DUAL SUN TRACKING SYSTEM BY USING FOUR QUADRANT SENSOR

LINGALA VENKATESWARLU[1], CH. KIRAN KUMAR[2] ,Dr T SESHAIAH[3]

[1]Assistant Professor ECE,[2] Assistant Professor Department of EEE,

3Associate Professor Mechanical Engineering,

QIS College of Engineering and Technology,Ongole, AP

Abstract

The automated dual axis sun tracking system described in this study uses an original four quadrant light dependent resistor (L.D.R.) and straightforward electronic circuit to ensure robust system performance. The proposed device uses a tracker to actively monitor solar radiation and subsequently changes the panel for optimum power production. The main objective of the project is to simulate and implement the best algorithm for a dual-axis solar tracker rotating in azimuth and elevation. In this simulation, the panel is rotated hemispherically while being positioned to absorb the maximum solar energy, increasing the overall quantity of power produced.

KEYWORDS—SOLAR PANEL,SOLAR TRACKER, LDR SENSOR.

INTRODUCTION

Concerns over the energy crisis and the effects of global warming are growing as population growth and economic development drive up energy demand and environmental issues. It is critically important to make use of the numerous conventional energy sources that are acquired from resources that naturally replenish on a human timescale, such as sunshine, wind, rain, tides, and geothermal heat. Solar energy is often abundant in nature in warm climates, making it one of the most promising renewable energy sources. India typically has relatively long sunny days for more than ten months and mostly overcast skies for the final two Photovoltaic cells (PV) are widely used in many projects around the world to capture solar radiation and transform it into electrical energy, but most of these projects installed the panels in fixed orientation, which significantly affects the solar energy the panel collects A solar cell, also referred to as a photovoltaic cell, is a type of electrical appliance that converts light energy directly into electricity by use of the photovoltaic effect. Solar cells are used to build photovoltaic modules, another name for solar panels. A solar panel is made up of several photovoltaic modules that are electrically connected to one another and fixed to a frame in order to collect solar radiation for the purpose of generating heat or electricity. This design consists of a functional experimental prototype that focuses on the use of solar panels that would track the sun's motion, specifically its azimuth altitude, and adjust itself continuously without human intervention. We are employing four Light Dependent Resistors (L.D.Rs) for this purpose, which will constantly track the sun's path and provide signals to the main circuit to drive the panel. Gearing and a D.C. motor would be used to move the panel. A microcontroller called an 8051 would be used to programmatically control all of the electrical components. For greater output, dual axis tracking

ensures sure the panel is constantly in the most precise position. This solar energy will be transformed into electrical energy by the photovoltaic (PV) cell of the solar panel, which we can store in batteries for later use. Small prototype models can be used as a conventional power supply and put in offices, homes, and other places.

LITERATUREREVIEW

This survey of the literature shows the thorough research that has been done so far on the subject of solar tracking. Five LDRs and an Arduino UNO controller were used in the design of a two- axial sun tracking system by N. Othman, M. I. A. Manan, Z. Othman, and S. A. M. AlJunid [1]. The automatic dual axis solar tracker is what this research aims to create and build in order to make the most of solar energy. The only thing to be concerned about is that this system should use as little energy as possible in order to increase the difference between power conversion and power consumption and, consequently, the system's net profit.The C language was utilised to programme the Arduino UNO controller. In order to make PV panels perpendicular to the sun, LDRs are used to determine the position of the highest amount of sunlight in the sky. A programme is then built to carry out calculations and run the servo motors [1]. Along with moving from east to west, the sun also changes angles as it moves from north to south. Thus, consideration should also be given to the north and south directions. Trackers with two axes do it. These trackers follow the sun both vertically and horizontally. The dual axis trackers' operational capability allows them to produce more output power than

the trackers with one axis. To identify the sun's brightest location in the sky, light dependent resistors are utilised. LDRs are plugged into an Arduino UNO controller, which learns where the sun is in the sky and rotates the motors in that direction. The rotation of the panel is accomplished by two Servo motors, which also meets the requirements for low cost and light weight [1]. A solar tracking system built with a microcontroller by Md. Tanvir Arafat Khan and S.M. Shahrear Tanzil (2010) uses stepper motors to move the photovoltaic (PV) panels to follow the sun and LDRs to measure the intensity of sunlight [2]. By detecting the brightest point in the sky, Fabian Pineda and Carlos Andres Arredondo (2011) developed and implemented a two-axis sun module positioning system. For the purpose of tracking bright points, a geodesic dome-based sensor has been constructed [3]. An open loop, two-axes sun tracking system with an angle controller has been devised and built by authors Salabila Ahmad and colleagues. As the efficiency parameter sits in between these two power factors, the hardware is chosen to maximise power gathered and minimise power spent [4].Additionally, solar tracking aids in bringing sunlight into basements and other dark spaces. The high precision tracking system based on a hybrid approach for concentrated sunlight transmission via fibres has been put into place by authors Jifeng Song et al. [5]. The multi-axes sun tracking system with PLC control was presented by author Cemil Sungur in 2008. At 37.6° latitude, Turkey's latitude, the azimuth and altitude angles of the sun are calculated for a year. An electromechanical system that tracks the sun based on azimuth and altitude angle is created and put into use [6] using these angles. Authors A. chaib et al (2013) havepresented the heliostat orientation system based on PLC robot manipulator. It is presented that by mounting certain no. of helio stats and facing them towards central power tower water can be heated and turbines can be driven for energy conversion purpose. By applying MATLAB program fordetermining the sun’s position for heliostat orientation and by using PLC robot manipulator it ispresented that maximum amount of energy gets converted from solar to electricity.

Concentrated Solar Power(CSP) is used in this experiment[7].Authors TaoYu and Guo Wencheng(2010)have introduced automatic sun-tracking control system based on Concentrated Photo Voltaic (CPV)generation. CPV generation works effectively when light panels trace the sun accurately. Steppertracking control technology is used. This control relies on control circuit with ARM and camera which can provide powerful computational capability [8].

DESIGNOFATRACKINGSYSTEM

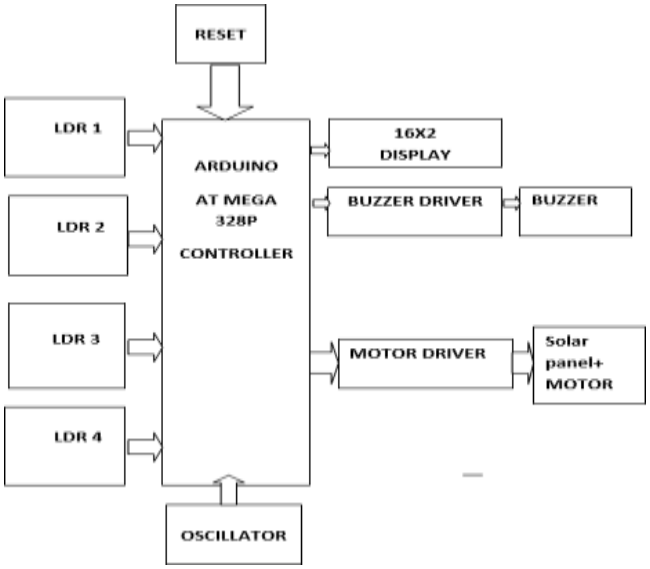

FIG:BLOCK DIAGRAM

SOLARCELL

A photovoltaic cell, often known as a sun-based cell, is a device that uses solar energy to generate electricity. The photovoltaic cell is a silicon-amalgam-based non-mechanical device. But one cell's output is only 1 or 2 watts, which is insufficient for the majority of equipment. A solar cluster needs daylight to function. The performance of the exhibit is significantly impacted by climate factors like fog and mist because they alter the amount of solar energy it receives. An efficiency of between 10 and 25 percent can be found in the majority of PV modules.

ARDUINOUNO

Due to the ATmega328, the Arduino Uno is a microcontroller board (datasheet). It features a 16 MHz artistic resonator, 6 simple information sources, 14 computerised input/yield pins (of which 6 may be used as PWM yields), a USB connection, a power jack, an ICSP header, and a reset button. It includes everything needed to support the microcontroller, allowing you to connect it to a PC using a USB cable or power it initially using an AC-to-DC connector or battery. The FTDI USB-to-serial driver chip is not used on the Uno, which is how it differs from every previous board. In its place, a USB-to-serial converter built using the Atmega16U2 (or Atmega8U2 up to variant R2) is included.

LDR(LIGHTDEPENDENTRESISTER)

The simplest optical sensor is a photon resistor, also known as a photocell. These light-touchy resistors come in two varieties: cadmium sulphide (CdS) and gallium arsenide. The light is detected by two cadmium sulphide (CdS) photocells in the sun tracker framework described here. The protection of the photocell, a latent component, is in direct opposition to the amount of light directed at it. It has a capacitor arrangement relationship. It depends on the photocell's dim protection and light immersion protection to be used for the tracker. According to the definition of light immersion, increasing the light power applied to CdS cells won't make their protection any less effective. In terms of light power, which is measured in lux, daylight brightens to about 30,020 lux.

LCD(LIQUIDCRYSTALDISPLAY)

Since they are easily customizable, fluid gem show screens can be used for a wide range of applications. They have no restrictions on exhibiting customised characters (unlike in seven sections), live lines, and other things. LCDs with characters and graphics are used the most frequently. Character LCDs display text, numbers, ASCII characters, and other types of characters. A 16x2 LCD has two such lines and can display 16 characters per line, according to the name. Two registers, specifically Command and Data, are present on this LCD. The order instructions sent to the LCD are stored in the summon enroll. A summon is a guideline given to LCD to completea predefined errand like instating it, clearing its screen, setting the cursor position, controlling show case and so forth. The information enroll stores the information to be shown on the LCD. The information is the ASCII estimation of the characters to be shown on the LCD.

L293DMOTORDRIVE

A twin H-connect engine driver coordinated circuit is designated L293D. (IC) Four half H-connect drivers on the motor driver L293D can be used to bi directionally drive two DC engines. Since they take a low-ebb and flow control flag and output a higher-ebb and flow flag, engine drivers act as ebb and flow enhancers. The engines are driven by this greater current flag. Typically, a transistor can function as a switch and carry out this task, which directs the engine in a single direction.

SOLARCHARGE CONTROLLER

Simple solar charge controllers only monitor battery voltage, open the circuit, and stop charging when the battery voltage reaches a predetermined level. Stop the DC power streams from returning to the solar-powered circuit boards. Even though the solar-powered boards are not producing power in the evening, power can still flow through them in reverse, draining the batteries. Older solar charge controllers opened or closed the circuit and started or stopped power to the batteries using a mechanical hand-off.

BUZZER:

A buzzer or beeper is a signalling tool that is primarily electronic and is found in cars, home appliances like microwaves, and game shows. It typically consists of several switches or sensors connected to a control unit that determines whether and which button was pressed or if a

predetermined amount of time has passed. It typically turns on a light next to the relevant button or control panel and emits an alarm.

The electromechanical system on which this device was initially based was essentially an electric bell without the metal gong. These units frequently used a wall or ceiling as a sounding board and were anchored to one of those surfaces. The use of a circuit to create the AC current was another implementation with some AC-connected devices.

Connect this circuit to a low-cost 8-ohm speaker and amplify the sound to a volume that can drive a loudspeaker. Nowadays, using a high-pitched piezoelectric sounder with a ceramic base, like a Sunalert, is more common. These were typically connected to "driver" circuits that changed the sound's pitch or pulsed it on and off.

POWERSUPPLY:

The primary necessity for the project's work is the power supply. The mains line provides the necessary DC power supply for both the base unit and the charging unit. A transformer with a secondary center-tapped at 8V-012V is utilised for this. This transformer provides us with a 5V power supply. This output of +6V is regulated and was created with a 7805 positive voltage regulator. This three-pin voltage regulator is capable of supplying 850 milliamps of current.

Rectification is a process of rendering an alternating current or voltage into aunidirectional one. The component used for rectification is called 'Rectifier'. A rectifier permitscurrent to flow only during positive half cycles of the applied AC voltage. Thus, pulsating DC is obtained to obtain smooth DC power additional filter circuits required.

LED:

It is a radioactive recombination semiconductor diode. A specific amount of energy is needed to create an electron hole pair. When an electron rejoins a hole, the same amount of energy is released. This recombination and the emission of photons could come from the energy released. You can hear the radiation that results from the electro's transition from the conduction band to the valence band. Alternately, the released energy can lead to a string of photons that liberate the lattice. Finally, another electron may receive the released energy. It's possible that the recombination radiation falls within the visible and infrared light spectrums.

Forward is peaked around the band gap energy and the phenomenon is called injection luminescence. In a junction biased in the avalanche break down region , there results a spectrumof photons carrying much higher energies . Almost White light then gets emitted from micro plasma break down regioninsiliconjunction.DiodeshavingradioactiverecombinationaretermedasLight Emitting Diode, abbreviated as LEDs.

In gallium arsenide diode, recombination is predominantly a radiation recombination and theprobability of this radioactive recombination far exceeds that in either germanium or silicon.HenceGaAsLEDhasmuchhigherefficiencyintermsofPhotonsemittedperCarrier.Theinternaleffic iency of GaAs LED may ba very close to 100% but because of high index of refraction, onlyasmallfractionoftheinternalradiationcanusuallycomeoutofthedevicesurface.Inspiteofthislowefficie ncyofactuallyradiatedlight,theseLEDsareefficiencyused aslightemittersinvisualdisplay units and in optically coupled Circuits, The efficiency of light generation increases withthe increase of injected

current and with decreases in temperature. The light so generated isconcentrated near the junction since most of the charge carriers are obtained within one diffusion length of the diode junction.

FLOWCHART

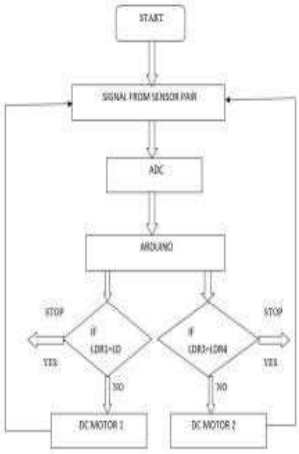

Fig. Flow chart

FINALEXPERIMENTALSETUP

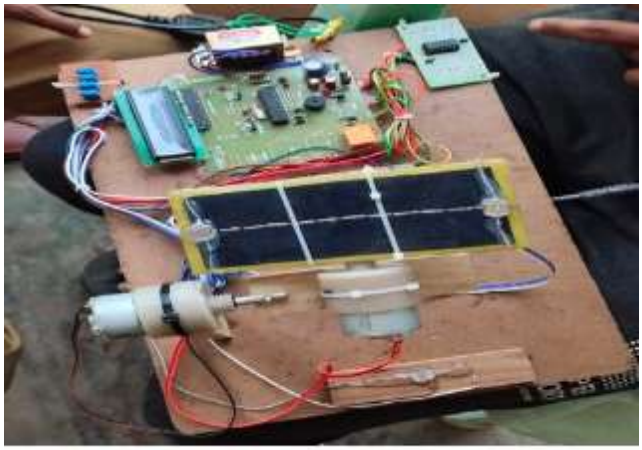

FIG: FINAL MODEL

TESTINGRESULT

Time (hrs)	Single axis(volts)	Dual axis (volts)
8 am	8.2	10.7
9 am	9.4	12.2
10 am	12.5	14.6
11 am	15.8	17.3
12 pm	17.9	19.8
1 pm	18.5	21.2
2 pm	16.4	17.9
3 pm	14.3	16.7
4 pm	12.1	13.8
5 pm	10.5	12.1

CONCLUSION

The double hub tracker has a significant improvement in performance, perfectly aligns with the direction of the sun, and tracks the sun's development. The exam manifests itself clearly. Show that settled module frameworks and double pivot following are superior to single hub following. Double hub sun-based trackers have a high power capture rate throughout the entire perception of time, which improves the conversion of solar-based irradiance into electrical energy yield.The suggested structure. is clever as well because a minor change to a single hub tracker led to a noticeable increase in power. Within the structure. Our research has shown that double pivot following can increase vitality by about 45% of the fixed exhibits. Making the best use of the resources that are already available, such as land and the transmission system, is one of the key motivating factors for achieving this goal.

FUTURESCOPE

Automatic solar tracking system offers a prototype for implementing a large array type solartracker.Thiswillbeanexpansionofmechanicalaswellaselectronicsystem Followingadditionscanbemadetotheprototypetomaximizethepowerconversion: • Byconnectingthesolarpanelsin an array more energy can be extracted. • Using aluminum type of material for the assembly setup the weight upon the motors can be reducedwhich will automatically reduce the powerconsumptionofthesystem. • WiththemonocrystallinePVpanelinusetheefficiencyoftheprojectcanbe increased.Monocrystalline PV panelshavealsomorelifetime thanpolycrystallinepanels.

• In Zigbee transmitter- receiver pair by interfacing range extension modules signal range can beextendedup to 15 miles.

REFERENCES

[1] N.Othman,M.I.A.Manan,Z. Othman, S.A.M.AlJunid, "Performance Analysis of Dual-axisSolar Tracking System", IEEE International Conference on Control System, Computing andEngineering,29 Nov.-1Dec. 2013, pp 370-375.

[2] Md. Tanvir Arafat Khan, S.M. ShahrearTanzil, Rifat Rahman, S M ShafiulAlam, "Designand Construction of an Automatic Solar Tracking System", 6th International Conference onElectricaland Computer EngineeringICECE, 18-20December 2010, pp.326-329.

[3] Fabian Pineda, and Carlos Andrés Arredondo, "Design and Implementation of Sun TrackerPrototypeforSolarModule Positioning",978-1-4673-0066-7IEEE,2011,pp. 2905-2910.

[4] SalsabilaAhmad,SuhaidiShafie,MohdZainalAbidinAbKabir,NoorSyafawatiAhmad,"Ontheeffectiveness oftime anddate-basedsunpositioningsolarcollectorintropicalclimate:AcasestudyinNorthernPeninsularMalaysia",RenewableandSustainableEnergy.2012.Pp.635-642.

[5] Jifeng Song, Yongping Yang, Yong Zhu, Zhou Jin, "A high precision tracking system basedon a hybrid strategy designed for concentrated sunlight transmission via fibres", Renewable andSustainableEnergy, 2013, pp. 12-19.

[6] Chaib, M. Kesraoui, E. Kechadi, "Heliostat Orientation System using a PLC based RobotManipulator", Eighth IEEE International Conference and Exhibition on Ecological Vehicles andRenewableEnergies (EVER),2013.

[7] Tao Yu, GuoWencheng, "Study on tracking strategy of automatic sun tracking system basedonCPVgeneration",IEEEinternationalconferenceonIntelligentSystemDesignandEngineeringApplication,2010, pp. 506-509.

[8] Deepthi. S, Ponni. A, Ranjitha. R, R. Dhanabal, "Comparison of efficiencies of single axistrackingsystemanddualaxistrackingsystemwithfixedmount".InternationalJournalofEngineering Science and Innovation Technology (IJESIT), March 2013, vol.2, Issue 2, pp 425-430.

[9] Prof.PoojaK.Chhatwani,Prof.JayashreeSomani,"Intelligentsolartrackersystemimplementedon8051microcontroller".InternationalJournalofEngineeringTrendsandTechnology,Vol.4,Issue9, pp 4267-4271, Sep.2013

[10] http://www.nrel.gov/learning/re_photovoltaics.html?print

[11] http://www.solar-facts.com/panels/panel-types.php.[12]S.P.Sukhatme,J.K.Nayak,"SolarEnergy-Principlesof thermal collectionand storage", Third Edition, pp.1-460.

[12] Tabassum, Saleha, and B. Mouli Chandra. "Power Quality improvement by UPQC using ANN Controller." International Journal of Engineering Research and Applications 2.4 (2012): 2019-2024.

[13] Chandra, B. Mouli, and Dr S. Tara Kalyani. "FPGA controlled stator resistance estimation in IVC of IM using FLC." Global Journal of Researches in Engineering Electrical and Electronics Engineering 13.13 (2013).

[14] Chandra, B. Mouli, and S. Tara Kalyani. "Online identification and adaptation of rotor resistance in feedforward vector controlled induction motor drive." Power Electronics (IICPE), 2012 IEEE 5th India International Conference on. IEEE, 2012.

[15] Chandra, B. Mouli, and S. Tara Kalyani. "Online estimation of Stator resistance in vector control of Induction motor drive." Power India Conference, 2012 IEEE Fifth. IEEE, 2012.

[16] MURALI, S., and B. MOULI CHANDRA. "THREE PHASE 11-LEVEL INVERTER WITH

REDUCED NUMBER OF SWITCHES FOR GRID CONNECTED PV SYSTEMS USING VARIOUS PWM TECHNIQUES."

[17] BABU, GANDI SUNIL, and B. MOULI CHANDRA. "POWER QUALITY IMPROVEMENT WITH NINE LEVEL MULTILEVEL INVERTER FOR SINGLE PHASE GRID CONNECTED SYSTEM."

[18] NAVEENKUMAR, K., and B. MOULI CHANDRA. "Performance Evaluation of HVDC Transmission system with the Combination of VSC and H-Bridge cells." Performance Evaluation 3.02 (2016).

[19] Vijayalakshmi, R., G. Naga Mahesh, and B. Mouli Chandra. "Seven Level Shunt Active Power Filter for Induction Motor Drive System." International Journal of Research 2.12 (2015): 578-583.

[20] BAI, RM DEEPTHI, and B. MOULI CHANDRA. "Speed Sensorless Control Scheme of Induction Motor against Rotor Resistance Variation." (2013).

[21] Chandra, B. Mouli, and S. Tara Kalyani. "Online Rotor Time Constant Tuning in Indirect Vector Control of Induction Motor Drive." International Journal on Engineering Applications (IREA) 1.1 (2013): 10-15.

[22] Rajesh, P., Shajin, F. H., Mouli Chandra, B., &Kommula, B. N. (2021). Diminishing Energy Consumption Cost and Optimal Energy Management of Photovoltaic Aided Electric Vehicle (PV-EV) By GFO-VITG Approach. Energy Sources, Part A: Recovery, Utilization, and Environmental Effects, 1-19.

[23] Reddy C, Narukullapati BK, Uma Maheswara Rao M, Ravindra S, Venkatesh PM, Kumar A, Ch T, Chandra BM, Berhanu AA. Nonisolated DC to DC Converters for High-Voltage Gain Applications Using the MPPT Approach. Mathematical Problems in Engineering. 2022 Aug 22;2022.

[24] Sravani, B., C. Moulika, and M. Prudhvi. "Touchlessdoor bell for post-covid." South Asian Journal of Engineering and Technology 12.2 (2022): 54-56.

[25] Mounika, P., V. Rani, and P. Sushma. "Embedded solar tracking system using arduino." South Asian Journal of Engineering and Technology 12.2 (2022): 1-4.

[26] Prakash, A., Srikanth, T., Moulichandra, B., &Krishnakumar, R. (2022, February). Search and Rescue Optimization to solve Economic Emission Dispatch. In 2022 First International Conference on Electrical, Electronics, Information and Communication Technologies (ICEEICT) (pp. 1-5). IEEE.

[27] Kannan, A. S., SrikanthThummala, and B. Mouli Chandra. "Cost Optimization Of Micro-Grid Of Renewable Energy Resources Connected With And Without Utility Grid." Materials Today: Proceedings (2021).

[28] Chandra, B. M., Sonia, D., Roopa Devi, A., YaminiSaraswathi, C., Mighty Rathan, K., &Bharghavi, K. (2021). Recognition of vehicle number plate using Matlab. J. Univ. Shanghai Sci. Technol, 23(2), 363-370.

[29] Noushin, S. K., and Daka Prasad2 Dr B. Mouli Chandra. "A Hybrid AC/DC Micro grid for Improving the Grid current and Capacitor Voltage Balancing by Three-Phase AC Current and DC Rail Voltage Balancing Method."

[30] Deepika, M., Kavitha, M., Chakravarthy, N. K., Rao, J. S., Reddy, D. M., & Chandra, B. M. (2021, January). A Critical Study on Campus Energy Monitoring System and Role of IoT. In 2021

International Conference on Sustainable Energy and Future Electric Transportation (SEFET) (pp. 1-6). IEEE.

[31] ANITHA, CH, and B. MOULI CHANDRA. "A SINGLE-PHASE GRID-CONNECTED PHOTOVOLTAIC INVERTER BASED ON A THREE-SWITCH THREE-PORT FLYBACK WITH SERIES POWER DECOUPLING CIRCUIT."

[32] Sai, V. N. V., Kumar, V. B. C., Kumar, P. A., Pranav, I. S., Venkatesh, R., Srinivasulu, T. S., ... & Chandra, B. M. Performance Analysis of a DC Grid-Based Wind Power Generation System in a Microgrid.

[33] Prakash, A., R. Anand, and B. Mouli Chandra. "Forward Search Approach using Power Search Algorithm (FSA-PSA) to solve Dynamic Economic Load Dispatch problems." 2019 5th International Conference on Advanced Computing & Communication Systems (ICACCS). IEEE, 2019.

34. **Dr**.R.Chinnaiyan , M.S.Nidhya (2018), " ReliabilityEvaluationofWirelessSensorNetworksusingEERNAlgorithm",LectureNotesonDataEngineeringandCommunicationsTechnologies,SpringerInternationalconferenceonComputerNetworksandInventiveCommunicationTechnologies(ICCNCT-2018),August2018(Online)
35. Dr.R.Chinnaiyan , R.Divya (2018), " Reliable AIBasedSmartSensorsforManagingIrrigationResources in Agriculture" , Lecture Notes on DataEngineeringandCommunicationsTechnologies,SpringerInternationalconferenceonComputer NetworksandInventiveCommunicationTechnologies(ICCNCT-2018),August2018(Online)
36. Dr.R.Chinnaiyan,S.Balachandar(2018),"Reliable Digital Twin for Connected Footballer" ,LectureNotesonDataEngineeringandCommunicationsTechnologies,SpringerInternationalconferenceonComputerNetworksandInventiveCommunicationTechnologies(ICCNCT- 2018),August 2018(Online)
37. Dr.R.Chinnaiyan,S.Balachandar(2018),"Centralized Reliability and Security Management ofDatainInternetofThings(IoT)withRuleBuilder" ,LectureNotesonDataEngineeringandCommunicationsTechnologies,SpringerInternationalconferenceonComputerNetworksandInventiveCommunicationTechnologies(ICCNCT- 2018),August 2018(Online)
38. Dr.R.Chinnaiyan,AbishekKumar(2017)"ReliabilityAssessmentofComponentBasedSoftware Systems using Basis Path Testing" , IEEEInternational Conference on Intelligent Computingand ControlSystems, ICICCS2017, 512– 517
39. Dr.R.Chinnaiyan, AbishekKumar(2017) ,"Construction of Estimated Level Based BalancedBinarySearchTree",2017IEEEInternationalConferenceonElectronics,Communication,and AerospaceTechnology(ICECA2017),344 -348, 978-1-5090-5686-6.
40. Dr.R.Chinnaiyan, AbishekKumar(2017), Estimationof Optimal Path in Wireless Sensor Networks basedonAdjancyList,2017IEEEInternationalConference on Telecommunication,Power Analysisand Computing Techniques (ICTPACT2017) ,6,7,8thApril2017,IEEE978-1-5090-3381-2.
41. Dr.R.Chinnaiyan,R.Divya(2017),"ReliabilityEvaluationofWirelessSensorNetworks",IEEEInternational Conference on Intelligent Computingand ControlSystems, ICICCS2017, 847– 852
42. Dr.R.Chinnaiyan,Sabarmathi.G(2017),"InvestigationsonBigDataFeatures,ResearchChallengesandA

pplications",IEEEInternational
Conference on Intelligent Computing and ControlSystems,ICICCS 2017, 782–786

43. G.Sabarmathi,Dr.R.Chinnaiyan(2018),"EnvisagationandAnalysisofMosquitoBorneFevers–AHealthMonitoringSystembyEnvisagative Computing using Big Data Analytics"inICCBI2018–Springeron19.12.2018to20.12.2018(RecommendedforScopusIndexedPublicationIEEEXploredigital library)
44. G.Sabarmathi,Dr.R.Chinnaiyan,ReliableDataMiningTasksandTechniquesforIndustrialApplications,IAETSDJOURNALFORADVANCEDRESEARCHINAPPLIEDSCIENCES, VOLUME 4, ISSUE 7, DEC/2017,PP-138-142,ISSN NO:2394-8442
45. Dr. M. Thangamani, Jafar Ali Ibrahim, Information Technology E-Service Management System, International Scientific Global Journal in Engineering Science and Applied Research (ISGJESAR). Vol.1. Issue 4, pp. 13-18, 2017. http://isgjesar.com/Papers/Volume1,Issue4/paper2.pdf
46. Ibrahim, Mr S. Jafar Ali, K. Singaraj, P. Jebaroopan, and S. A. Sheikfareed. "Android Based Robot for Industrial Application." International Journal of Engineering Research & Technology 3, no. 3 (2014).
47. Ibrahim, S. Jafar Ali, and M. Thangamani. "Momentous Innovations in the Prospective Method of Drug Development." In Proceedings of the 2018 International Conference on Digital Medicine and Image Processing, pp. 37-41. 2018.
48. Ibrahim, S. Jafar Ali, and M. Thangamani. "Prediction of Novel Drugs and Diseases for Hepatocellular Carcinoma Based on Multi-Source Simulated Annealing Based Random Walk." Journal of medical systems 42, no. 10 (2018): 188. https://doi.org/10.1007/s10916-018-1038-yISSN 1311-8080, https://acadpubl.eu/hub/2018-119-16/1/94.pdf
49. Jafar Ali Ibrahim. S, Mohamed Affir. A "Effective Scheduling of Jobs Using Reallocation of Resources Along With Best Fit Strategy and Priority", International Journal of Science Engineering and Advanced Technology(IJSEAT) – ISSN No: 2321- 6905, Vol.2, Issue.2, Feb-2014, http://www.ijseat.com/index.php/ijseat/article/view/62
50. M. Thangamani, and Jafar Ali Ibrahim. S, "Knowledge Exploration in Image Text Data using Data Hiding Scheme," Lecture Notes in Engineering and Computer Science: Proceedings of The International MultiConference of Engineers and Computer Scientists 2018, 14-16 March, 2018, Hong Kong, pp352-357http://www.iaeng.org/publication/IMECS2018/IMECS2018_pp352-357.pdf
51. M. Thangamani, and Jafar Ali Ibrahim. S, "Knowledge Exploration in Image Text Data using Data Hiding Scheme," Lecture Notes in Engineering and Computer Science: Proceedings of The International MultiConference of Engineers and Computer Scientists 2018, 14-16 March, 2018, Hong Kong, pp352-357http://www.iaeng.org/publication/IMECS2018/IMECS2018_pp352-357.pdf
52. S. Jafar Ali Ibrahim and M. Thangamani. 2018. Momentous Innovations in the Prospective Method of Drug Development. In Proceedings of the 2018 International Conference on Digital Medicine and Image Processing (DMIP '18). Association for Computing Machinery, New York, NY, USA, 37–41. https://doi.org/10.1145/3299852.3299854
53. S. Jafar Ali Ibrahim and Thangamani, M "Proliferators and Inhibitors Of Hepatocellular Carcinoma", International Journal of Pure and Applied Mathematics (IJPAM) Special Issue of Mathematical Modelling of Engineering ProblemsVol 119 Issue. 15. July 2018
54. Thangamani, M., and S. Jafar Ali Ibrahim. "Ensemble Based Fuzzy with Particle Swarm Optimization Based Weighted Clustering (Efpso-Wc) and Gene Ontology for Microarray Gene

Expression."In Proceedings of the 2018 International Conference on Digital Medicine and Image Processing, pp. 48-55. 2018. https://dl.acm.org/doi/abs/10.1145/3299852.3299866

55. Dr.R.Chinnaiyan, Abishek Kumar (2017) " Reliability Assessment of Component Based Software Systems using Basis Path Testing" , IEEE International Conference on Intelligent Computing and Control Systems, ICICCS 2017, 512 – 517
56. Dr.R.Chinnaiyan, AbishekKumar(2017) ,"Construction of Estimated Level Based Balanced Binary Search Tree", 2017 IEEE International Conference on Electronics,Communication, and Aerospace Technology (ICECA 2017), 344 - 348, 978-1-5090-5686-6.
57. R.Chinnaiyan, S.Somasundaram (2012) , Reliability Estimation Model for Software Components using CEP", International Journal of Mechanical and Industrial Engineering (IJMIE) , ISSN No.2231-6477, Volume-2, Issue-2, 2012, pp.89-93.
58. R.Chinnaiyan, S. Somasundaram (2011) ,"An SMS based Failure Maintenance and Reliability Management of Component Based Software Systems", European Journal of Scientific Research, Vol. 59 Issue 1, 9/1/2011, pp.123 (cited in EBSCO, Impact Factor: 0.045)
59. R.Chinnaiyan, S.Somasundaram(2011), "An Experimental Study on Reliability Estimation of GNU Compiler Components - A Review", International Journal of Computer Applications, Vol.25, No.3, July 2011, pp.13-16. (Impact Factor: 0.814)
60. R.Chinnaiyan, S.Somasundaram(2010) "Evaluating the Reliability of Component Based Software Systems " ,International Journal of Quality and Reliability Management , Vol. 27, No. 1., pp. 78-88 (Impact Factor: 0.406)
61. Dr.R.Chinnaiyan, AbishekKumar(2017), Estimation of Optimal Path in Wireless Sensor Networks based on Adjancy List, 2017 IEEE International Conference on Telecommunication,Power Analysis and Computing Techniques (ICTPACT2017) ,6,7,8th April 2017,IEEE 978-1-5090-3381-2.
62. Ibrahim, S. Jafar Ali, and M. Thangamani. "Enhanced singular value decomposition for prediction of drugs and diseases with hepatocellular carcinoma based on multi-source bat algorithm based random walk." Measurement 141 (2019): 176-183. https://doi.org/10.1016/j.measurement.2019.02.056
63. Compound feature generation and boosting model for cancer gene classification Ibrahim, S. Jafar Ali Ibrahim., Affir, A.M., Thangamani, M.International Journal of Engineering Trends and Technology, 2020, 68(10), pp. 48–51, Doi No:doi:10.14445/22315381/IJETT-V68I10P208 https://ijettjournal.org/Volume-68/Issue-10/IJETT-V68I10P208.pdf
64. Innovative drug and disease prediction with dimensionality reduction and intelligence based random walk methods, Ibrahim, S.J.A., Thangamani, M.International Journal of Advanced Trends in Computer Science and Engineering, 2019, 8(4), pp. 1668–1673, https://www.warse.org/IJATCSE/static/pdf/file/ijatcse93842019.pdf
65. R. Ganesan, M. Thangamani, S. Jafar Ali Ibrahim, "Recent Research Trends and Advancements in Computational Linguistics", International Journal of Psychosocial Rehabilitation Vol 24, no 8 (2020):1154-1162, DOI: **10.37200/IJPR/V24I8/PR280128**
66. C. Narmatha , Dr. M. Thangamani , S. Jafar Ali Ibrahim, " Research Scenario of Medical Data Mining Using Fuzzy and Graph theory", International Journal of Advanced Trends in Computer Science and Engineering, Vol 9, No 1 (2020): 349-355