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Asymmetric Reduced Switch Fifteen-Level Multilevel Inverter for Unipolar PWM Scheme

D.Periyaazhagar
Assistant Professor, Department of Electrical and Electronics Engineering
Krishnasamy College of Engineering and Technology, Cuddalore, Tamilnadu

P.Nammalvar
Associate Professor, Department of Electrical and Electronics Engineering
Krishnasamy College of Engineering and Technology, Cuddalore, Tamilnadu

N.Purushothaman
Assistant Professor, Department of Electrical and Electronics Engineering
Krishnasamy College of Engineering and Technology, Cuddalore, Tamilnadu

Abstract-
Multilevel *DC* to *AC* converters offers a higher capability of power allied with lesser output voltage harmonics and minor commutation losses. Their major weakness is their complication; need an enormous number of switching devices and passive device, and relatively difficult control circuitry. This paper focuses on the performed effort on one phase fifteen-level reduced switch *DC* to *AC* converter. Unipolar sinusoidal reference signal with triangular wave carriers is used in favour of producing the preferred switching pulses to produce the essential output *AC* voltage level. The asymmetric fifteen-level *DC* to *AC* converters circuit have been proposed and modelled through MATLAB-Simulink. The simulation outcomes are shows with fewer *THD* and bargain switching loss have been achieved.

Keywords*: Total harmonic distortion, DC to AC converters, Unipolar PWM, Reduced Switch, Multi-level Inverter.*

I. INTRODUCTION

The premises of multilevel inverter have been discussed more than 30 years back. The multilevel inverter has lots of rewards while compared to a predictable two-level inverter such as withstanding higher voltage facility, minor harmonic distortion, lesser switching losses, lesser switching strain, and producing the higher value of output voltage through superior electromagnetic compatibility [1]. The *MLI* technique not only creates superior voltage levels but additional also promotes renewable power creation strategy in input supply side [2]. *MLI* is one of the electrical energy exchange strategies that create *AC* kind voltage as output supply side using input supply *DC* source [3].

Minimum switching multilevel inverter module contain their individual reward and drawback. The module requires a bidirectional switching device in favour of achieving the preferred output *AC* voltage level. Utilization of bidirectional switching device increases, the whole count of switches in those modules, since the mixture of double unipolar switches makes single bidirectional switches through the impression of emitter attached to all switches [4-19]. A familiar topology of the inverters is full bridged 3-level. The 3-level inverter can satisfy qualifications through its extremely higher switching, although it might also regrettably enlarge switching stress and level of interfering to additional apparatus. Civilizing its *AC* output voltage waveform decreases its harmonic substance and, therefore, besides the dimension of the filter worn and the stage of *EMI* created through the inverter's switching process [20]. A variety of conventional topology of *MLIs* is worn in favour of exchange of *DC-AC* supply such *NPC MLI*, *FC MLI* and *CHB MLI* [21-22]. *NPC MLI* needs the additional number of diodes and the number of capacitors needs in the *FC MLI* is large for the reason that voltage harmonizing constraint.

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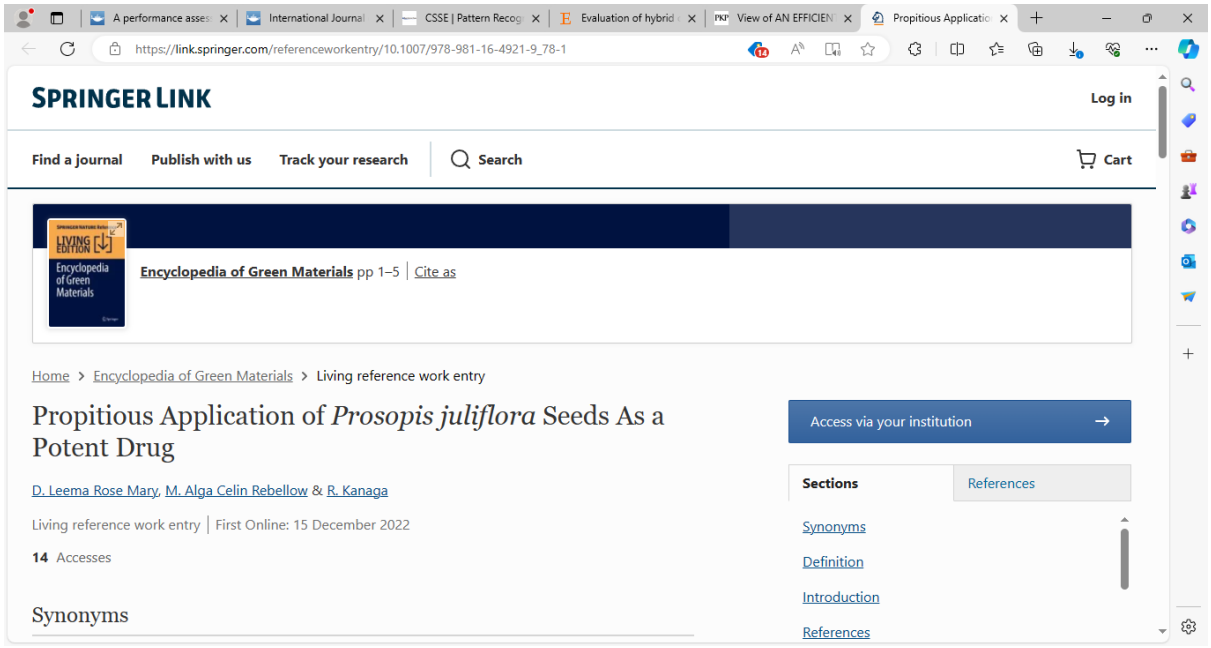
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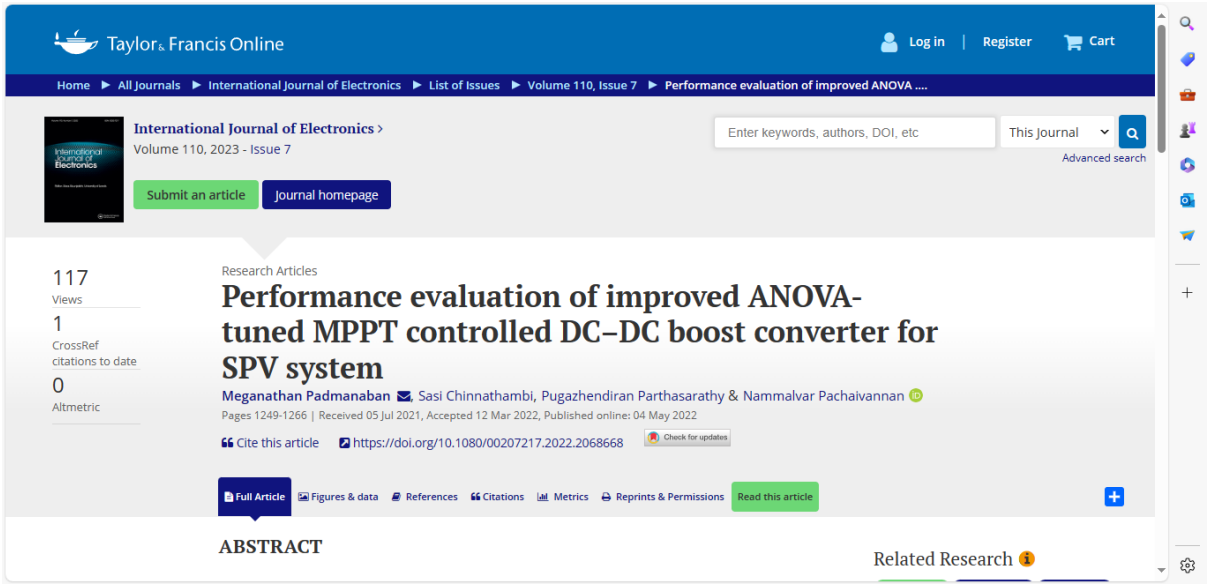
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ABSTRACT
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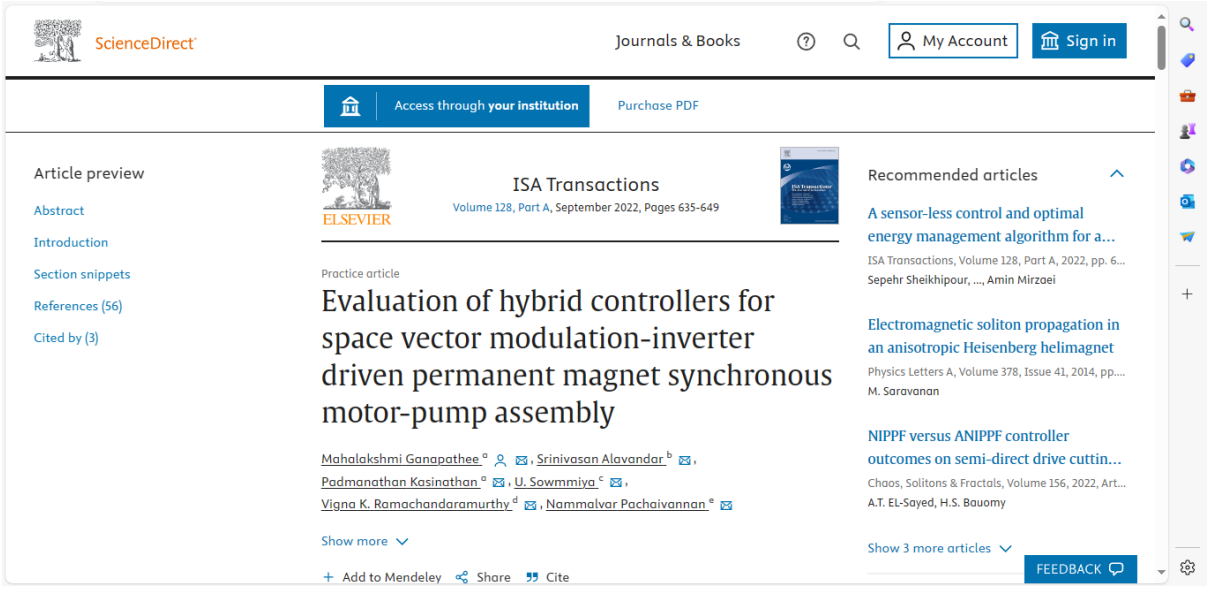
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AN EFFICIENT HYBRID CONVERTER FOR DC-BASED RENEWABLE ENERGY NANOGRID SYSTEMS

ANNAPOORANI SUBRAMANIAN[1], JAYAPARVATHY RAMAN[2], NAMMALVAR PACHAIVANNAN[3]

Key words: Boost converter, Dc nanogrid, Hybrid converter, Photovoltaic panel, Single input multiple output converter.

Many electrical and electronic equipment used in homes requires multiple dc and ac power supplies. Existing hybrid converters used in nanogrid systems provide only single ac and dc outputs for single dc input. They also have limitations such as shoot through problem and requirement of dead time circuitry. This paper proposes a novel single input multiple output hybrid converter (SIMOHC) derived from the dc-dc boost converter, which can produce one ac and two dc outputs simultaneously in single stage from a single dc input with less complex circuit. The proposed converter has higher electromagnetic interference (EMI) immunity, no shoot through problem, and dead time circuitry requirement is avoided. The proposed converter uses simple unipolar sinusoidal pulse width modulation (USPWM) technique and provides higher reliability. The proposed converter is validated using simulation and hardware implementation. It is observed that the proposed circuit performs equally good compared to the existing hybrid converter like boost derived hybrid converter (BDHC), and in addition, has the advantage of providing two dc outputs and one ac output.

1. INTRODUCTION

The uncertainty and cost involved with fossil fuels necessitate the use of renewable energy resources in numerous applications [1]. Modern electronic appliances like mobile chargers, laptop chargers, and LED driver circuits need power electronic circuit interface. Decentralized distribution has increased demand in residential and industrial buildings due to its smooth control flexibility. This structure in literature [2,3] is termed as nanogrid. Nanogrid type architecture is also used to feed different loads in hybrid electric vehicles (HEV) [4,5]. The nanogrid architecture is of two types depending upon the source as dc nanogrid and ac nanogrid [6]. This paper focuses on dc nanogrid, which is fed from dc source only. In conventional dc nanogrid architecture, two dedicated converters are used for the dc-dc and dc-ac conversion, which involves more switches and associated losses. For dc-dc conversion, boost converter may be used, and for dc-ac conversion, mostly, voltage source inverter (VSI) is used, which has less reliability due to EMI or other noise signals resulting in the shoot-through condition, that occurs when switches in the same leg are turned on simultaneously. Hybrid converter is a single stage converter, which can feed ac and dc loads simultaneously with a smaller number of switches.

The advantages of hybrid converters are high reliability due to inherent shoot-through protection, compact size, high EMI immunity, and no need of dead time circuitry, which increases its suitability for loads which need both dc and ac supply. An ac fan and a LED lamp in a home can be fed simultaneously from a hybrid converter in a single stage. Renewable energy sources provide clean and green energy, and hence, preferred for intelligent residential applications. Among all renewable energy sources, PV panels or fuel cells are preferred as sources for dc-based systems. Low voltage and power ratings are the drawbacks of renewable energy sources. Topologies with high boosting factor are required to produce step up operation based on the requirements [7,8]. Therefore, various configurations of single stage boost converters are proposed for hybrid converters, which can feed ac and dc loads at the same time.

Shoot-through is the major problem in the conventional VSIs, which requires the use of dead time circuitry. Unwanted turning on of the inverter leg switches due to the spurious noise signals or EMI causes damage to the switches. Hence, VSI when used in residential applications must be provided with proper protection against EMI or other spurious signals. In Z-source inverter (ZSI), the problem of shoot-through is mitigated [9]. Due to the presence of input impedance network in ZSI, both the switches of the inverter leg can be turned on at the same time, which is called the shoot-through state. To increase the boosting factor, extended boost ZSI [10] is presented in Z-source topology. But the drawback with ZSI is that it cannot supply both ac and dc loads at the same time. Also, dynamic instability is caused when two capacitors are not matched across them with equal loads [11]. Based on inverse Watkins–Johnson (IWJ) topology, a hybrid converter called Switched Boost Inverter (SBI) is presented in [12]. Other than the components in VSI, SBI has two switches and one pair of LC filter, but could supply both dc and ac load simultaneously, and has the advantages of ZSI like buck-boost operation and allowing shoot-through of the inverter switches to provide EMI immunity.

Boost derived hybrid converter (BDHC) [13,14] is proposed from the boost converter, which is based on the two switch converter. Component count is less in BDHC in comparison to IWJ converter. A hybrid converter based on current fed switched inverter (CFSI) based hybrid converter presented in [15] feeds both ac and dc loads simultaneously from a single dc supply, and has high boosting voltage making it suitable for dc nanogrid systems. Residential loads may need two dc outputs and one ac output like two LEDs and one ac fan. Hence, this paper proposes a single input multiple output hybrid converter (SIMOHC) based on the boost converter, which can produce two dc outputs and one ac output simultaneously with a smaller number of switches in single stage. The simple and conventional

[1]Agni College of Technology, Thalambur, Tamil Nadu, India, tannapoorani@gmail.com
[2]Sri Sivasubramaniya Nadar College of Engineering, Kalavakkam, Tamil Nadu, India
[3]Krishnasamy College of Engineering and Technology, Cuddalore, India

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Pattern Recognition of Modulation Signal Classification Using Deep Neural Networks

D. Venugopal[1], V. Mohan[2], S. Ramesh[3], S. Janupriya[4], Sangsoon Lim[5,*] and Seifedine Kadry[6]

[1]Department of Electronics and Communication Engineering, KPR Institute of Engineering and Technology, Coimbatore, 641048, India
[2]Department of Electronics and Communication Engineering, Saranathan College of Engineering, Trichy, 620012, India
[3]Department of Computer Science and Engineering, Krishnasamy College of Engineering & Technology, Cuddalore, 607109, India
[4]Department of Electronics and Communication Engineering, K. Ramakrishnan College of Engineering, Tiruchirappalli, 621112, India
[5]Department of Computer Engineering, Sungkyul University, Anyang, Korea
[6]Department of Applied Data Science, Noroff University College, Kristiansand, Norway
*Corresponding Author: Sangsoon Lim. Email: lssgood80@gmail.com
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Abstract: In recent times, pattern recognition of communication modulation signals has gained significant attention in several application areas such as military, civilian field, etc. It becomes essential to design a safe and robust feature extraction (FE) approach to efficiently identify the various signal modulation types in a complex platform. Several works have derived new techniques to extract the feature parameters namely instant features, fractal features, and so on. In addition, machine learning (ML) and deep learning (DL) approaches can be commonly employed for modulation signal classification. In this view, this paper designs pattern recognition of communication signal modulation using fractal features with deep neural networks (CSM-FFDNN). The goal of the CSM-FFDNN model is to classify the different types of digitally modulated signals. The proposed CSM-FFDNN model involves two major processes namely FE and classification. The proposed model uses Sevcik Fractal Dimension (SFD) technique to extract the fractal features from the digital modulated signals. Besides, the extracted features are fed into the DNN model for modulation signal classification. To improve the classification performance of the DNN model, a barnacles mating optimizer (BMO) is used for the hyperparameter tuning of the DNN model in such a way that the DNN performance can be raised. A wide range of simulations takes place to highlight the enhanced performance of the CSM-FFDNN model. The experimental outcomes pointed out the superior recognition rate of the CSM-FFDNN model over the recent state of art methods interms of different evaluation parameters.

Keywords: Pattern recognition; signal modulation; communication signals; deep learning; feature extraction

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Profit Maximization of Generation Companies Considering Renewable Energy Integration and Unit Forced Outage Rates

[1]S. Sivasakthi, [2]S. Ganesan and [3]S. Subramanian

[1]Department of Electrical and Electronics Engineering, Krishnasamy College of Engineering and Technology, Cuddalore, Tamil Nadu, India.

[2]Department of Electrical and Electronics Engineering, Government College of Engineering, Salem, Tamil Nadu, India

[3]Department of Electrical Engineering, Annamalai University, Annamalai Nagar, Tamil Nadu, India.

E-mail: [1]sivasakthi_gayu@yahoo.co.in, [2]ganeshshriraj@gmail.com, [3] dr_smani@yahoo.co.in

ABSTRACT

Recently, the power system operational planning has been renovated because of the restructuring of the electric power sector. In competitive markets, individual generation companies (GENCOs) determine independent unit commitment (UC) schedules based on forecasted load demand and price. Here, GENCOs develop UC strategies based on the cost characteristics of their generators and revenues from spot price projection in order to maximise profit. This redefined UC is termed "profit-based unit commitment" (PBUC). Unlike convectional UC, PBUC aims to maximise profit rather than minimise costs. We are turning to renewable energy sources as a result of growing environmental concerns. Recently, wind energy has grown in popularity. Here, the traditional producing units are combined with a wind energy farm to reduce the hazardous gas emissions from the fossil generating units. Additionally, the PBUC formulation of the wind-integrated thermal power system takes reliability issues into account. The GENCOs must have a reliable tool to perform PBUC on real-world power systems. This study proposes a novel bio-inspired method called Grey Wolf Optimization (GWO) to address the profit-based scheduling problem. The realistic 10 thermal generating units confirm the GWO model's effectiveness. The simulation results demonstrate the ability of the intended method to produce cost-effective resolutions with high solution quality.

Keywords: *Generation scheduling, grey wolf optimization, profit based unit commitment, reliability analysis, wind power generation*

1. INTRODUCTION

1.1 Profit Based Unit Commitment

The Unit Commitment (UC) problem, which is used in regulated power generation, establishes the best schedule for generating units to achieve the lowest operating cost by satisfying equality and inequality criteria. Millions of dollars are annually saved when producing units are run on their optimum schedule. Conventionally, several deterministic and heuristic techniques are reported to solve UC problems. Still, the development of better models is necessary to handle the new challenges.

Recently, the power industry is moving towards horizontally integrated industry from vertically integrated industry. The usual design of the power system is centralised, and the UC problem is constructed there to save operating expenses. Now, however, as we transition to a deregulated system, generating companies seek to maximise profit by producing and reselling electricity. Here, UC has evolved from a profit-based policy known as Profit Based Unit Commitment to a minimum cost policy (PBUC).

In a competitive environment, GENeration Companies (GENCOs) may produce less real power than the anticipated demand. Here GENCOs may choose most profitable generation by considering the softer demand. This provides little flexibility in the power generation planning. The GENCOs have to maximize profit with simultaneous maintain of power quality to the consumers.

Electricity is traded as a commodity on the open electricity market under a deregulated structure. A GENCO's goal is to maximise profit on the open energy market while adhering to the generating units' inequality limits. The restrictions include the thermal units' minimum up/down times and generation constraints.

In unregulated markets, GENCOs take into account generation planning up to 24 hours in advance, depending on the availability of generating units, their individual features, and price projections. The GENCOs plan the bidding strategy for each of the following day's bidding periods.

In order to outperform their rivals, GENCOs will have additional producing units with flexible operating capability, which enables a prompt response to the ongoing changes in the conditions of the power system. As a result, the emphasis has shifted from a profit maximisation objective in the deregulated system to a cost minimization policy in the centrally planned system.

1.2 Wind Integrated Profit Based Unit Commitment

Due to wind energy's sustainability and lack of carbon emissions, its penetration in the power system has dramatically

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Secure Data Sharing with Confidentiality, Integrity and Access Control in Cloud Environment

V. Rajkumar[1,*], M. Prakash[2] and V. Vennila[3]

[1]Department of Computer Science and Engineering, Krishnasamy College of Engineering and Technology (Affiliated to Anna University, Chennai), Cuddalore, 607109, India
[2]Department of Computer Science and Engineering, School of Computing, SRM Institute of Science & Technology, Kattankulathur, 603203, India
[3]Department of Computer Science and Engineering, K.S.R. College of Engineering (Affiliated to Anna University, Chennai), Tiruchengode, 637215, India
*Corresponding Author: V. Rajkumar. Email: raj7win@gmail.com
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Abstract: Cloud storage is an incipient technology in today's world. Lack of security in cloud environment is one of the primary challenges faced these days. This scenario poses new security issues and it forms the crux of the current work. The current study proposes Secure Interactional Proof System (SIPS) to address this challenge. This methodology has a few key essential components listed herewith to strengthen the security such as authentication, confidentiality, access control, integrity and the group of components such as AVK Scheme (Access List, Verifier and Key Generator). It is challenging for every user to prove their identity to the verifier who maintains the access list. Verification is conducted by following Gulliou-Quisquater protocol which determines the security level of the user in multi-step authentication process. Here, RSA algorithm performs the key generation process while the proposed methodology provides data integrity as well as confidentiality using asymmetric encryption. Various methodological operations such as time consumption have been used as performance evaluators in the proposed SIPS protocol. The proposed solution provides a secure system for firm data sharing in cloud environment with confidentiality, authentication and access control. Stochastic Timed Petri (STPN) Net evaluation tool was used to verify and prove the formal analysis of SIPS methodology. This evidence established the effectiveness of the proposed methodology in secure data sharing in cloud environment.

Keywords: Secure interactional proof system; access control; multi-step authentication; Gulliou-Quisquater protocol

1 Introduction

Cloud computing is the next-gen technology which finds its applications across different sectors for information storage and security concerns. In cloud computing model, data privacy and prevention of data loss are the major concerns to be addressed [1]. In this scenario, the current research work proposes

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An AI assisted multi-objective cloud computing model for optimized task scheduling and enhanced QOS

R. Vijayalakshmi
Associate Professor, Department of Master of Computer Application, Krishnasamy College of Engineering & Technology
Email: vijayalakshmirmca@kcet.in

Dr. S.K.V. Jayakumar
Associate Professor, Department of Computer Science & Engineering, Pondicherry University, Puducherry.
Email: skvjey@gmail.com

Dr. M. Sathya
Assistant Professor, Department of Computer Science & Engineering, Pondicherry University, Puducherry.
Email: satsubithra@gmail.com

***Abstract*---**In recent decades, cloud computing has gained popularity due to the extensive collection of autonomous systems with a flexible framework and diversified features. Various communities require a cloud computing paradigm to maximize their revenue due to its commercial reality. Scheduling of resources to the cloud consumers dramatically influences the cost-benefit of the service providers. Several kinds of research have already been made, focusing on task scheduling and resource utilization. Job shop scheduling is one of the strong NP-hard problem for the production of optimal scheduling strategies. Evolutionary algorithms such as genetic algorithm and tabu search have been emerged to perform optimal job scheduling in cloud computing environments, but that are confined to perform a single objective. Hence to meet the multiple objectives in cloud computing platforms, we proposed a novel artificial intelligence-based task scheduling strategy to facilitate minimum makespan, energy efficiency, reduced computational cost, and reliability. The proposed modified sheep flock heredity algorithm (MSFHA) facilitates the optimal task scheduling strategy by selecting the job schedules with the Longest job to the High-speed processor (LJHP), Smallest job to the High-speed processor (SJHP), and high-affinity values. The best-fit jobs having minimum makespan and highest robust factor are cloned and further replaced with new incoming jobs. Furthermore, to enrich