrial production and performance of the whole system [12]. There have been many implementations of SCADA for other fields, including for oil storage [7], desalination [11], dairy industry [13], floating docks [14], liquid and detergent factory [15], etc.

Based on this, a SCADA application will be developed for a prototype popcorn processing machine from raw corn to packaged popcorn. The system consists of the control section and the supervision section. Control is carried out on the sensor and actuator devices owned by the machine. The controller uses a Schneider TM221CE40R PLC because it has an ethernet port and an analog module. Supervision of the production process on the machine is carried out through HMI. Communication between PLC and HMI is done via ethernet so that monitoring can be done remotely in real-time.

Broadly speaking, the production process starts from the selection of popcorn flavor variants by the user through HMI. There are two flavor variants to choose from, namely sweet and original, as well as 2 volume options, namely small and large. Corn with these flavors are each placed in 2 different containers. Each end of the container has a rotary vane feeder that can be adjusted for the number of turns. When the rotary vane feeder rotates, a number of raw corn will enter the kettle which has been equipped with a heating element. The result of the user's choice will determine which containers rotary vane feeder will rotate and how long it will rotate. The next process is heating raw corn with a certain temperature and for a certain time so that all the corn turn into popcorn. The resulting popcorn will be loaded into empty packages transported by conveyors. The last process is the conveyor will transport the popcorn packaging to the next stage of production. Users can monitor the animation of the entire process that occurs through the HMI screen.

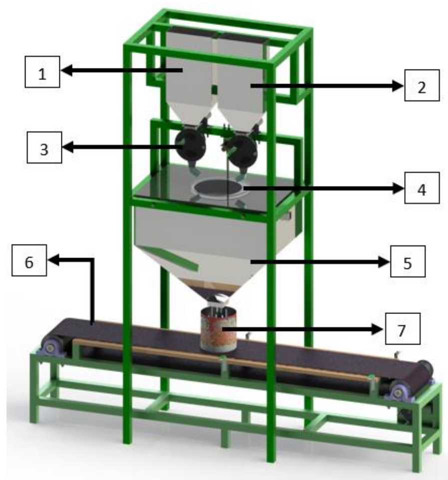
With the SCADA system on the popcorn cooking machine prototype that can be monitored remotely and record the amount of production, it is hoped that the popcorn production process will be more efficient, more practical and product hygiene is maintained.

METHODS

Popcorn Cooking Machine Prototype Design

The popcorn cooker prototype is designed to be able to cook corn into popcorn with a choice of 2 flavors and different packaging sizes. The full design can be seen in Fig. 1.

To control the popcorn cooker machine is equipped with several kinds of sensors. The photodiode sensor is used to detect the position of the packaging carried by the conveyor, detect the number of rotations of the rotary vane feeder motor, and detect the content of raw corn in the container so that if the raw corn in the container are running low, the system will raise an alarm. Data from the thermocouple temperature sensor is used to stop the heater when it reaches the desired temperature. The DC motor is used to drive the conveyor, rotate the rotary vane feeder, open and close the boiler door.



Notes:
1. Container A: Holds the original corn kernels.
2. Container B: Holds the sweet corn kernels.
3. Rotary vane feeder: As a tool that will scoop up ingredients.
4. Cooking container closing door.
5. The kettle in which there is a heating element.
6. Conveyors, packaging carriers.
7. Popcorn Packaging.

FIGURE 1. Popcorn cooking machine prototype

To control the popcorn cooker machine is equipped with several kinds of sensors. The photodiode sensor is used to detect the position of the packaging carried by the conveyor, detect the number of rotations of the rotary vane feeder motor, and detect the content of raw corn in the container so that if the raw corn in the container are running low, the system will raise an alarm. Data from the thermocouple temperature sensor is used to stop the heater when it reaches the desired temperature. The DC motor is used to drive the conveyor, rotate the rotary vane feeder, open and close the boiler door.

The mechanism for determining the volume of raw corn to be cooked is using a rotary vane feeder which has 2 curves as shown in Fig. 2(a). The rotary vane feeder is placed at the bottom end of container A and container B. The curve on the rotary vane feeder functions like a measuring spoon. For 1 arch is equivalent to ± 35 grams of raw corn kernels. Each rotary vane feeder is rotated by a DC motor. When the arch is facing up, the arch will be filled with raw corn kernels, while when the arch is facing down, the corn will be poured into the cooking kettle. To calculate the number of rotations of the rotary vane feeder, a photodiode sensor is used.

(a) (b).

FIGURE 2. (a). Rotary vane feeder design with 2 curves and photodiode, (b). The design of a cooking kettle equipped with a thermocouple and heater

The kettle used to cook corn is equipped with a heater that can be adjusted on-off and a thermocouple sensor to determine the temperature of the kettle as can be seen in Fig. 2(b). At the top of the outer housing of the heater there is a closing and opening door that is driven by a DC motor and a pair of limit switches as a door position sensor.

The results of processing in the form of popcorn products will be packaged in a tube-shaped package. The size of the popcorn packaging has a diameter of approximately 10 cm and a height of 15 cm. This package will be filled with popcorn weighing approximately 35-75 gr.

Block Diagram System Design

The block diagram of the system consists of controlling part carried out by the PLC and the monitoring part carried out by the HMI, as can be seen in Fig.3.

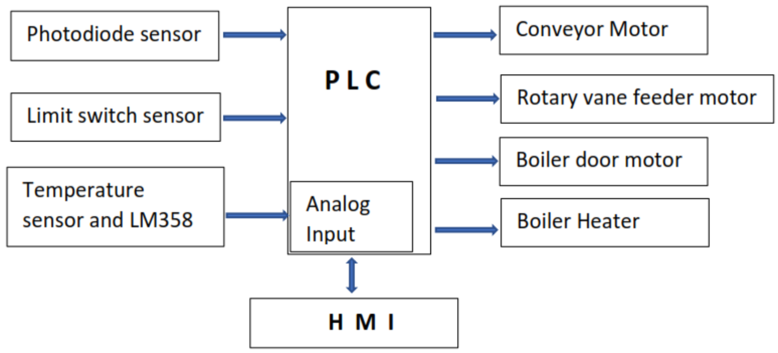


FIGURE 3. SCADA block diagram for popcorn cooking and packaging system using PLC and internet

The photodiode sensor is used to detect the position of the packaging carried by the conveyor. If the package is detected under the cooking kettle, the conveyor will stop. The conveyor starts moving again when the popcorn is finished packing. The photodiode sensor is also used to detect the number of rotations of the rotary vane feeder motor, and detect the content of raw corn in containers A and B. If the raw corn in the container are running low, the HMI will raise an alarm so that the operator can immediately fill the raw corn into the container. The limit switch sensor is used to limit the movement of the boiler door during open or close operation. The sensors are connected to the PLC via a digital input port.

The temperature sensor uses a thermocouple. The maximum output voltage of the thermocouple sensor is 11.7 mV with a temperature reaching 316°C. In order to be read clearly by the PLC, the output voltage is amplified using LM358 so that it can reach a voltage of about 8.5 V.

HMI displays a main menu that provides information about options for the user. The REAL-TIME menu displays the options Mode, Composition of flavors and sizes that function to select the popcorn flavor variant and the volume of corn to be produced. This menu also used to start the production process and monitor the ongoing production process. In this display, the user can monitor the temperature value along with the trend and observe whether there is an alarm regarding the volume of raw corn in the container, so that if an alarm appears the user can immediately increase the volume of raw corn in a container that is almost empty. This is necessary so that the popcorn cooking process can take place continuously. Report menu display report and production amount, to see the daily production amount for the last 1 week and save it in the form of a file.

Internet Communication Design

Data communication between the computer that is used as the HMI and the PLC is done via an ethernet network. In order for the HMI to communicate with the PLC, it is necessary to set up a network configuration which includes the IP address of the PLC and the IP address of the computer used as the HMI. Both must be in the same class. In addition, the Microsoft Windows MBENET application program is used to enable data access on the Modicon PLC via an Ethernet network. The communication protocol will handle data elements in conversations that use a 3-part naming convention, namely Application name, Topic Name, and Item Name.

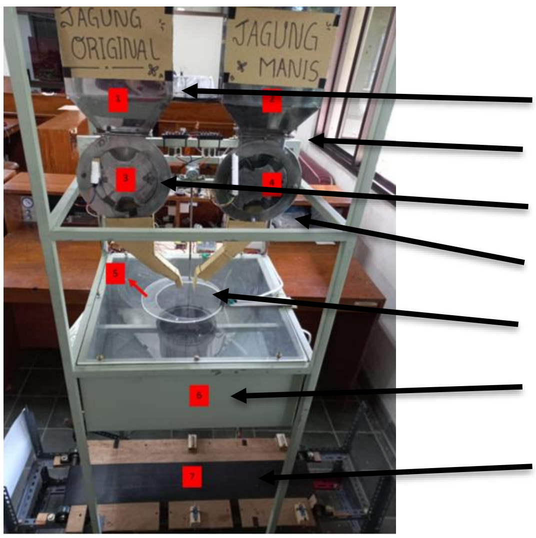
PLC and HMI Programming

All sensors and actuators are connected to the PLC via digital input ports, digital output ports and analog input modules with a specific addressing format according to the PLC being used. Ladder programming is made using special software that has been provided by the PLC maker. HMI programming is made so that it can display temperature information, temperature trends, input and output equipment conditions and animation of current process. The software used to develop HMI is Wonderware Intouch

RESULTS AND DISCUSSION

The Results of the Implementation of the Popcorn Cooker and Packaging Machine Prototype

The physical form of the popcorn cooker and packaging machine has been successfully made like Fig. 4. This tool measures about 75 cm x 50 cm x 175 cm which is separated from the conveyor part. The conveyor is made with a total length of 130 cm while the belt length is 95 cm, height 25 cm and width 26 cm. The conveyor is driven by a DC motor with an input voltage specification of 12V with a rotating speed of 90 rpm and the rotary vane feeder is rotated using a DC motor with a voltage of 24V. The thermocouple temperature range between 125°C - 180°C. This temperature range of the kettle is the optimal temperature so that the corn can turn into popcorn and not burn.



Notes:

1. Original corn seed container
2. Sweet corn seed container
3. Rotary vane feeder on the original corn container
4. Rotary vane feeder on sweetcorn container
5. Boiler door
6. Cooking Container; it has a cooking kettle in it
7. Conveyor

FIGURE 4. The results of the implementation of the popcorn cooking and packaging machine prototype

The most likely cause of the discrepancy in speed between the two containers is that there may be a malfunctioning component in either the DC motor or its power supply. If this is true, then it should be checked and replaced if necessary. It is also possible that there are differences in friction between the two containers due to their design or materials used which could affect their speed. In this case, some adjustments may need to be made to ensure that both containers rotate at an equal speed.

To adjust the on-off heater condition so that it corresponds with the temperature range required for optimal popcorn production, a look-up table can be created from Fig. 4 and programmed into the PLC register memory. This will allow for easy adjustment of conditions to achieve the desired temperature range.

Production Process Observation

Production Process observation is carried out through HMI. The REAL-TIME menu in Fig.5 is used to select the Mode which includes the composition of flavors and sizes, as well as monitoring the condition of the Plant. In the initial condition the indicator lights will be red which it means the system or input output device is still off, the kettle and the kettle cover are white. The packing container will be at the left end of the conveyor.

The operation of this prototype has the following sequence: The user determines the flavor and size variant. There are 4 different flavors and sizes available in HMI, namely Original Small, Original Large, Sweet Small and Sweet Large. The choice of small size will cause the rotary vane feeder in the corn seed container to rotate so that the curve pours 1 spoon of corn into the cooking kettle, while the choice of Large size will cause the rotary vane feeder in the corn seed container to rotate so that the curve pours 2 tablespoons of corn seeds for one production process. After that, choose a production day so that the amount of production that day will be recorded in the report file according to the selected day. Press the START button to start the cooking and packing process. During the process the user can monitor the cooking and packaging process, temperature values and temperature trends and see whether there are alarms that appear.

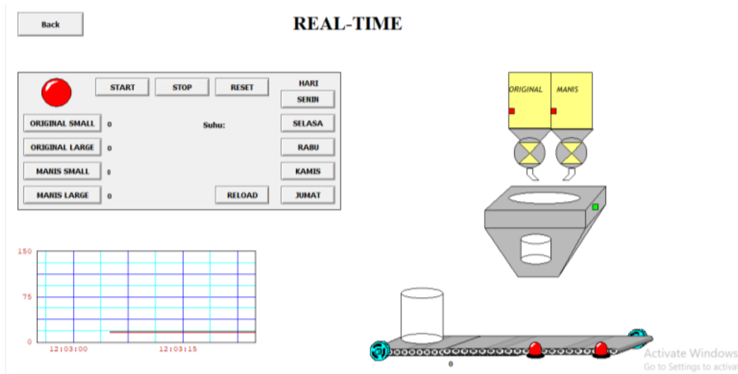


FIGURE 5. REAL-TIME menu display

Many experiments have been carried out to determine the success rate of the prototype with various modes of choice of flavors and sizes provided by HMI. From these observations, it appears that the sequence of processes that occur in the prototype of the popcorn cooking and packaging machine is the same as that shown in the HMI. The sequence of this process has also been in accordance with what was designed. The machine has succeeded in cooking corn into popcorn with flavor and size variant modes according to the user choice. The time needed to process one product is around 12-15 minutes for small size and 15 – 20 minutes for Large size.

However, the construction of the machine that is not quite right means that not all corn can turn into popcorn and not all popcorn goes into the container. This causes the remaining corn and popcorn stay in the heating kettle and get scorched. The machine has achieved a success rate of about 80%.

In order to further improve the success rate, HMI should consider making some modifications to the prototype. The first modification would be to increase the temperature control accuracy and reduce any possible temperature fluctuations. This could help ensure that all corn kernels are heated up evenly for maximum popping efficiency. Additionally, HMI should also look into improving the design of their heating kettle so that it is able to better contain all popcorn within its walls and prevent scorching or burning. Finally, they could add more sensors in order to detect when all of the popcorn has been removed from the kettle and stored in containers before continuing with subsequent processes.

Overall, these modifications can potentially lead to higher rates of success and efficiency in popcorn popping.

CONCLUSION

SCADA for popcorn cooking and packaging system using PLC and internet has been successfully implemented. The machine is able to cook popcorn with 4 choices of flavor and size variants and then pack it in a package. Improper machine construction causes not all corn can turn into popcorn and not all popcorn goes into the container. This causes the remaining corn and popcorn stay in the heating kettle and get scorched. The cooking and packaging process was successfully monitored through HMI in real time and carried out remotely via the internet. The machine has been tested and all the processes are functioning as expected.

REFERENCES

1. R. G. Buttery, L. C. Ling, and D. J. Stern, J. Agric. Food Chem. **45**(3), 837–843 (1997).
2. M. Taufik, Jurnal Qardhul Hasan; Media Pengabdian kepada Masyarakat **8**, 45–49 (2022).
3. Maisalis, S. Hurri, and Elfiana, J. S. Pertan. **1**(3), 195–202 (2017).
4. I. Giovani, C. Jesica, C. Mudhita, and W. El Kiyat, Maj. Kesehat. Pharmamedika **10**(2), 100 (2019).
5. T. Dong, "Research on the application of mechanical automation in the field of food packaging", in *Proc. - 2020 5th Int. Conf. Mech. Control Comput. Eng. ICMCCE 2020*, pp. 763–766, 2020.

6. A. Ayub, H. Yoo, and I. Ahmed, "Empirical Study of PLC Authentication Protocols in Industrial Control Systems", in *Proc. -IEEE Symp. Secur. Priv. Work. SPW 2021*, pp. 383–397, 2021.
7. X. Wang, G. Li, and X. Wei, "PLC-based SCADA system for oil storage and application", in *Int. Conf. Electr. Inf. Control Eng. ICEICE 2011 - Proc.*, pp. 1539–1541, 2011.
8. A. Sapena-Bano *et al.*, "Automatic translation of Programmable Logic Controllers (PLC) control programs in packaging machinery", in *9th Int. Microsystems, Packag. Assem. Circuits Technol. Conf. Challenges Chang. - Shap. Futur. IMPACT 2014 - Proc.*, pp. 445–448, 2014.
9. N. N. Misra, Y. Dixit, A. Al-Mallahi, M. S. Bhullar, R. Upadhyay, and A. Martynenko, IEEE Internet Things J. **9**(9), 6305–6324 (2022).
10. S. K. Panda, A. Blome, L. Wisniewski, and A. Meyer, "IoT Retrofitting Approach for the Food Industry ", in *IEEE Int. Conf. Emerg. Technol. Fact. Autom. ETFA*, vol. 2019-September, pp. 1639–1642, 2019.
11. I. Morsi, M. El Deeb, and A. El Zawawi, "SCADA/HMI development for a multi stage desalination plant", in *Comput. World Futur. Comput. Serv. Comput. Adapt. Content, Cogn. Patterns, Comput. 2009*, no. 1, pp. 67–71, 2009.
12. A. Kaur and D. Bansal, "Monitoring and controlling of continue furnace line using PLC and SCADA", in *5th Int. Conf. Wirel. Networks Embed. Syst. WECON 2016*, no. V, 2017.
13. B. Dhage and A. Dhage, "Automation of CIP Process in dairy industries using programmable controllers and SCADA", in *Int. Conf. Autom. Control Dyn. Optim. Tech. ICACDOT 2016*,
14. A. Topalov, O. Kozlov, and Y. Kondratenko, "Control processes of floating docks based on SCADA systems with wireless data transmission", in *Perspect. Technol. Methods MEMS Des. MEMSTECH 2016 - Proc. 12th Int. Conf.*, pp. 57–61, 2016
15. T. S. Tamir *et al.*, *"* Developing SCADA Systems to Monitor and Control Liquid and Detergent Factories", in *IEEE Int. Conf. Autom. Sci. Eng.*, vol. 2020-August, pp. 691–696, 2020

Abstract View article PDF

Preliminary assessment on the performance of long distance wireless data transmission for disaster early warning system

Michael Ardita; Alfarid Hendro Yuwono; Gatot Kusrahardjo; Radimas P. M. D. Labib; Kartiko Ardi Widodo

AIP Conf. Proc. 3077, 050067 (2024) https://doi.org/10.1063/5.0216537

Abstract View article PDF

Experimental study a low speed-one phase generator with permanent magnetic radial flux

Syafriyudin Syafriyudin; Muhammad Suyanto; Aji Pranoto

AIP Conf. Proc. 3077, 050068 (2024) https://doi.org/10.1063/5.0202470

Abstract View article PDF

Design and analysis of cabin carbon monoxide warning system

Erfan Rohadi; Rudy Ariyanto; Indrazno Siradjuddin; Kristinanti Charisma

AIP Conf. Proc. 3077, 050069 (2024) https://doi.org/10.1063/5.0203224

Abstract View article PDF