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Rakhmat Purnomo, Tri Dharma Putra*

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SUPER PEER ARCHITECTURE USING DISTRIBUTED COMPUTING

Gayathri K S, Shilpa Abhang

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A Real-Time Application for Waste Detection and Classification

Minh Nguyen, Huy Lam, Tuan Le, Nha Tran, Tai Lam, Tinh Nguyen, Hung Nguyen

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11503

E- AUCTION PLAN USING CRYPTOGRAPHY

P. Adhi Narayanan, Mr. P.Sakthimurugan, L.Praveen raja

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11504

ADVANCE ANDROID APPLICATION FOR LAW AND ORDER USING DATA MINING

Mr. A. Aravindkumar, Mr.M.Rajkumar, Mr.D.Sasidharan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11505

Developing a Security for Home In Terms Of Locking Door Using Android OS

Mr.M.Gopalakrishanan, Ms.N.Kalaiselvi, Mr.Krishnan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11506

Functions of edge computing in the various applications of human interative activities in day-to-day life

V.Gopi, P.Sakthimurugan, V.Boopalan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11507

ANALYSIS OF MOISTURE LEVEL IDENTIFICATION OF RED SOIL IN TERMS OF WEATHER CONDITION USING DATA MINING ALGORITHMS

Mr.P.Gowthamraj, Mr.M.Rajkumar, Mr.T.Bharathkumar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11508

Analysis of Tobacco Based on Fertilization of in Termsof crop age

Ms.V.Hemalatha, Mr.C.Rajkumar, Ms.S.Prema

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11509

ROLE OF POTASSIUM AND NITROGEN ON GROWTH,YIELD AND QUALITY OF TURMERIC

Ms.P.Hemamalini, Mr.S.Gopalakrishnan, Ms.O.Janaki

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11510

ANALYSIS OF CROP YIELD ESTIMATION RATIO OF COCONUT BASED ON FERTILIZATION IN TERMS OF CROP AGE

Ms.J.J.Srirethanya, Mr.P.Sakthimurugan, Ms. N. Rakshana

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11511

Yield and Income Estimation of Maize Farmers per Harvesting Using K-Means Clustering Algorithm

Ms.M.Jaishanthi, Mr.C.Rajkumar, Mr.P.Vengatesh

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11512

REVIEW OF WIRELESS MULTIMEDIA NETWORKS

Ms.B.Kamali, Mr.C.Rajkumar, Ms.M.Prabavathi

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11513

INITIATING THE SECURITY MEASURES FOR WOMEN IN TERMS OF MOBILE APPLICATION USING ANDROID OS

Mr.S.Kannan, Ms.E.Nithya, Mr.M.Praveen

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11514

SCHEDULING AND LOAD BALANCING IN CLOUD BALANCING IN CLOUD USING STANDARD AND DYNAMIC ALGORITHM

Mr.G.Karthik, Mr.D.Govindaraj, Mr.S.Yuvaraj

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11515

ANALYSIS OF CROP YEILD ESTIMATION RATIO OF PAPAYA BASED ON FERTILIZITION OF IN TERMS OF CROP AGE

Ms.A.Mohanapriya, Mr.K.Kannan, Ms.N.Keerthana

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11516

ENDPOINT PROTECTION MEASURING THE EFFECTIVENESS OF INSIDER THREAT REMEDIATION TECHNOLOGIES AND METHODOLOGIES

Mr.N.Karthikeyan, MS.N.Kalaiselvi, Mr.P.Nagarajan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11517

MELOMANIAC BASED ON MACHINE LEARNING

Priyanka R, Pooja S, Proksha J Reddy, Romesh K V

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11518

Depression Detection using Machine Learning and Deep Learning

Saish Patil, Om Mandhare, Shubham Chaudhari, Sanket Garde, Prof. Sneha Tirth

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11519

E-Health and Telemedicine in Today's World

Chethan Chandra S Basavaraddi, Dr. Vasanth G

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11521

Face Recognition: Is It a Match?

Kimaya Atul Patil

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11522

Hotel Inventory Management System

Hrishikesh Jawalkar, Suraj Pansare, Ranjit Iwale, Ashmit Ghorpade, Lect. S. Naik

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11523

Hassle Free Doctor Consultation

Abhishek Kishor, Akash Verma, Aryan Goyal, Harshit Sisodiya, Ms. Vanshika Gupta

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11524

Avoiding Fake Products and Implementing Product Verification Using Private Blockchain Network

Nikhil Shinde, Uday Deore, Rajat Bakale, Asst. Prof. Nilesh Wani

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11525

"Social Interaction Tracking and Patient Prediction System for Potential COVID-19 Patients "

Janhavi Supekar, Mayuri Narkhede , Ankita Patole

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11526

Data Collection for Machine Learning

Megha Kharat, Sheetal Wadhai

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11527

Diagnosis of Polycystic ovarian syndrome using Deep learing

Pratik Kadam , Nikita Gadhave , Krutika Pandit

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11528

Enhance Network Aggression Classification Using Neural Network and SVM

Vijay Kumar Uikey, Sushma Kushwaha

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11529

Implementation of early flood detection and avoidance alert system based on IOT android application

Rahul Choudhari, Swapnil Satbhave, Maithali Panchbai, Saurabh Kubde, Prof .D.A.Kapgate

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11530

Grocery System using Flutter: FILL ME UP

Mr. Swapnil Kajne, Mr. Nishanth Gajbhiye, Mr. Amit Saroj, Mr. Akash Patil, Mr. Akhilesh Wankhede, Prof. Virendra Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11531

Farmer Mart

Sayapaneni Meghana, Siddabathula Dhana Lakshmi, Ramineni Naga Lakshmi, Soupati Revathi, Bhanu Prakash Battula

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11532

Emotional Intelligence by Face Recognition Using Machine Learning

Aashna Badli, Anish Singh, Harshit Gupta, Piyush Rawat, Siddhant Negi

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11533

Design of Smart Health Monitoring System for Alzheimer's Patients

Sandeep Kumar Polu

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11534

Review on different mechanisms for detecting financial fraud using machine learning

Sandeep Shinde, Satish Kale

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11535

Predictive Analysis of Online Education System after Pandemic based on Machine Learning Ensemble Algorithms

Pankajini Sahu, Dillip Narayan Sahu*, Ruma Sahu, S. Balaji, Kiran Kumar Sahu

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11536

Predictive Analysis of Students Performance Evaluation in Higher Education: A Machine Learning Approach

Pankajini Sahu, Dillip Narayan Sahu*, E. Nageswara Rao, S. Balaji, Ruma Sahu

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11537

"Eduweb: A Virtual Classroom"

Reena Bardeskar, Tanishq Jena, Rashmi Yadav, Swapnali Waman, Ashwini Dhoke

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11538

DESIGN OF EMBEDDED SYSTEM OF POWER GRID SYNCHRONIZATION FAILURE DETECTION

Ronit Jain, Madhav Dogra, Ankit Mishra, Ankit Kumar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11539

SIGN LANGUAGE ASSISTANT FOR SPECIALLY ABLED

Vanshika Gupta, Tanishq Sharma, Saksham Sharma, Saurav Pant, Yash Kumar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11540

ANALYSIS OF FAKE NEWS DETETCTION USING MACHINE LEARNING TECHNIQUES

Monal Eswar. N, Padmapriya. V, Prabavathi. V, Lilly Florence. M

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11541

KNOWLEDGE-BASED APPROACH TO DETECT POTENTIALLY RISKY WEBSITES

Mrs.R.L.Indu Lekha, M.E, Chaithra N, Deepa Sri, Kamna Agarwal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11542

Image Style Transfer Application With Text Condition Using CNN And CLIP

Rohith D'souza M, Prateek Sharma S, Pranavi Shree V, Lilly Florence M

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11543

IoT based Agricultural Crop Protection

Sahana Devali, Abhishek A G, Abhishek Krishna Naik, Aishwarya,Veerendra V Rao

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11544

COVID-19 Detection through Transfer Learning using Multimodal Imaging Data

Shriyash Mangaonkar, Salman Sayyed, Ronak Kamble, Abhijeet Adusl,Priyanka Agarwal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11545

A WEARABLE SYSTEM TO SAFEGUARD A PERSON

Dr.Pramod Sharma, Swati Gupta, Sanvhit Agarwal, Km.Anita

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11546

IoT BASED SUSTAINABLE GROUNDWATER SUPPLY SYSTEM FOR GREEN INDIA

CHIDANAND MT, KARKERA PRAJWAL, VAISHNAVI G, RHITHIKA SREENIVAS, Dr. Sri Krishna Shastri, Dr. Jayaprakash M C

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11547

Using a Split and Merge Algorithm Based on Superpixels, Automatic Brain Tumor Segmentation from MRI Images

Bhandari Yagnik Ishwarbhai , Sheetal A Wadhai

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11548

SIGN LANGUAGE VERBAL INTERPRETER

Apoorv Gupta, Anshika Awasthi, Arpita Saxena, Vidhi Gupta, Mrs. Uma Sharma

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11549

Restaurant Explorer Using React Native

Harshal Pawshekar, Aashay Dhokpande, Saloni Rahate, Hemant Turkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11550

Music Genre Classification

Shivanshu Garg, Anshu Varshney

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11551

Survey: Approaches for Phishing Detection

Abhishek Patil, Harshal Patil, Tejaswini Savkar, Priyanka Shirore, Prof D. M. Kanade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11552

A Review on Song Recommendation Approaches

Kirti Jain, Shruti Swarup Srivastava, Tushar Vij

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11553

Real-Time Hand Gesture and Sign Language Detection and Translation

Lavneesh Jaggi, Nitish Pasricha, Namita Goyal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11554

EFFECT OF PERFORMANCE BASED PHYSICAL FITNESS PROGRAM ON FUNDAMENT SKILL IN BASKETBALL: A PILOT STUDY

Ramakant D. Bansode, Sinku Kumar Singh

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11555

COVID-19 Detection through Transfer Learning using Multimodal Imaging Data

Salman Sayyed, Shriyash Mangaonkar, Ronak Kamble, Abhijeet Adsul, Priyanka Agarwal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11556

She Support(H)ers: A Django Based Web Application for Women's Empowerment

Prof. Yashodha Sambrani, Apoorva M Mulmuttal, Pooja S Chandavar, Babita Naragund, Aditi K Naik

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11557

Blockchain based "Transparent and Genuine Charity Application"

Prof. Sunil Sonawane, Miss. Riya Chandrakant Chawate, Mr.Omkar Sunil Naiknavare, Mr. Mandar Pravin Patil, Miss. Amisha Bharat Borana

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11558

Song Recommendation Using Emotion Detection

Kirti Jain, Shruti Swarup Srivastava, Tushar Vij

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11559

Review on Applications of Object Detection using Deep Learning

Mr.Mohan Kashinath Mali, Mrs.Vijaya Sayaji Chavan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11560

Start-up profit Prediction

Mr. Kanhaiya Pandey, Mr. Rahul Sharma, Ms. Swapnali Shinde , Ms. Samiksha Ghuge Prof. S.R Patil

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11561

Smart Traffic Light Control Using Image Processing

Mr.S.S.Sonawane, Ms.Bhagyashree Kenchannvar, Ms.Kajal Kumbhar, Ms.Pranjali Salunkhe

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11562

Office Manager Application

Shweta Maurya, Tarang Jain, Unnati Gupta, Vijita Chauhan, Aashna Badli

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11563

Student Engagement Recognition Virtually In Class Environment [SERVICE]

Pratham Mohindru, Rakshit Nigam, Shalini Srivastava, Tejasi Porwal, Dr. Pooja Tripathi

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11565

Future of the Internet of Things (IoT) in India

Suraj Mane, Sheetal Wadhai

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11564

THE VINE ROBOT

Dhananjali Singh, Mini Parihar, Teena Kumari, Abhishek Solanki

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11566

LOGARITHM

Mrs Anagha A. Bade, Mr. Vinai Mehrotra

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11567

ANALYTICS OF LENDING

Harsh Gupta, Garwit Choudhary, Shraddha Srivastava

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11568

Online Transaction System Using Cryptography

Lucky Chaudhary, Noor Ahmad, Prakhar Mishra, Rayyan Manzar Ansari

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11569

Movie Recommendation System Using Machine Learning

Sahil Chacherkar, Nilesh Nikhare, Akash Gawhane, Sagar Burade, Prof. Pratiksha Ramteke

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11570

A Review on Classification and Grading of Areca Nuts using Machine Learning and Image Processing Techniques

Pramod Kumar K G, Adarsh S Shetty, Smitha Prabhu, Deepika, Sowjanya

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11571

Survey and Monitoring of Forest by the Classification of Various Animal Species

Tejaswini C A, Megha V Kulkarni, Yashvith Ballal, Jithesh k, Deeksha Bekal Gangadhar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11572

Survey Study on Rain Prediction System

Rushali Jakkan, Vaishnavi Chavan, Nikita Chavan, Prof. Sunita Vani

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11573

Automated Deep Learning-Based Network for Detecting COVID-19 from a Lung CT Scan

Sudharsan S, Suresh Jagannathan S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11574

Marathi Text to Speech Conversion Using Concatenative Approach

Patekar Komal, Shivani Pardeshi, Pratik Watane, Atharva Thosar, and K.P.Birla

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11575

A Review on Knowledge Map Visualization Using Co-Word Analysis

Utkarsh Malkoti, Vidhi Jain

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KKSDLA – KNOCK and KNOCK SYSTEM FOR DOOR LOCK USING ARDUINO

Ms. Harshavarthini Panneerselvam, Mr. G. Sudhakar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11577

Fake Product Detection Using Blockchain Technology

Srikrishna Shastri C, Vishal K, Sushmitha S, Lahari, Ashwal R Shetty

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11578

Online Voting System – Based on Blockchain

Jeednyasa D. Kharpuriya, Eliazer Mailabathula, Ruchita D. Machale, Suwarna Nimkarde

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11579

A Systematic Analysis on Role of Data mining algorithms in the field of Educational Data mining

Karthick S, Kanimozhi V A, Malathi V A, Vibinchandar S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11580

Chemical Dept Stock Management System

DR.M. MOHANKUMAR, GOBINATH.S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11581

Graphical Password Authentication

K. Kathirvel, Ragunandan.S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11582

Student And Faculty Feedback Management System

SUBA SREE.K, DR.M.MOHANKUMAR

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11583

Integrated Plant Health Monitoring System

Prasad Sawant, Dheeraj Shingate, Bhagyashree Thorat, Jayesh Rajole, Namrata Pagare

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11584

Smart E-vehicle and Smart Road System using RFID Technology

Prof. Mrs. S. V. Karande , Sakshi Santosh Memane , Vaishnavi Chandrakant Bodke, Harshada Rajaraam Sonawane

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11585

Dlib and YOLO Based Online Proctoring System

Chinmaya Nilakantha Naik, Adarsh S Shetty, Vismita Kuppayya Naik, Rakshith CP

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11586

Software Testing Techniques: Manual Testing

Satish Kale, Sandeep Shinde

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11587

E-Patha – A Hyperlocal Weather Monitoring Application Using Django framework

Chinmaya Nilakantha Naik, Nikethan Poojary, Gaurish Vidyadhar Naik, Anviraj Shetty, Uday J

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11588

Entropy Based Lung Cancer Prediction

Dimpy Raghav, Priyanka Srivastava, Nancy Singh Harsh Rawat

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11589

CROP YIELD AND PRICE PREDICTION USING ARTIFICIAL NEURAL NETWORKS AND DECISION TREE REGRESSION

Abhishek Parashar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11590

QUALITY CHECK USING IMAGE PROCESSING

Aditya Shahare, Sneha Sharma, Ranjeet Sonawane, Poorva Wadhavane, Prof. Monali Mahajan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11591

Detection of Soft Tissue Tumor using Machine Learning

Rambhau Dhage, Tejas S Dusane, Chetan Patil, Sayali Rathod

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11592

Developing an E-Commerce Website with Blockchain intergrade

Yuvanraj.K, Thulasika.G, Mr. Sudhakar.G

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11593

Blockchain-based secure healthcare for Cardio Disease Prediction of Arrhythmia

Arbaaz Bebal, Nomit Bhatnaga, Ankita Jagtap, Pratiksha Kamthe, Gajanan Arsalwad

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11594

Data Concealment Using Steganography Technique

Apurva Sankpal, Adarsh Singh, Sanket Takalkar, Shubham Varma, Prof. Ayesha Sayyed

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11595

Improve the Recognition Accuracy of Sign Language Gesture

Priyanka Gaikwad, Kaustubh Trivedi, Mahalaxmi Soma, Komal Bhore, Prof. Richa Agarwal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11596

Smart Agriculture System to Control the Water Resources Using Arduino UNO AND IoT

Ramachandra H N, M H Vidyashree, Vignesh V Udupa, Raghavendra Pai, Abhilash

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11597

A System To Detect Forest Fire Using Optimal Solar Energy: A Review

Anamika Dinesh, Adarsh S Poojary, Shreya B Shetty, Rakshith K, Vishwitha A

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11598

Augmented E-commerce: Making Augmented Reality Usable in Everyday E-commerce with Chatbot Integration

Dr. Nilesh Shelke, Ashish Akhare, Nitish Suryawanshi, Shrutika Mankar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.11599

FORECAST WEB TRAFFIC TIME SERIES USING ARIMA MODEL

Vrushant Tambe, Apeksha Golait, Sakshi Pardeshi, Rohit Javeri, Gajanan Arsalwad

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115100

Segmentation and Classification of Brain Tumor using Watershed, SVM and CNN Algorithms

Ajinkya Koulwar, Sainath Chakrawar, Aditya Pawale, Gautam Thakur, Prof. Raju Singh

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115101

CRIME BASED CLUSTERING AND ZONING

Vedant Patil, Aniket Desale, Yash Palekar, Tanishka Patil, Prof. M. J. Patil

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115102

CREDIT SYSTEM USING FACIAL RECOGNITION

G. Srujana, G.Balachennaiah, D. Pavan Kumar, A.Venkatesh Babu, C.Anish

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115103

AES IMAGE ENCRYPTION (ADVANCED ENCRYPTION STANDARD)

Paavni Gaur, Mr. Ajay Kaushik

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115104

Calories Burnt Prediction Using Machine Learning

Rachit Kumar Singh, Vaibhav Gupta

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115105

Big Mart Sales Prediction Using Machine Learning

Nimit Jain

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115106

Process Automation for instant Procurement of Crypto currencies

Francisca Oladipo, Paul Stephen Edache & Andrew Adeiza Ohieku

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115107

"Android based Development of an app Fixician for home utilities using android programming."

Prof. Sunil Sonawane Sir, Kesar Gadiya, Tanishq Kundiya Avadooth Dhumal, Akshad Kalashetti

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115108

Prediction of Diabetic Retinopathy using Neural Networks

Vishesh S, D S Pavan, Rishi Singh, Rakesh Gowda B

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115109

Types of Software Testing

Sujata Gawade, Pournima Kamble

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115110

RTO SIGN RECOGNITION FOR DRIVER ALERT

Shubham Tadas, Aditya Mundhe, Suraj Dongare, Hitesh Sonawane

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115111

PREDICTION OF DYSLEXIA BASED ON EYE TRACKING

Pranav Pawar, Anisha Deochake, Bhagyoday Patil, Nachiket Mali, Dr. Snehal Kamlapur

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115112

Spectrum Sensing techniques for Cognitive Vehicular Networks

K Jyostna, Dr. B N Bhandari

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115113

SMART TRAVEL GUIDE APPLICATION

Mrs. S.A.Shete, Miss. Akansha Anil Sasane, Mr. Vishal Balu Tijore, Mr. Rohan Laxman Pawar, Mr. Praful Pradeep Dhiwar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115114

Secure Socket Layer in the Network and Web Security

RAM AGASHE, AKASH PAUL, UDAY AWARE, CHINMAY KHOPKAR,VRUSHABH GIRI

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115115

PLANT HEALTH IDENTIFICATION USING LEAF IMAGES

VANSH ARORA

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115116

SMART TRAVEL GUIDE APPLICATION

Mrs. S.A. Shete, Miss. Akansha Anil Sasane, Mr. Vishal Balu Tijore, Mr. Rohan Laxman Pawar, Mr. Praful Pradeep Dhiwar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115117

Cryptocurrency Price Prediction and Visualization using Deep Learning

Mayur Patil, Jitesh Bagul, Raj Dugad, Pritam Karad, Prof. Mokshada Kotwal

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115118

Decentralized Finance App Using Ethereum Blockchain

Himanshu Pratap Singh

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115119

SIGNBOARD DETECTION AND TEXT RECOGNITION USING CNN

Golla. Manasa,Are. Navya sri, Abburi. Sirisha,Edulamudi. Jyoshna, J. Sravan Kumar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115120

ML technique to improve the performance of Mobile Adhoc Network

Hamela K

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115121

DATA INTEGRITY AUDITING WITHOUT PRIVATE KEY STORAGE FOR SECURE CLOUD STORAGE

Sivaganesh.M, Priyanka.M, Priyadharshini.C, Priyadharshini.G, Sujitha.A

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115122

A Study on Digital Marketing and Its Impacts

DR. A. PUNNAVANAM, MRS. JASEENA. VP

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115123

Anti-Spoofing Based Secured Transaction Using Facial Recognition And FA

Anukul Muley, Akash Bendre, Priti Maheshwari, Shanmukh Kumbhar, Prof. Bhagyashree Dhakulkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115124

Divergent Big Data Tools and Its applications in Different Domains

Vaishali B. Bhagat, Dr. V. M. Thakare

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115125

Using Machine Learning Techniques To Detect Covid-19 infected patient's X-Ray

Adyan Ahmed, Karan R, Sanjay Kumar B M, Revanth G P, Krishnamurthy H

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115126

Phishing Attack Detection using Hybrid Learning

Shreetej Sharma, Darshan M, Shashank KS, Prof. Usha C.R

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115128

Object Tracking Using MEMS Microphone Arrays

Harrison Keats, Kyle Kearly, Dean Aslam

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115129

Digital Mapping of Faulty Transmission Lines

Dony D'Souza, Abilash A R, Shivani, Vishisht Padiyar M

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115130

SMART AND COOL CAR PARKING SYSTEM

Vasanthamma H, Amrutha.Hugar, Chandana.B , Kavya S S, Omshree S N

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115131

BETA-VERSE

Dr. C. Sunitha, R. Rohith Yasif, M. Harish

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115132

PNEUMONIA TEXTURE ANALYSIS USING X-RAY IMAGES

Nakul Sethi, Shubh Kumar, Yitik Kawatra

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115133

HAND GESTURE RECOGNITION USING OPENCV AND PYTHON

Dr. C. Sunitha, M. Krishna priya, R. Sanjana

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115134

COLLEGE MANAGEMENT SYSTEM

P. SUBHA, I.FEFINA, C.NIRANJANA DEVI,S. SURUTHIKA,K. SUSHMEENA

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115135

"Prison Management System"

MR. SAISH NILESH WAGH, MR.SAGAR VIJAY MINDE, PROF. M. R. JADHAV

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115136

Invincia Management System

Anoop V V, H Shashank Kumar, Gondi Sankara Sai Skanda, Dr. Sharmasth Vali Y, Ms. Sneha.S.Bagalkot

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115137

Password Authentication Methods Using Various Techniques

Victoria A. Mittapelli, P.T. Tandekar, S.K Purve

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115138

An Effcient Way to Detect the Duplicate Data in Cloud by using TRE Mechanisam

Saiprasad Waman Wate, Lowlesh Nandkishor Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115139

Face PIN: Biometric Authentication System For ATM Using Deep Learning

K. PRIYANKA, N. LAKSHMI, G. MAMTHA, V. SINDHU

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115140

SMART CLASSROOM ATTENDANCE SYSTEM USING FACE RECOGNITION

G. BHUVANESWARI, K. KAVIYASELVI, M. LAKSHMI PRABHA, S. PUVIYARASI

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115141

Various Techniques Used in Cryptography

Vishakha R. Agalawe, Nihal B. Jiwane, Ashish B. Deharkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115142

A STUDY OF CYBER SECURITY CHALLENGES AND ITS EMERGING TRENDS ON LATEST TECHNOLOGIES

Shilpa S. Kalwal, P.T. Tandekar, S.K Purve

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115143

Design and Implementation of E-learning System

Pratiksha S.Bodhe,Ass. Prof. Neehal B. Jiwane Sir,Ass. Prof. Ashish Deharkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115144

KNOWN AND UNKNOWN FACE SMART HOME DOOR LOCK SYSTEM USING AI AND EDGE COMPUTING

K. PRIYANKA, S. ABIRAMI, P.AKILA, S.MALA, G.NIVETHA

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115145

HEALTHCARE CHATBOT

Vigneshwara C, Kunda Suchitra, Sareddy Nikhil Reddy, Rahul Manojkumar Makadiya, Dr Sivakumar N

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115146

Data Collection and Analysis in a Smart Home Automation System

Mr. Krishna. M. Patel, Mr.L.N. Yadav, Mr.V.M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115148

Using Encryption Algorithms in Cloud Computing for Data Security and Privacy

Mr.Parin.J.Patel, Mr.L.N.Yadav, Mr.V.M.Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115149

INTERNET of THINGS RESEARCH CHALLANGES and FUTURE SCOPE

Sohel M. Sheikh, Lowlesh N. Yadav, Vijay M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115150

THE NEW TREND FOR SEARCH ENGINE OPTIMIZATION, TOOLS AND TECHNIQUES

Swati Kishor bobade, Mr. L.N. Yadav, Mr. V.M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115151

Research on Association Rule Mining Algorithms

Hirali Devendra Wadaskar1 Vijay M. Rakhade, Lowlesh N. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115152

Detecting Alzheimer using Shallow Learning and Deep Learning Techniques

Sakshi Singh, Komal Gaikwad, Asma Nehal, Sukanya Pawal, Poonam Gupta

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115153

Blockchain Technology

Sangita Vijaykumar Singh, Lowlesh Nandkishor Yadav, Vijay M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115154

Virtual Control of the Mouse using Hand Gesture

Pooja Keshav Dongre, Neehal B. Jiwane, Ashish B. Deharkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115155

Study of Ethical Hacking

Sakshi Madhukar Adewar, Neehal B. Jiwane, Ashish B. Deharkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115156

Human – Drivers Drowsiness Detection System

Vishnu Dinesh, Arun Prakash, Amal Dasan, Poojitha Reddy, Mr. Mohammed Zabeeulla

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115157

Sentiment Analysis of social media

Anamika J. Mallick, Pushpa Tandekar, Shrawan Purve

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115158

Brain Tumor Detection Using Convolutional Neural Network In Deep Learning

Pavan Kshirsagar, Aniket Joshi, Vivek Shedage, Abhishek Kamble, Miss. Sakhare Y.N

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115159

Automatic Detection Of Coronavirus Disease Using X-Ray Images By Convolution Neural Networks Based On Python

Ms.G.Elayaroja, M. Mohamed Ismail, B.Chouthri, M.Chandru

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115160

A Study on Positive and Negative Effects of Social Media on Society

Anuradha A. Ename, Vijay M. Rakhade, Lowlesh N. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115161

Digital Voting System Based On BlockChain

Sujita Sudhakar Bhalme, Neehal B. Jiwane, Ashish.B.Deharkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115162

COVID-9 Protocol Management and Violation Detection

Hingne Shubhankar, Somwanshi Shailendra, Kothawade Dhiraj, Sadgir Tanuja, and Prof.Jyoti Mankar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115163

Sensor Study: A Review of their Precision and Reliability

Falguni Pal, Dhiraj Gede, Ritik Ingle, Tushar Karade, Ritikesh Nimje, Priyal Jambhulkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115164

Security Solution of The Atm and Banking System

Ashwini Pyarelal Bambode, Lowlesh Nandkishor Yadav, Vijay M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115165

RESUME SCREENING USING TF-IDF

Chandraghandi S, Shilpa S, Anamika P, Kamalakkannan R, Santhoshsivan N

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115166

Location Based Alarm System Using Android Development

Dr. Rajiv Suresh Kumar, Anirudh M, Manuvel Victor J, Rakesh R

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115167

AI Attendance Using Face Recognition System

Mohammad Shoeb Sheikh Mohammad Siddiki, Neehal B. Jiwane, Ashish B. Deharakr

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115168

Integrating Blockchain into Agriculture Supply Chain

Pranav Prakash Kamble, Pratik Pramod Shetane, Baliram Shankar Waghmare, Chaitanya Jalindar Kate, Dr. Dinesh Bhagwan Hanchate

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115169

Diabetes Disease Prediction using Machine Learning Technique

Dr. G RAJIV SURESH KUMAR, Shubham Kumar Mishra, Merwin Prabhu, Vishnu Priya MK, Sruthi S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115170

DEEP LEARNING SYSTEM TO INTRUSION DETECTION BASED ON RECURRENT NEURAL NETWORK

Narmada B, Brinda S, Prasanna S,Shneka P

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115171

REAL TIME PEDESTRIAN DETECTION

Prof. Karthikeyini, Adarsh AV, Akhilesh A, Aswin N L, Prathin Pratheesh

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115172

Detection Of Cyberbullying On Social Media Using Machine Learning

Athira S, Joel Saji, Abin Biju, Shon Alex Chacko

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115173

SELF MONITORING SYSTEM FOR VISION BASED APPLICATION USING DEEP LEARNING

G. SUGAPRIYA, S. BUVANESHWARI, S. EVANJELIN, M. NIVEDHA, A. SIVASANGAVI

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115174

IMAGE PROCESSING COMPUTER VISION FOR CRACK DETECTION OF AIRCRAFT SURFACE

Devvrat V. Tarale, Ass. Prof. P. T. Tandekar, Ass. Prof. S. K. Purve

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115175

Research on Data Mining

Chandrakant A. Zade, Prof. Vijay Rakhade, Prof. L. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115176

INTEGRATED PARKING SYSTEM FOR REAL-TIME PARKING

Greeshma K, Shibin K, Nabeel Kallan,Amal E R,Mohammed Musthafa A P

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115177

ANDROID GAME DEVELOPMENT USING VCROSS – PLATFORM APPLICATION IN UNITY GAME ENGINE WITH C# LANGUAGE ZOMBIE SHOOTER

Prof. M. Ravi Kumar, Praveen Kumar J, Sivahari S, Bavan Kumar V, Sivasankar A

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115178

STUDY on INTERNET of THINGS BASED APPLICATION

Tanushree S. Dhumane, Vijay M. Rakhade, Lowlesh N. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115179

HUMAN COMPUTER INTERACTION (HCI) THROUGH EYE-GAZE TECHNOLOGIES BASED ON IMAGE PROCESSING

Rupa M, Srinivasan S, Harish V, Raja S

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115180

Shipborne Monitoring System Using Lora Technology

Er.S.R.Karthiga,S.Vishnuvarathan,V.Yuvaraj

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115182

Theft Detection Using Artificial Intelligence Video Retrieval Technique

Narmada B, Iswarya G, Kaviya M, Menaka M

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115183

IOT Based Robot for Social Distancing

Ms. Pallavi Katre, Dr. S.S.Shriramwar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115184

Diabetes Prediction using Machine Learning

Daksh Ghatate, Sanket Bhoyar, Farhan Qureshi, Madhurmeet Jadhav, Ima Rahman, Mohammed Rayyan

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115185

CONTENT AND SHAPE-AWARE IMAGE ADAPTING

Latesh Kapse, Rohit Khamkar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115186

ONLINE KNOWLEDGE ASSESSMENT

P. SUBHA, T.JAYANTHINI, S.KOWSALYA, R.PRIYADHARSHINI, A.PRIYAVATHANI

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115187

TRUST CENTRIC PRIVACY PRESERVING BLOCKCHAIN BASED DIGITAL CERTIFICATE LOCKER

JAYAPRATHA S, GOWSALYA A, RASMI J, ROSLINA BEGUM R

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115188

Cloud Storage Security Based on Dynamic key Generation Technique

Soundarya Sunil Tumsare, Lowlesh Nandkishor Yadav, Vijay M. Rakhade

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115189

Review on Voice Based Email System for Visually Impaired

ASHWITHA SHETTY, MEGHA MANJUNATH NAIK, NAYAK ASHMITHA SURESH, SACHIN, SANJEEVI KUMAR P

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115190

AIOE BASED REAL TIME THREAT DETECTORS FOR SMART SURVEILLANCE

Er.V.Kokila, T.Nalin, M.Neelamegam

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115191

Research on Techniques for Resolving Big Data Issues

Dhanashri D. Shukla, Vijay M. Rakhade, Lowlesh N. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115192

OBJECT DETECTION USING ARTIFICIAL INTELLIGENCE

Arji Bhandhavi, S Rishika

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115193

Investigation Recommendation System Using AI

Shital Vijay Karekar, Ashish B. Deharkar, Neehal B. Jiwane

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115194

Performance Evaluation And Analysis Of Fisheye, Tree And Linear Menus On A Web Based Interfaces

Saidu Muhammad, Suru Hassan, Anas Gulumbe

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115195

Artificial Neural Network

Dhanashree V. Navghare, Vijay M. Rakhade, Lowlesh N. Yadav

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115196

Diabetic Retinopathy Detection and Classification

Dr. T N Anitha, Brunda K, Jhalkee

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115197

Fire detection and pesticide spraying using drone

Karthik Prakash, Aishwarya S B, Amin Pradvith, Vinayambika S Bhat

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115198

MACHINE LEARNING APPROACH FOR AQI AND POLLUTANT PREDICTION FOR METROPOLITAN CITIES

Malini R, Mallika C, Navyashree PN, Rukhaiya Badar R

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115199

IoT based Aquaponics Monitoring system

Prof. Vasanthamma, G Punith Goud, Shainaz K, Sree Lakshmi, Vaishnavi Chitragar

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115200

GESTURE CONTROLLED VIRTUAL MOUSE

Shashwat Gupta, Shivam Sharma, Suhana Sharma, Tannu Sharma, Medhavi Bhardwaj

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115201

Handwritten Recognition with Language Translation

Dr.Maria Manuel Vianny, Harshitha K C, Keerthana L, Pavithra S, Varshitha Y

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115202

Brain Tumor Detection

Syed Amaanullah, Pallavi N

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115203

Cervical Cancer Detection using Deep Learning

Sonia S B, Gagan V, Prasanna Kumar V, Shreesha K Rao

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115204

HUMAN ACTIVITY RECOGNITION IN REAL TIME USING DEEP LEARNING

AZHAGUMEENATCHI.C, DURGA DEVI.R, KAREESHINI.S, SARANYA.B, SANGEETHAPRIYA.J

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115205

Survey on Improvisation quality of degraded images using Super resolution CNN Algorithm

Shruti B, Ajay Hegde, Hruthic Chandan M, Nagarjuna C

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ONLINE BUSPASS ISSUE AND RENEWAL USING SELENIUM

DIVYA R, Arunabishek A, Joy prasanna S, Sridharan R, Vinoth K

Abstract | PDF | DOI: 10.17148/IJARCCE.2022.115207

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Aniruddh T S, Joshua A, Mukesh Kanna V, Vishnu S S, Dr. Tamilselvi P

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Early Detection of Pneumonia in COVID-19 Patients Using CNN Algorithm

Kamakshi D Shanbhag, Greeshma G Sail, Arshi Prasad, Uzma Sulthana

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REAL TIME DETECTION AND REPORTING OF ROAD POTHOLES USING GPS

V. NITHYAPOORANI, P. KEERTHANA,T. JAYAPRIYA,P. SOUNTHARYA, K. THAIYAL NAYAGI

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Simulation of Preemptive Shortest Job First Algorithm

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Abstract: With simulation, we imitate the operation of a real world process or system over time. It requires the use of models; model that represent the behavior or characteristics of the selected process or system. Computer are used to execute the simulation. In operating systems, OS-SIM is one of simulation application to represent the system characteristic or behavior of any process scheduling algorithm. Several scheduling algorithms in operating systems are available. There are preemptive shortest job first scheduling algorithm and non-preemptive shortest job first scheduling algorithm in operating system. Preemptive shortest job first scheduling algorithm is where when the shortest process arrives and is positioned at the head of the queue and interrupted the longer process. In this journal, we simulate preemptive shortest job first (SJF) algorithm with OS-SIM. Case study is discussed to understand the simulation thoroughly.

Keywords: Preemptive Shortest Job First, Scheduling Algorithm, OS-SIM

I. INTRODUCTION

Operating System (OS) is software which its role is as an interface between a user and the computer hardware. OS is known as a resource manager because its main duty is to manage the resources of computer system. Scheduling is one fundamental and most important design (Putra, 2020). Scheduling refers to set of rules, policies and mechanism that govern the order in which resources is allocated to various processes and the work is to be done. The scheduling is a methodology of managing many queues of processes in order to make delay minimum and to make performance optimal of the system. A scheduler is a module in operating system that implements the scheduling policies. Its main objective is to make systems performance's optimal that match with the criteria set by the system designer (Pawan Singh, Amit Pandey, 2015).

Scheduling is a prime concept in multiprocessing and multitasking of OS design and in real-time operating system design by arranging switching in the CPU among process. Premptive Shortest Job First (SJF) Algorithm is a well known algorithm in CPU processing. A scheduler is an OS module that implements the scheduling policies. Its primary objective is to optimize the systems performance according to criteria set by the system designer (Shweta Jain, 2016)

A computer simulation is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system. It is a tool to virtually investigate the behavior of the system under study. Computer simulation in operating systems has become a useful part of modelling many scheduling algorithms. But also in other area of science like in physics, chemistry and biology and human systems in economics and social science (e.g., computational sociology) as well as in engineering computer simulation. Simulation is used to gain insight into the operation of those systems. A good example of the usefulness of using computers to simulate can be found in the field of operating systems with OS-SIM. In such simulations, the model behavior of file, disk, memory management, process scheduling simulation can be implemented (Wikipedia, 2022).

With simulation, we imitate the operation of a real world process or system over time. It requires the use of models; model that represent the behavior or characteristics of the selected process or system. Computer are used to execute the simulation. OS-SIM is one of simulation application to represent the system characteristics or behaviors of Preemptive Shortest Job First (SJF) algorithm (OS Concep Simulator, n.d.).

The Operating System Simulator (OS-SIM) is designed to support two main aspects of a computer system's resource management: process management and memory management. Once a compiled code is loaded in CPU Simulator's memory, its image is also available to the OS Simulator. It is then possible to create multiple instances of the program

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images as separate processes. The OS Simulator displays the running processes, the ready processes and the waiting processes. Each process is assigned a separate Process Control Block (PCB) that contains information on the process state. This information is displayed in a separate window. The main memory display demonstrates the dynamic nature of page allocations according to the currently selected placement policy. The OS maintains a separate page table for each process which can also be displayed. The simulator demonstrates how data memory is relocated and the page tables are maintained as the pages are moved in and out of the main memory illustrating virtual memory activity . In terms of process scheduling, OS-SIM can simulate all scheduling algorithms like FCFS, priority, round robin, and shortest job first. Modelling these algorithms is the main objective of OS-SIM.

Preemptive SJF scheduling algorithm is usually used among various other algorithms for scheduling CPU, however it can make the problem of starvation which happens when processes with longer burst time are not given any chance of CPU utilization due to prolong CPU usage by processes with shorter burst time.

OS Sim (Operating System Concepts Simulator) is an educational purpose application to graphically simulate Operating System concepts and support the computer science students learning process (OS Concep Simulator, n.d.) .

II. OVERVIEW OF EXISTING ALGORITHMS

There are several scheduling algorithms proposed by experts, namely:

1. **Shortest Job First (SJF)**. This one is a well known scheduling algorithm, the system will choose the shortest job of process to be executed first. That's why it is named Shortest Job First (SJF). One main weakness of this algorithm is that starvation could happen, the long process will never be executed because there are still shorter jobs exist in the system. If shorter job still keeps coming in then starvation will occur (Putra, 2020). SJF algorithm is one optimal algorithm. It executes the short process before the long process and thus reduces the waiting time for short process more than increases waiting time for long process. Which finally ends up with minimum average waiting time compared to the other scheduling algorithm (Asma Joshita Trisha, 2019).
2. **Round Robin (RR)**. Round robin algorithm is a real-time scheduling algorithm in operating system. The Round Robin scheduling algorithm is cited as standard Round Robin and it is a preemptive type that allocates a slice of context switching. Whenever time slice or context switching completes the current process is preempted and put in the rear of ready queue. Round robin algorithm is usually applied in real-time and time-sharing operating system because it provides every process an average share of time to utilize the CPU and gives a small responds time. However, the standard round robin algorithm has many weaknesses such as small throughput and big turnaround time as well as the big waiting time and also huge context switches number (Hoger K. Omar, Kamal H. Jihad, n.d.). In advanced round robin, a dynamic time slice is used to find the effective algorithm that is running in the system. The intelligent time slice (quantum) for round robin architecture for real time operating systems is a modified version of simple round robin scheduling (Putra, 2020).
3. **Priority Scheduling**. In priority scheduling, the idea behind this algorithm is straightforward, each process is allocated a priority. The equal process priority are scheduled in first come first serve basis. SJF is one example. SJF has the same idea as Priority Scheduling. Namely, the longer the burst of CPU, then it makes the lower the priority and the smaller the burst time, the higher the priority (Kunal Chandiramani, Rishabh Verma, 2019). Priority can be defined internally or externally. Internally defined priorities use some measurable quantities or qualities to computer priority of a process (Chandra Shekar N, 2017). Priority scheduling algorithm manages processes in its queue based on its priority. Something else that gives priority on running state is preemption (Ledina Hoxha Karteri, 2015).
4. **First Come First Serve (FCFS).** This is a standard algorithm. The process which arrives first will be executed first. That is why it is called first come first serve. The first process that exist will be executed first. This is the same as the concept of First In First Out (FIFO) (Kunal Chandiramani, Rishabh Verma, 2019). This is the simplest scheduling algorithm. While the processes in the ready queue will occupy the CPU in the order of their arrival to the ready queue. The process which enters first in the ready queue will occupy the CPU first and the process which enters afterwards will occupy CPU sequentially in the arrival order. This is a non-preemption scheduling algorithm. Once the process is allocated in the ready queue, it will be release by the CPU until it is terminated. The weaknesses of this algorithm is a high average waiting time (Pawan Singh, Amit Pandey, 2015) (Siahaan, 2016) (Hoger K. Omar, Kamal H. Jihad, n.d.).

III. ORGANIZATION STRUCTURE

This journal is divided to be six chapters. The first chapter is introduction. In this chapter, we discuss the idea behind the the CPU scheduling algorithm and about CPU simulation. In the second chapter we discuss the overview of existing algorithms. Discussion about algorithm like shortest job first, round robin, priority algorithm, first come first serve. The

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third chapter is explanation about organization structure of this journal. The fourth chapter is about OS-SIM Simulator, Chapter five is about case study analysis of simulation of preemptive shortest job first algorithm. Here we discuss one case study simulation. The last chapter is conclusion and future work.

IV. OS-SIM

Operating Systems concepts are best learned through implementation. However, this can be difficult and time consuming. To support this learning process an OS simulator has been developed that allows students to learn about OS concepts using this simulator, OS-SIM.

The OS-SIM can be used to explore the behavior of the operating system. For example, the user can step through each process to see when it has access to the processor, how long it has had access, and where in memory it is located. The use of memory is visually depicted in the simulator based upon which memory allocation method the user chooses.This modular approach permits the user to experiment with different implementations of different algorithms. Through this experimentation the user is able to gain a better understanding of the behavior and performance characteristics of the OS element under consideration.

Figure 1. below is the dashboard display of OS-SIM Simulator. There are five pull-down menus, namely: File, processes, Memory, File System, Disk, and Help. Here we can see four major divisions of the operating system to be simulated, namely, process scheduling, disk management, memory management, and file management. File Menu is for arranging file. Menu Processes is about process scheduling manipulation, we will use this a lot in this simulation. This is our main focus. Menu Memory is for memory management simulation. Disk is for disk simulation and the last menu, Help, is for information and help about this simulator.

FIGURE 1. OS-SIM SIMULATOR

In figure 2 below, we can see here the simulation of first come first serve algorithm. We will get into deep on process scheduling. Here we can manipulate the processes scheduling of the systems.

There are four algorithms that can be simulated: First Come First Serve (FCFS), Shortest Job First (SFJ), Priority, Round Robin. All can be made preemptive or non preemptive algorithm.

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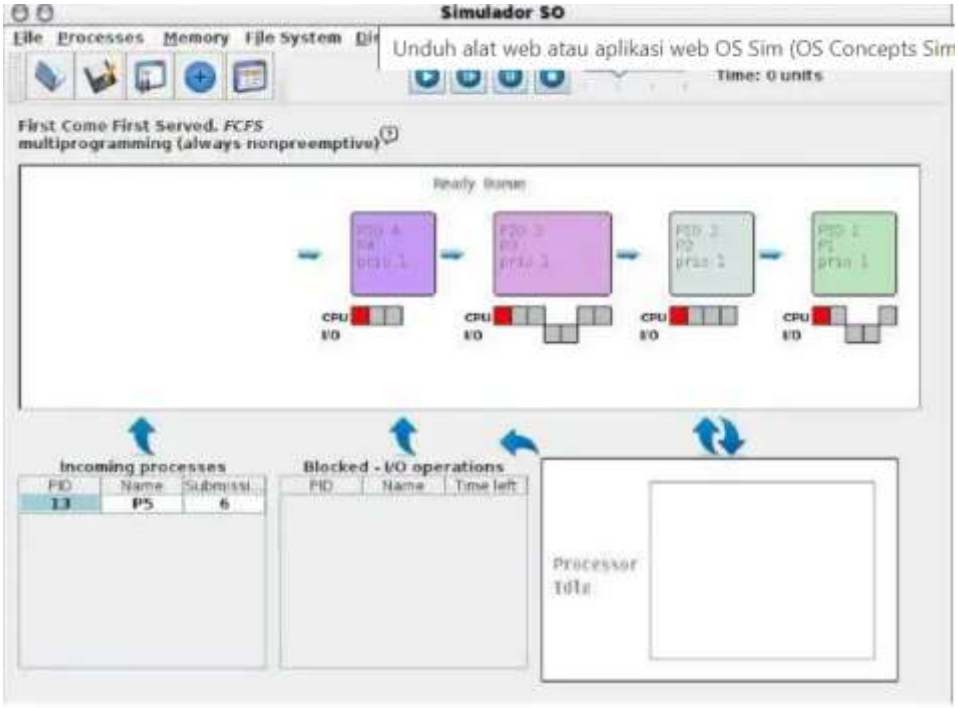

FIGURE 2. PROCESS SCHEDULING ALGORITHM SIMULATION

In figure 3, we can see the simulation of Non Contiguous Memory Management, with Pagination Page: 2 unit

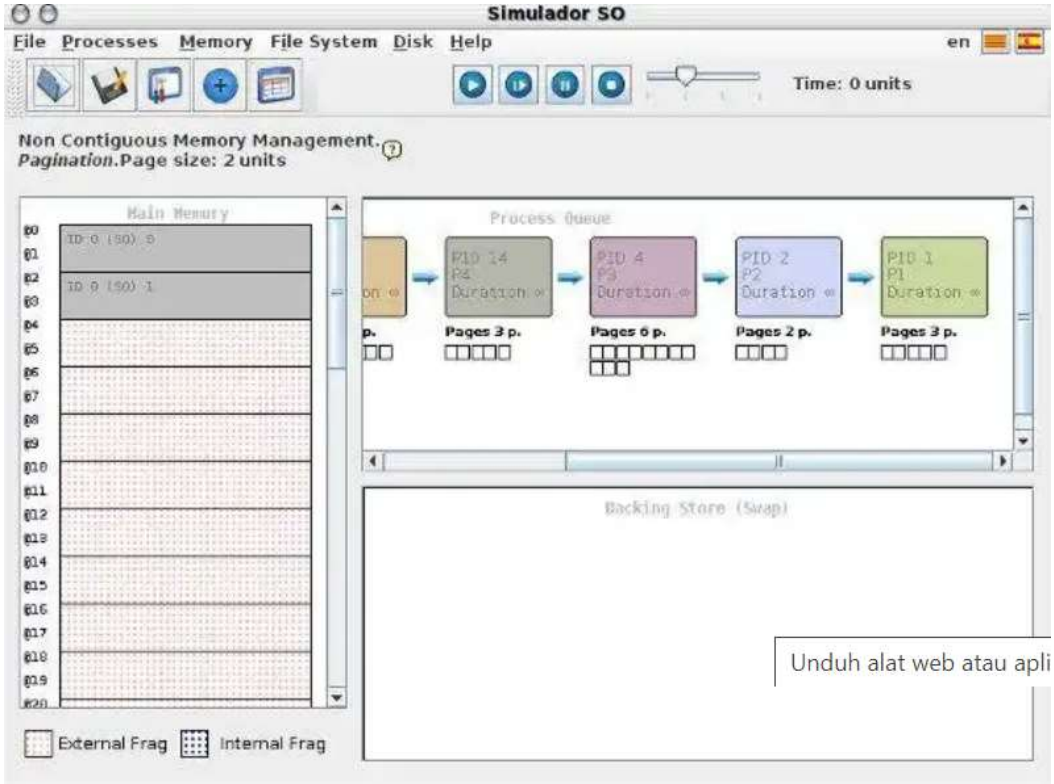

FIGURE 3. MEMORY MANAGEMENT

In figure 4, we can see the display of file allocation table, the cluster, the sectors, tracks, clusters. For saving the data in the disk.

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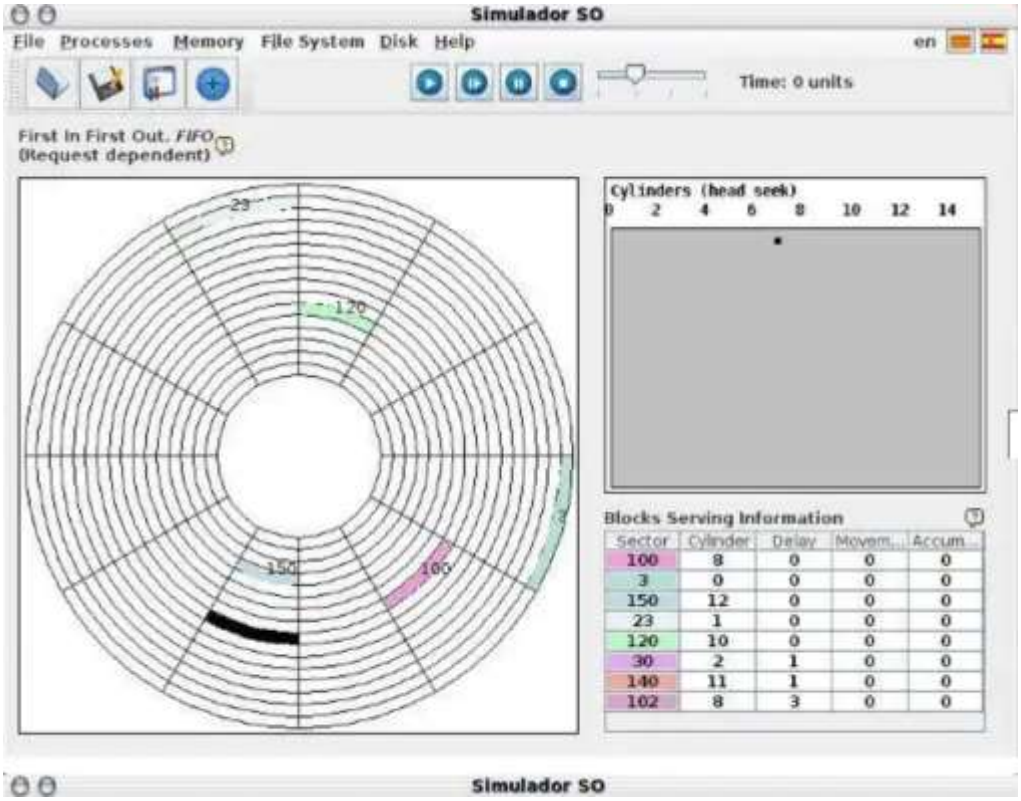

FIGURE 4. DISK ALLOCATION IN SECTORS, TRACKS, AND CLUSTER.

In figure 5 below, we can see the simulation of file management in blocks.

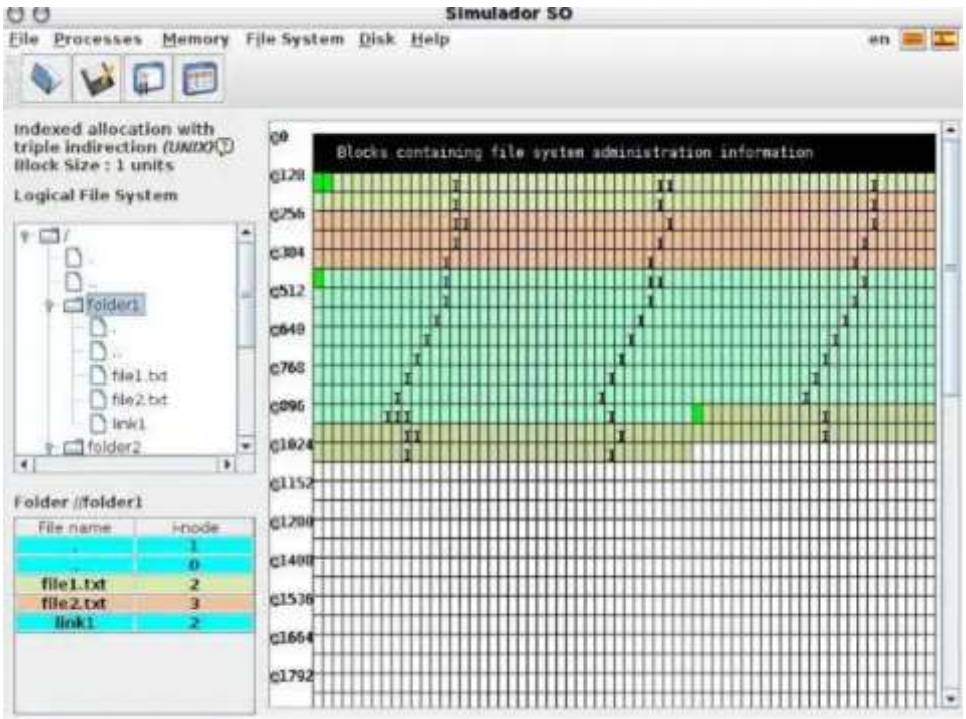

FIGURE 5. FILE MANAGEMENT

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In this simulator we can see the virtual representation of the systems process scheduling, that is behind the scene. With it we can describe and understand the process work clearly. Another advantage of this OS-SIM is that we can explore more deeply into the scheduling process of the systems. And manipulate it, making it easier to be understood.

V. CASE STUDY ANALYSIS

In this chapter we will discuss one case study about preemptive shortest job first using OS-SIM. There will be four processes. Each with burst time and arrival time. The discussion is as follows:

Here we have four processes, Please take a look on table 1, we have four processes namely A, B, C, and D. Also given here different arrival times, with different burst times each.

TABLE 1. CASE STUDY

Process	Arrival Time	Burst Time
A	0	4
B	1	2
C	2	2
D	4	2

Please take a look on figure 6. The table of table 1. is implemented as shown in figure 6. on OS-SIM.

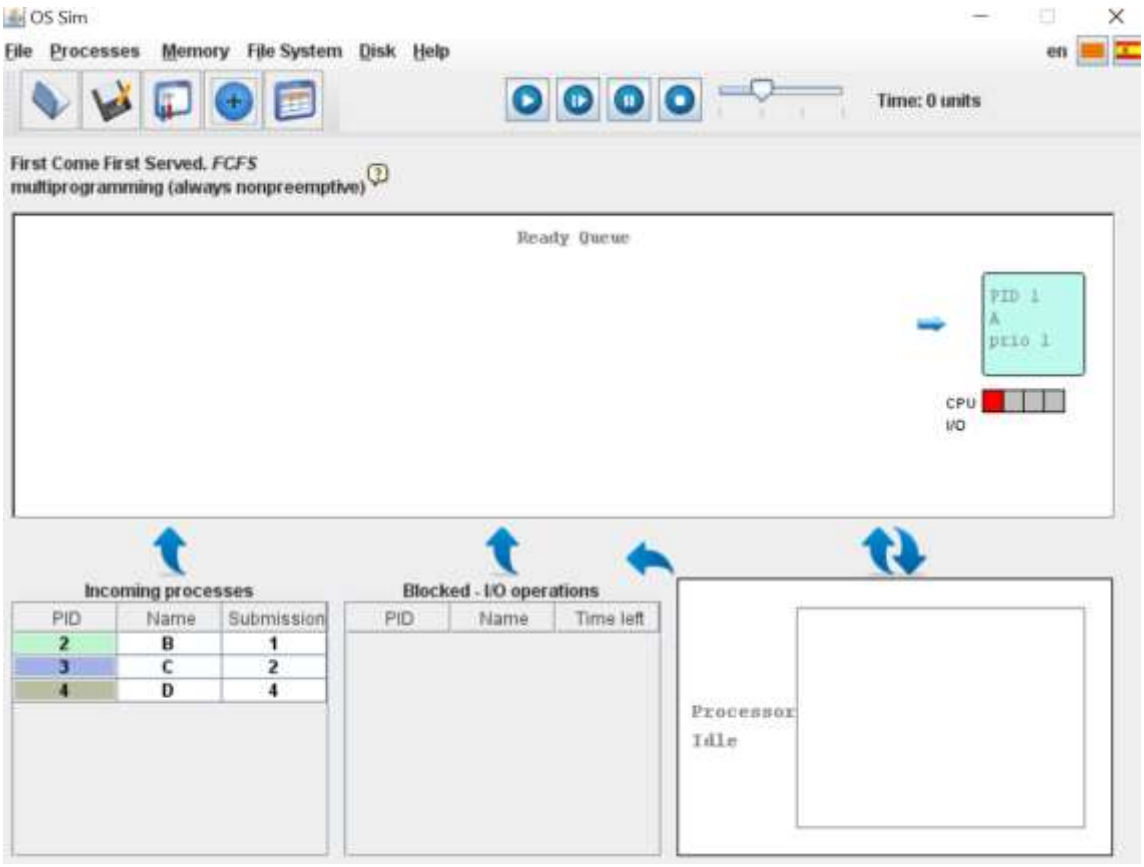

FIGURE 6. SIMULATION IMPLEMENTATION OF TABLE 1.

At t=0, A arrives with burst time 4. But at t=1, B interrupted A. The system compares the burst time of A and B. A is 3 ms left, but B is still 2 ms. Then at t=1, B interrupted A to be executed. As shown in figure 7.

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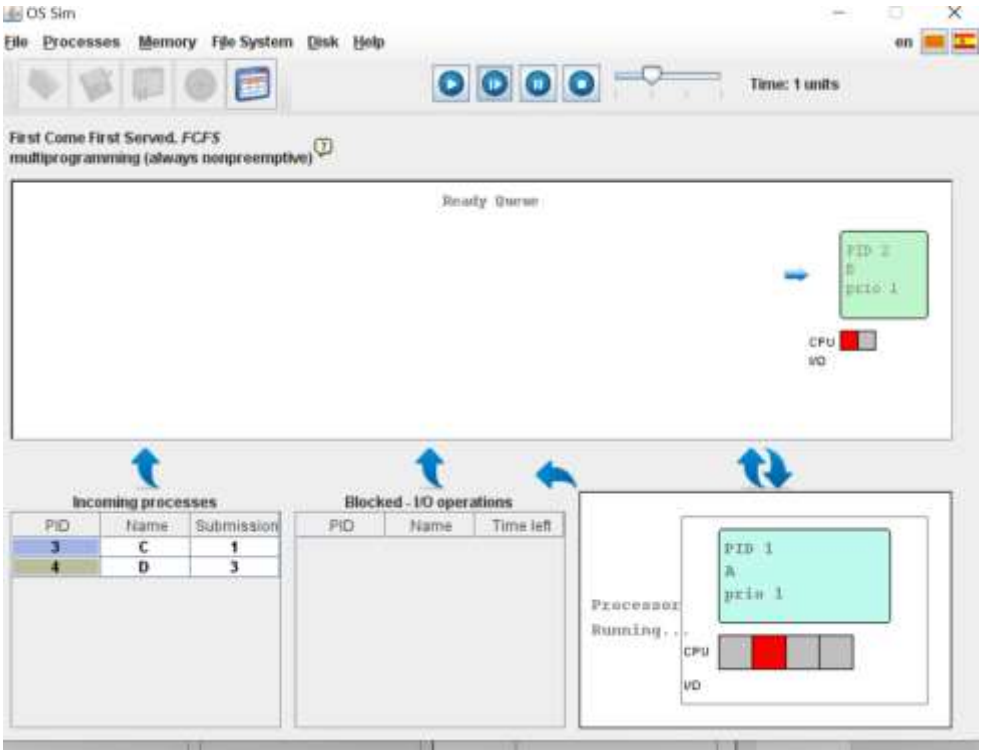

FIGURE 7. STEP BY STEP SIMULATION IMPLEMENTATION AT T=2

At t=2 C gets in. As shown in figure 8. B is compared with C. B is one ms left. But C is still 2 ms left. So that the systems continues execute B until B is finished.

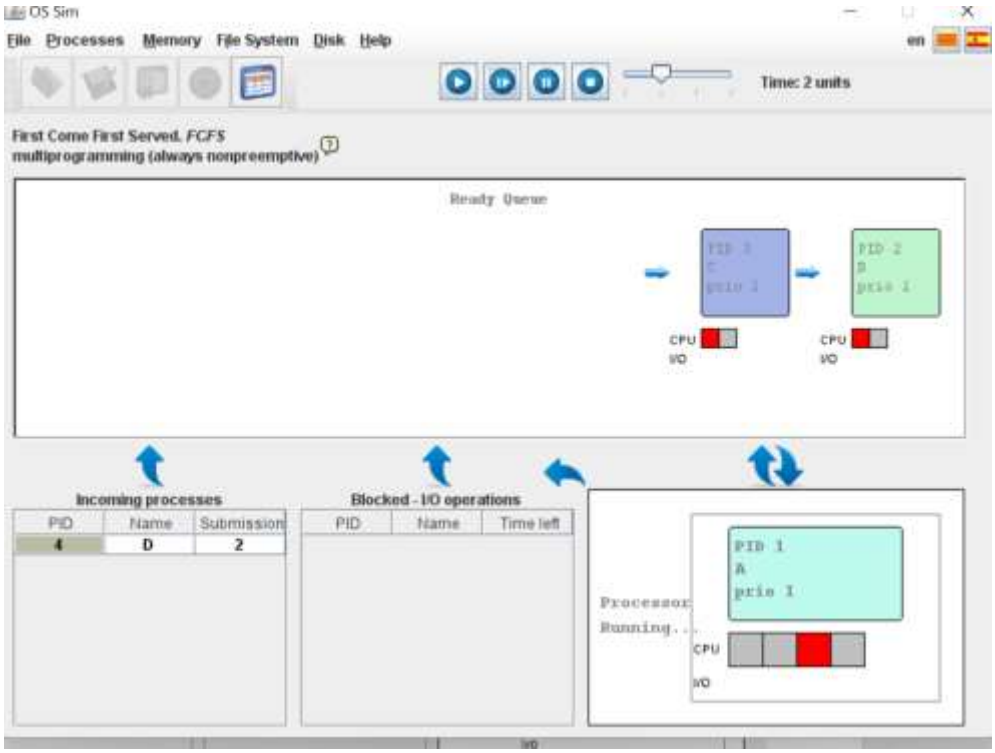

FIGURE 8. STEP BY STEP SIMULATION IMPLEMENTATION AT T=3

Please take a look on figure 9. At t=3, C gets in. C will be compared with D at t=4. Since process C is shorter than D, then C id executed first.

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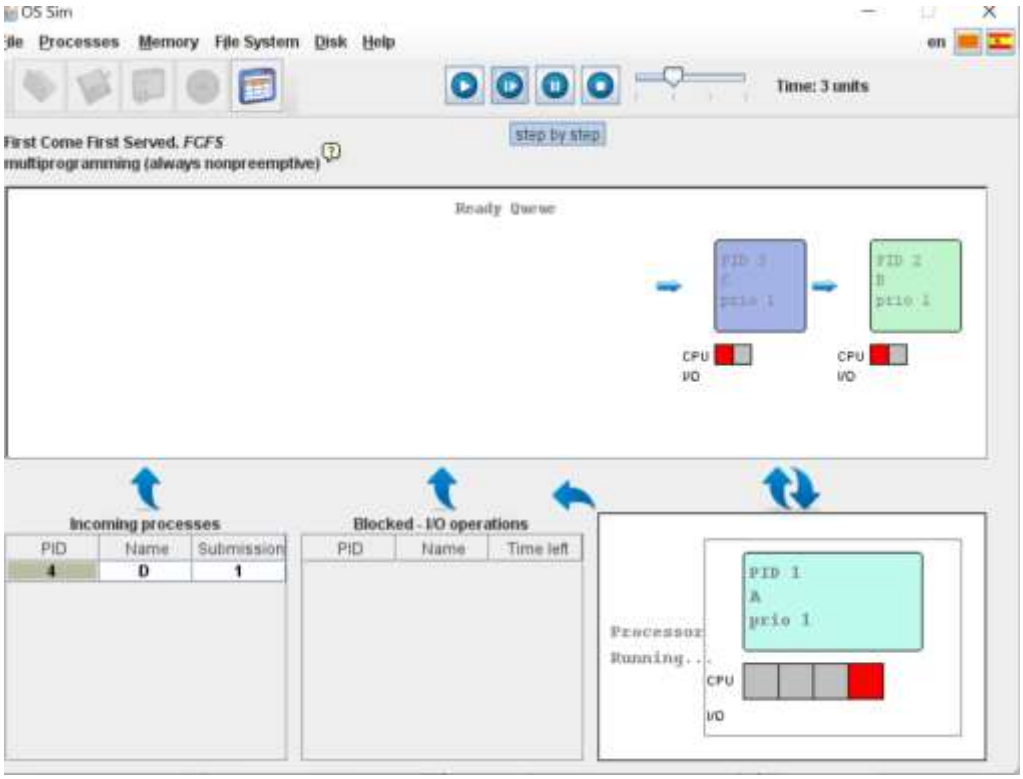

FIGURE 9. STEP BY STEP SIMULATION IMPLEMENTATION AT T=4

At t=4, C is compared with D. C is 1 ms left. But D is still 4 ms. Then the shortest process is still C. Then C continues until finish at t=5. Please take a look on figure 10.

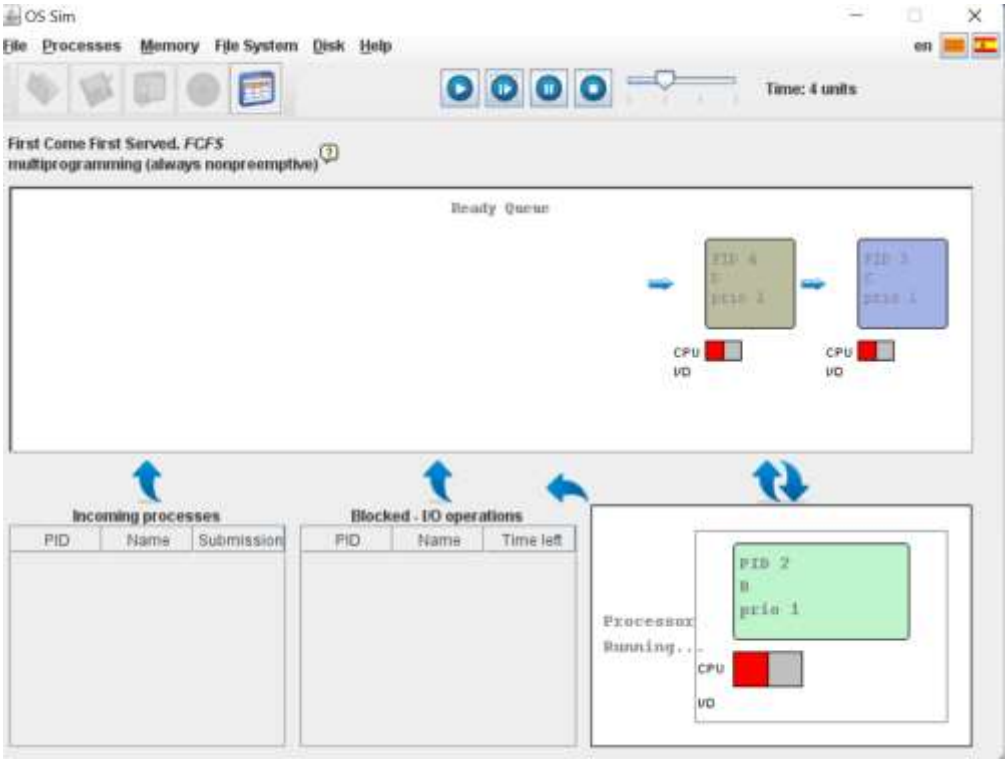

FIGURE 10. STEP BY STEP SIMULATION IMPLEMENTATION ATR T =5

At t=5, C is finishes. Then A is compared with D. A is 3 ms, but D is 2 ms. So the systems executes D until D is finish for 2 ms. Please take a look on figure 11.

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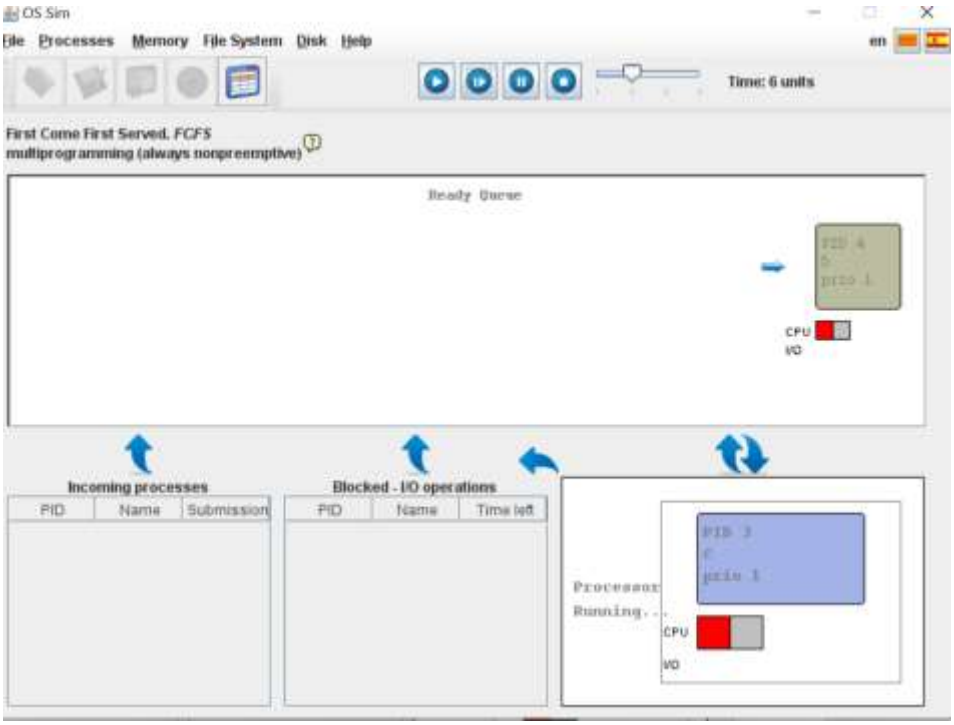

FIGURE 11. STEP BY STEP SIMULATION IMPLEMENTATION AT T = 6

At t=7 A is executed. Please take a look on figure 12. It is left 3 ms for A. Then A is executed until finish at t= 10. A is the last process to be executed.

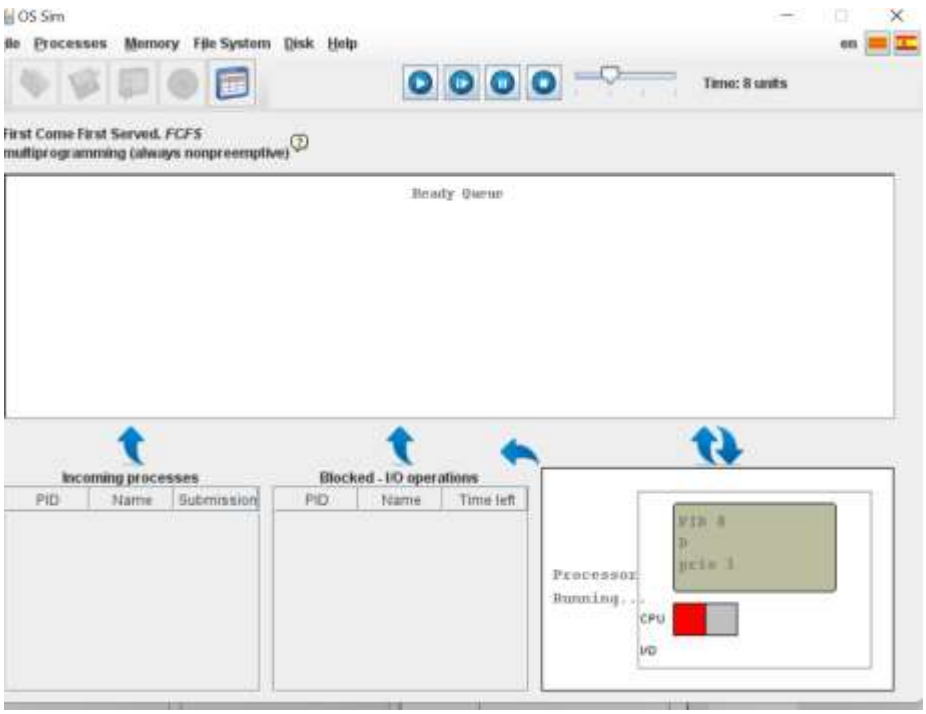

FIGURE 12. STEP BY STEP SIMULATION IMPLEMENTATION AT T=7

Based on the analysis above by the OS-SIM, we get the table analysis of systems simulation. Average turnaround time is 5.25 ms. Average waiting time is 2.75 ms. Average respons time is 2.75. In this table we can see also the burst time, the process names, arrival times, and efficiency. As we can take a look on the Table 2. below:

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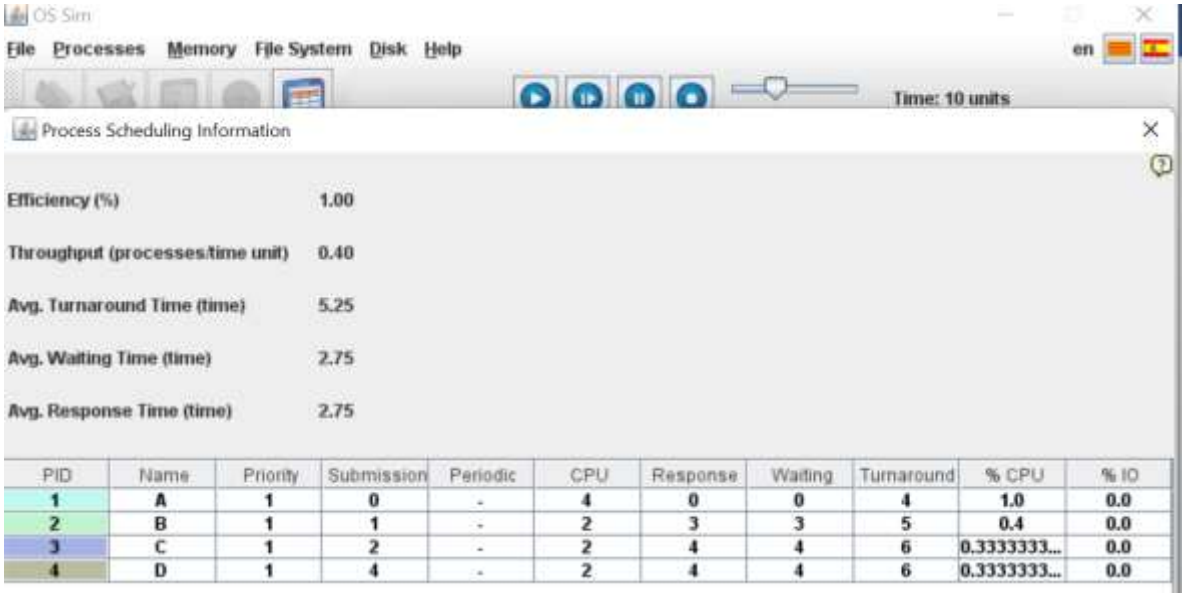
TABLE 2. ANALYSIS OF SYSTEM'S SIMULATION



PID	Name	Priority	Submission	Periodic	CPU	Response	Waiting	Turnaround	% CPU	% IO
1	A	1	0	-	4	0	0	4	1.0	0.0
2	B	1	1	-	2	3	3	5	0.4	0.0
3	C	1	2	-	2	4	4	6	0.3333333...	0.0
4	D	1	4	-	2	4	4	6	0.3333333...	0.0

Below is Gantt Chart for the processes:

A	B	B	C	C	D	D	A	A	A
0	1	2	3	4	5	6	7	8	9	10

FIGURE 13. GANTT CHART OF THE PROCESSES

.

From the gantt chart above, we can conclude that A is the last time to be executed. Since it is the longest process to be executed. A is executed two times, at t=0 until t=1 and t=7 until t=10. A is also executed the last time. B is executed at t=1 until t=3. C is executed at t=3 until t=5. D is executed at t=5 until t=7. This happened because of different arrival times of the processes.

VI. CONCLUSION

The objective of this journal is to simulate Preemptive Shortest Job First (SJF) Scheduling Algorithm in CPU. The calculation of one case study shows that preemptive SJF process scheduling has 2.75 ms average waiting time The average turn around time is 5.25 ms. Average response time is 2.75. This case study gives understanding about the preemptive SJF process scheduling more thoroughly. The preemptive priority scheduling will interrupt the process if the running process has shorter best time than the ready process. The processes in case study finishes after 10 ms. OS-SIM is one well known simulator that represent the behaviors of scheduling processes. By this simulator, we can simulate the processes scheduling that is behind the scene. For future works, I propose to simulate other existing algorithms like round robin or priority with OS-SIM and compared the results.

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Simulation of Preemptive Shortest Job First Algorithm Rakhmat Purnomo rakhmat.purnomo@dsn.ubharajaya.ac.id Tri Dharma Putra* tri.dharma.putra@dsn.ubharajaya.ac.id *Correspondence Author Department of Informatics, Faculty of Computer Science, University of Bhayangkara Jakarta Raya, Jalan Perjuangan Bekasi Utara, Indonesia Abstract: With simulation, we imitate the operation of a real world process or system over time.

It requires the use of models; model that represent the behavior or characteristics of the selected process or system. Computer are used to execute the simulation. In operating systems, OS-SIM is one of simulation application to represent the system characteristic or behavior of any process scheduling algorithm. Several scheduling algorithms in operating systems are available.

There are preemptive shortest job first scheduling algorithm and non-preemptive shortest job first scheduling algorithm in operating system. Preemptive shortest job first scheduling algorithm is where when the shortest process arrives and is positioned at the head of the queue and interrupted the longer process. In this journal, we simulate preemptive shortest job first (SJF) algorithm with OS-SIM. Case study is discussed to understand the simulation thoroughly.

Keywords: Preemptive Shortest Job First, Scheduling Algorithm, OS-SIM Introduction Operating System (OS) is software which its role is as an interface between a user and the computer hardware. OS is known as a resource manager because its main duty is to manage the resources of computer system. Scheduling is one fundamental and most important design (Putra, 2020).

Scheduling refers to set of rules, policies and mechanism that govern the order in which resources is allocated to various processes and the work is to be done. The scheduling is a methodology of managing many queues of processes in order to make delay minimum and to make performance optimal of the system. A scheduler is a module in operating system that implements the scheduling policies.

Its main objective is to make systems performance's optimal that match with the criteria set by the system designer (Pawan Singh, Amit Pandey, 2015). Scheduling is a prime concept in multiprocessing and multitasking of OS design and in real-time operating system design by arranging switching in the CPU among process. Premptive Shortest Job First (SJF) Algorithm is a well known algorithm in CPU processing. A scheduler is an OS module that implements the scheduling policies.

Its primary objective is to optimize the systems performance according to criteria set by the system designer (Shweta Jain, 2016) A computer simulation is an attempt to model a real-life or hypothetical situation on a computer so that it can be studied to see how the system works. By changing variables in the simulation, predictions may be made about the behavior of the system.

It is a tool to virtually investigate the behavior of the system under study. Computer simulation in operating systems has become a useful part of modelling many scheduling algorithms. But also in other area of science like in physics, chemistry and biology and human systems in economics and social science (e.g.,

computational sociology) as well as in engineering computer simulation. Simulation is used to gain insight into the operation of those systems. A good example of the usefulness of using computers to simulate can be found in the field of operating systems with OS-SIM. In such simulations, the model behavior of file, disk, memory management, process scheduling simulation can be implemented (Wikipedia, 2022).

With simulation, we imitate the operation of a real world process or system over time. It requires the use of models; model that represent the behavior or characteristics of the selected process or system. Computer are used to execute the simulation. OS-SIM is one of simulation application to represent the system characteristics or behaviors of Preemptive Shortest Job First (SJF) algorithm (OS Concep Simulator, n.d.).

The Operating System Simulator (OS-SIM) is designed to support two main aspects of a computer system's resource management: process management and memory management. Once a compiled code is loaded in CPU Simulator's memory, its image is also available to the OS Simulator. It is then possible to create multiple instances of the

program images as separate processes.

The OS Simulator displays the running processes, the ready processes and the waiting processes. Each process is assigned a separate Process Control Block (PCB) that contains information on the process state. This information is displayed in a separate window. The main memory display demonstrates the dynamic nature of page allocations according to the currently selected placement policy.

The OS maintains a separate page table for each process which can also be displayed. The simulator demonstrates how data memory is relocated and the page tables are maintained as the pages are moved in and out of the main memory illustrating virtual memory activity . In terms of process scheduling, OS-SIM can simulate all scheduling algorithms like FCFS, priority, round robin, and shortest job first.

Modelling these algorithms is the main objective of OS-SIM. Preemptive SJF scheduling algorithm is usually used among various other algorithms for scheduling CPU, however it can make the problem of starvation which happens when processes with longer burst time are not given any chance of CPU utilization due to prolong CPU usage by processes with shorter burst time.

OS Sim (Operating System Concepts Simulator) is an educational purpose application to graphically simulate Operating System concepts and support the computer science students learning process (OS Concep Simulator, n.d.) . Overview of Existing Algorithms There are several scheduling algorithms proposed by experts, namely: Shortest Job First (SJF).

This one is a well known scheduling algorithm, the system will choose the shortest job of process to be executed first. That's why it is named Shortest Job First (SJF). One main weakness of this algorithm is that starvation could happen, the long process will never be executed because there are still shorter jobs exist in the system.

If shorter job still keeps coming in then starvation will occur (Putra, 2020). SJF algorithm is one optimal algorithm. It executes the short process before the long process and thus reduces the waiting time for short process more than increases waiting time for long process. Which finally ends up with minimum average waiting time compared to the other scheduling algorithm (Asma Joshita Trisha, 2019). Round Robin (RR).

Round robin algorithm is a real-time scheduling algorithm in operating system. The Round Robin scheduling algorithm is cited as standard Round Robin and it is a preemptive type that allocates a slice of context switching. Whenever time slice or

context switching completes the current process is preempted and put in the rear of ready queue.

Round robin algorithm is usually applied in real-time and time-sharing operating system because it provides every process an average share of time to utilize the CPU and gives a small responds time. However, the standard round robin algorithm has many weaknesses such as small throughput and big turnaround time as well as the big waiting time and also huge context switches number (Hoger K. Omar, Kamal H. Jihad, n.d.).

In advanced round robin, a dynamic time slice is used to find the effective algorithm that is running in the system. The intelligent time slice (quantum) for round robin architecture for real time operating systems is a modified version of simple round robin scheduling (Putra, 2020). Priority Scheduling. In priority scheduling, the idea behind this algorithm is straightforward, each process is allocated a priority.

The equal process priority are scheduled in first come first serve basis. SJF is one example. SJF has the same idea as Priority Scheduling. Namely, the longer the burst of CPU, then it makes the lower the priority and the smaller the burst time, the higher the priority (Kunal Chandiramani, Rishabh Verma, 2019). Priority can be defined internally or externally.

Internally defined priorities use some measurable quantities or qualities to computer priority of a process (Chandra Shekar N, 2017). Priority scheduling algorithm manages processes in its queue based on its priority. Something else that gives priority on running state is preemption (Ledina Hoxha Karteri, 2015). First Come First Serve (FCFS). This is a standard algorithm.

The process which arrives first will be executed first. That is why it is called first come first serve. The first process that exist will be executed first. This is the same as the concept of First In First Out (FIFO) (Kunal Chandiramani, Rishabh Verma, 2019). This is the simplest scheduling algorithm. While the processes in the ready queue will occupy the CPU in the order of their arrival to the ready queue.

The process which enters first in the ready queue will occupy the CPU first and the process which enters afterwards will occupy CPU sequentially in the arrival order. This is a non-preemption scheduling algorithm. Once the process is allocated in the ready queue, it will be release by the CPU until it is terminated. The weaknesses of this algorithm is a high average waiting time (Pawan Singh, Amit Pandey, 2015) (Siahaan, 2016) (Hoger K. Omar, Kamal H. Jihad, n.d.).

Organization Structure This journal is divided to be six chapters. The first chapter is introduction. In this chapter, we discuss the idea behind the the CPU scheduling algorithm and about CPU simulation. In the second chapter we discuss the overview of existing algorithms.

Discussion about algorithm like shortest job first, round robin, priority algorithm, first come first serve. The third chapter is explanation about organization structure of this journal. The fourth chapter is about OS-SIM Simulator, Chapter five is about case study analysis of simulation of preemptive shortest job first algorithm.

Here we discuss one case study simulation. The last chapter is conclusion and future work. OS-SIM Operating Systems concepts are best learned through implementation. However, this can be difficult and time consuming. To support this learning process an OS simulator has been developed that allows students to learn about OS concepts using this simulator, OS-SIM.

The OS-SIM can be used to explore the behavior of the operating system. For example, the user can step through each process to see when it has access to the processor, how long it has had access, and where in memory it is located. The use of memory is visually depicted in the simulator based upon which memory allocation method the user chooses.This modular approach permits the user to experiment with different implementations of different algorithms.

Through this experimentation the user is able to gain a better understanding of the behavior and performance characteristics of the OS element under consideration. Figure 1. below is the dashboard display of OS-SIM Simulator. There are five pull-down menus, namely: File, processes, Memory, File System, Disk, and Help. Here we can see four major divisions of the operating system to be simulated, namely, process scheduling, disk management, memory management, and file management.

File Menu is for arranging file. Menu Processes is about process scheduling manipulation, we will use this a lot in this simulation. This is our main focus. Menu Memory is for memory management simulation. Disk is for disk simulation and the last menu, Help, is for information and help about this simulator. _ Figure 1. OS-SIM Simulator In figure 2 below, we can see here the simulation of first come first serve algorithm. We will get into deep on process scheduling.

Here we can manipulate the processes scheduling of the systems. There are four algorithms that can be simulated: First Come First Serve (FCFS), Shortest Job First (SFJ), Priority, Round Robin. All can be made preemptive or nonpreemptive algorithm. _ Figure

2.

Process Scheduling Algorithm Simulation In figure 3, we can see the simulation of Non Contiguous Memory Management, with Pagination Page: 2 unit _ Figure 3. Memory Management In figure 4, we can see the display of file allocation table, the cluster, the sectors, tracks, clusters. For saving the data in the disk. _ Figure 4. Disk Allocation in sectors, tracks, and cluster. In figure 5 below, we can see the simulation of file management in blocks. _ Figure 5.

File Management In this simulator we can see the virtual representation of the systems process scheduling, that is behind the scene. With it we can describe and understand the process work clearly. Another advantage of this OS-SIM is that we can explore more deeply into the scheduling process of the systems. And manipulate it, making it easier to be understood.

V. Case Study Analysis In this chapter we will discuss one case study about preemptive shortest job first using OS-SIM. There will be four processes. Each with burst time and arrival time. The discussion is as follows: Here we have four processes, Please take a look on table 1, we have four processes namely A, B, C, and D.

Also given here different arrival times, with different burst times each. Table 1. Case Study Process _Arrival Time _Burst Time _ _A _0 _4 _ _B _1 _2 _ _C _2 _2 _ _D _4 _2 _ _ Please take a look on figure 6. The table of table 1. is implemented as shown in figure 6. on OS-SIM. _ Figure 6. Simulation Implementation of Table 1. At t=0, A arrives with burst time 4.

But at t=1, B interrupted A. The system compares the burst time of A and B. A is 3 ms left, but B is still 2 ms. Then at t=1, B interrupted A to be executed. As shown in figure 7. _ Figure 7. Step by Step Simulation Implementation at t=2 At t=2 C gets in. As shown in figure 8. B is compared with C. B is one ms left. But C is still 2 ms left. So that the systems continues execute B until B is finished. _ Figure 8.

Step by Step Simulation Implementation at t=3 Please take a look on figure 9. At t=3, C gets in. C will be compared with D at t=4. Since process C is shorter than D, then C id executed first. _ Figure 9. Step by Step Simulation Implementation at t=4 At t=4, C is compared with D. C is 1 ms left. But D is still 4 ms. Then the shortest process is still C. Then C continues until finish at t=5. Please take a look on figure 10. _ Figure 10.

Step by Step Simulation Implementation atr t =5 At t=5, C is finishes. Then A is compared with D. A is 3 ms, but D is 2 ms. So the systems executes D until D is finish for

2 ms. Please take a look on figure 11. _ Figure 11. Step by Step Simulation Implementation at t = 6 At t=7 A is executed. Please take a look on figure 12. It is left 3 ms for A. Then A is executed until finish at t= 10. A is the last process to be executed. _ Figure 12.

Step by Step Simulation Implementation at t=7 Based on the analysis above by the OS-SIM, we get the table analysis of systems simulation. Average turn around time is 5.25 ms. Average waiting time is 2.75 ms. Average respons time is 2.75. In this table we can see also the burst time, the process names, arrival times, and efficiency. As we can take a look on the Table 2. below: Table 2.

Analysis of System's Simulation _ Below is Gantt Chart for the processes: A _B _B _ C _C _D _D _A _A _A _ _0 1 2 3 4 5 6 7 8 9 10 Figure 13. Gantt Chart of the Processes . From the gantt chart above, we can conclude that A is the last time to be executed. Since it is the longest process to be executed. A is executed two times, at t=0 until t=1 and t=7 until t=10. A is also executed the last time. B is executed at t=1 until t=3. C is executed at t=3 until t=5.

D is executed at t=5 until t=7. This happened because of different arrival times of the processes. Conclusion The objective of this journal is to simulate Preemptive Shortest Job First (SJF) Scheduling Algorithm in CPU. The calculation of one case study shows that preemptive SJF process scheduling has 2.75 ms average waiting time The average turn around time is 5.25 ms.

Average response time is 2.75. This case study gives understanding about the preemptive SJF process scheduling more thoroughly. The preemptive priority scheduling will interrupt the process if the running process has shorter best time than the ready process. The processes in case study finishes after 10 ms. OS-SIM is one well known simulator that represent the behaviors of scheduling processes.

By this simulator, we can simulate the processes scheduling that is behind the scene. For future works, I propose to simulate other existing algorithms like round robin or priority with OS-SIM and compared the results. References Asma Joshita Trisha, S. B. (2019). A Combined Preemptive SJF and Preemptive Priority Algorithm to Enhance CPU Utilization.

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