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To

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Subject: Acceptance letter for manuscript (2020/BP/1807F) as a book chapter of Challenging Issues on Environment and Earth Science (International Book)

Dear Dr. M.S. SIVAKUMAR,

We are pleased to inform that your manuscript (Ref. no. **2020/BP/1807F**) entitled "**The Effect of Volataile Fatty Acid on an Aerobic Biofilm Reactor Using Dairy Wastewater**" is ACCEPTED for publication **as a book chapter in the following book: <u>Challenging Issues on Environment and Earth Science</u>** (International Book)

Thank you for submitting your manuscript in <u>**Challenging Issues on Environment and Earth Science**</u>

Thanking you.

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Table of contents (12 chapters)

Patient health monitoring using soft computing techniques

YVR Naga Pawan, Kolla Bhanu Prakash and Pradeep Kumar Vadla

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Abstract : Due to exponential growth and rapid modernization in urban areas, there is a disparity in the socio-economic urban and rural populace. The wellbeing of these population is peril change in lifestyle affecting the health of an individual or their families. Moreover, the many countries has health issues in Communicable and Non-Communicable Diseases and malnutrition. As per World Health Organization (WHO), the Doctor to Patient Ratio (DPR) is 1:1000. It is an apprehensive task for a Doctor to monitor health concerns of the patients. The time to spent by a doctor to a patient is an average of 7-10 min, where most of the time, the doctorsare busy in taking notes symptoms or feeding the data to the Health Care System. The smart devices and Computational Intelligence (CI)and Soft Computing Techniques (SCT) may help the doctors to monitor the data of their patients suffering with various health care issues and also to diagnose and to provide state-of-the-art treatment.The collected data may be used by theconglomeration of doctors for their superfluous analysis and predictions,local government authorities may use the data to improve sanitation and controlling the outbreak of epidemics and also for other health care predictions. Applying SCT, identification of correlated features, feature ranking or importance and feature selection are performed on UCI Machine learning Datasets and also classification and prediction are performed on the Datasets to examine the accuracy of the predictions for the classification algorithms - rpart, knn and svm.

1. INTRODUCTION

A sustainable Good heath is fundamental for the development of any country. As mentioned in [1], doctor is central for implementation healthcare in the society. After the doctor, the infrastructure, staff, hale and hearty socio-economic conditions of the peoples etc improves the quality of healthcare in the society. This in turn contributes to the nation building. Unfortunately, in India, the DPR is lower than the WHO norm which 1:1000 [2]. For one doctor there are 1457 patients. A limited appointment time, called as Doctor to Patient Time (DPT), is likely to adversely affect the healthcare of the patients and workload and pressure for doctors[3]. The socio and economic conditions of the patients are also detrimentally impacting the healthcare and living standards of the people after recuperation from severe illness.

The technology is changing the world. The Healthcare industry is not an exception to the changes. Many studies shown that better than humans, the Artificial Intelligence (AI) performs better in diagnosing diseases fastly and accurately [4].Computational Intelligence (CI) and Soft Computing (SC), a subset of AI, are a collection of mathematical paradigms that are biologically and linguistically driven [5]. CI mainstays on neural networks, fuzzy systems and evolutionary computing whereas SC includes probabilistic reasoning, Fuzzy Logic, Evolutionary Computing and Neural Networks. Thus indicating CI and SC share a majority of machine learning methods.

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Block chain for Tertiary Education

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Abstract: Tertiary Education is expanded exponentially over a decade, in India. The statutory authorities are striving for inducing the quality in tertiary education through Outcome Based Education as one of the major transformations. The phoney credentials are culminating the initiatives and affecting the right spirit of transformation initiatives. Blockchain, a disruptive technology, with its public, secure and unique distributed ledger brings transparency to the details of students, faculty and Institutions, enabling the stakeholders and statutory bodies like AICTE, UGC, affiliating university to access genuine information from the data stored in the blockchain.

Keywords: Outcome based Education, Blockchain, Tertiary Education.

1. Introduction

The globalized industry is drastically changing its shape. It is the time for fourth industrial revolution i.e., Industry 4.0 (I40). The disruptive technologies like Artificial Intelligence (AI), Robotics, 3D Printing, High Speed Travel, extra-terrestrial colonization etc., are going to change the world and also population way of living. It is challenging for HR Managers to hire employees with high qualification and smart skill set along with self-engaging skills. If I40 employs human force as required, new performance management tools are required in coming years for assessment. To caters, the demand of I40, the Technical Education (TE) needs to transform transiently which enables the upcoming engineering graduates are highly employable. The demand for quality engineering education may rise steeply.

2. Higher Education in India

The Higher Education Institutions (HEI) or Tertiary Education (TE) have to play a pivotal role, in building new India in imminent decades. Numerous

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Engineering Institutions are producing a large of Graduates, Post Graduates and also Doctorates, these days. In Particular, the Engineering Graduates from Centrally Funded Institutions (CFIs) like Indian Institute of Technology (IITs), National Institute of Technologies (NITs), and State level Government Universities and Government Engineering College and a very few reputed Private Institutions are comfortably employable irrespective of the vacillations in the Industry. Majority of the Tertiary Technical Education (TTE) is imparted through Self-Financing Private Institutions. As per statistics of All India Council for Technical Education (AICTE), a statutory body to oversee the Technical Education in India, reports that majority institutions are imparting low quality technical education which is not suitable for the current and future industry.

The Ministry of Human Resource Development (MHRD), Government of India (GoI), robustly believes that the institutions with well-established infrastructure and quality faculty impart quality education to the students. MHRD through AICTE instructing the Technical Education Institutions (TEI) to adopt Outcome Based Education (OBE) and insisting to get accreditation for the programs offered. Globally, it is evidenced that OBE enables the TEIs to transform Engineering Education to the necessities of Stakeholders.

3. Outcome Based Education

Outcome Based education is an educational theory Model based on goals (outcomes) for each part of an educational system. It is a student-centric learning model. In OBE, the program created with an expected outcome as per the requirements of the stakeholders. The curriculum is designed with the aim of equipping learners with the knowledge, skills and orientations needed for success after leaving the institution. The OBE model measures graduates' progress from the parameters, which are

- Program Educational Objectives (PEO)
- Program Specific Objectives (PSO)
- Program Outcomes (PO)

Impact of Inertia Weight and Cognitive and Social Constants in Obtaining Best Mean Fitness Value for PSO

Yallapragada V. R. Naga Pawan[ID] and K. Bhanu Prakash[ID]

Abstract The performance of an Inertia Weight-based Particle Swarm Optimization (IWPSO) is relied on parameters like inertia weight, cognitive, and social coefficients. This paper is investigating effective range of inertia weights and relationship between cognitive and social coefficients over different swarm sizes for selective iterations and dimensions in assessing performance of IWPSO. The experimental results show that the inertia weights in the range 0.1–0.8 and when cognitive coefficient is less than social coefficient, the results are more aspiring.

Keywords Particle swarm optimization · Inertia weight · Cognitive constant and social constant

1 Introduction

Particle Swarm Optimization (PSO) is a biologically inspired Swarm Intelligence (SI) technique where bird-like objects tend to move toward a goal. This technique is proposed by Kennedy and Eberhart [1, 2] used for solving global optimization problems. Due to its ease in implementation, it is used in a wide spectrum of domains as promising optimization technique due to faster convergence to an optimum.

The work of Kennedy and Eberhart [2] is considered as a Basic Particle Swarm Optimization (BPSO) technique. In BPSO, the velocities and positions of the particles are randomly initialized. The equations used BPSO are given as Eqs. (1) and (2).

$$v[i+1][d] = v[i][d] + \text{constant1} * \text{random}() * (p\text{Best}x[i][d] - \text{current}X[i][d])$$
$$+ \text{constant2} * \text{Random}() * (p\text{Best}x[g\text{Best}][d] - \text{current}X[i][d]) \tag{1}$$

$$\text{current}X[i+1][d] = \text{current}X[i][d] + v[i][d] \tag{2}$$

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197

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for presenting the research paper entitled "Accurate Detection and Diagnosis of Breast Cancer using Scaled Conjugate Gradient Back Propagation Algorithm and Advanced Deep Learning Techniques" in the Second International Conference on Advances in Electrical and Computer Technologies 2020 (ICAECT 2020) held at The Hotel Aloft, Coimbatore, Tamil Nadu, India during 12 - 13, June 2020.

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Chapter 6

Machine learning in blockchain

Kolla Bhanu Prakash[1], Vadla Pradeep Kumar[2] and Venkata Raghavendra Naga Pawan[3]

The promise and potential of blockchain to drive social impact is enormous. Blockchain will touch every significant industry which people interact with in day-to-day life. Blockchain will enable solutions that are not previously possible. Health sector recently attracted more initiatives than any other industry. Applications for blockchain in health include digital health records exchange and pharmaceutical supply chain management. In many of these areas, blockchain offers a more secure, decentralized and efficient solution than would otherwise be possible.

Blockchain and machine learning (ML) technologies are gaining strong momentum and thrust around the world. Blockchain, a disruptive technology, made its big splash with crypto currencies invention and trading. On the other hand, with predictive and descriptive algorithms, ML is making considerable waves in harnessing existing data to identify patterns and gain insights.

Congregating the two technologies can only make them super disruptive! Both have the potential to hasten data exploration and analysis as well as intensify transactions security. Additionally, distributed blockchains can be a significant and proven input for ML, which requires big datasets to make quality predictions.

It goes without saying that each technology has its degree of complexity, but both artificial intelligence (AI) and blockchain are in situations where they can benefit from each other and help one another. Both these technologies are able to effect and enact upon data in different ways as their combination makes sense, which can take the exploitation of data to new levels. At the same time, the integration of ML and AI into the blockchain, and vice versa, can enhance blockchain's underlying architecture and boost AI's potential. Additionally, blockchain can also make AI more coherent and understandable for tracing and decision-making using

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7-Level Semi Cross Switched Multilevel Inverter Fed Induction Motor Drive

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Abstract. Multilevel inverters have more prominent features than 2-level inverter due to various advantages like voltage quality, low EMI etc. The semi cross switched multilevel converter topology need less number of semiconductor switches compared to cascaded H-bridge multilevel inverter, and can be implemented to any number of voltage levels. The operating modes of 7-level semi cross switched multi level inverter are discussed. Three phase seven level inverter fed induction motor is implemented in MATLAB/SIMULINK.

1 Introduction

Now a day's multilevel inverters grab the attention of researchers due to the various advantages like quality output waveform, low EMI, low THD and are suitable for low and medium voltage industrial applications. Many multi-level inverter topologies are proposed and popular among them are the neutral point clamped [2], [3], flying capacitor [4], and cascaded H-bridge [5] structures, neutral point clamped and Flying capacitor multilevel inverters require complex circuitry with the increase in number of levels.

The main topologies of cascade H bridge is symmetrical with equal voltage sources and asymmetrical with unequal DC sources. The problem with asymmetrical topologies is that some switches have to process through main part of voltage so some high voltage switches are required.
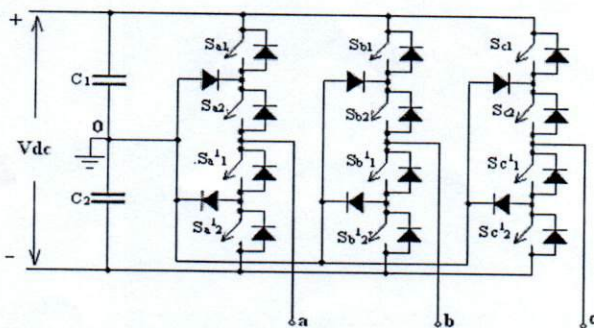

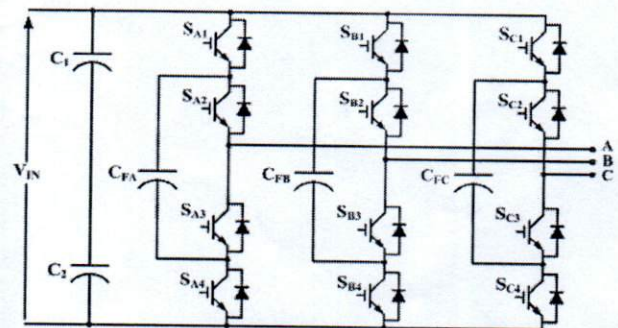**Fig. 1.** 3-Phase 3-level Capacitor-Clamped MLI

Fig. 2. 3-Phase 3-level Diode-Clamped MLI

2 Cascaded H-bridge Multilevel Inverter

The cascaded H-bridge(CHB) inverters are more interested due to the greater demand of medium-voltage high-power inverters. Full bridge strings are connected in cascaded form with separate dc sources to form CHB. Each full-bridge string generates three voltages at the output $+V_{dc}$, 0 and $-V_{dc}$.
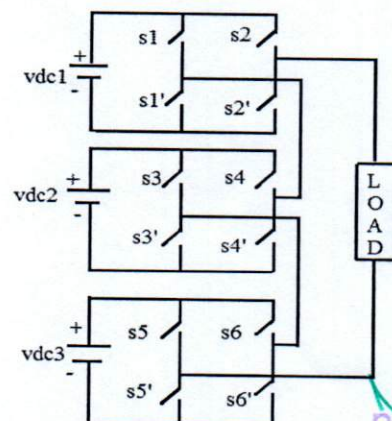

Fig. 3. Single Phase Cascaded H-bridge 7-level Inverter

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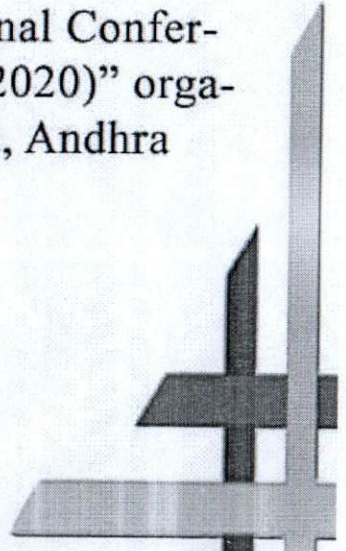
Model Predictive Controller based Unified Power Quality Conditioner for Voltage Regulation Studies in 33- Bus Closed Loop Distribution System

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Abstract-Recent developments in FACTS have produced U.P.Q.C to mitigate sag and attenuate THD. U.P.Q.C has been urbanized as a FACTS controller between feeding end & far end of distribution system .The U-P-Q-C is capable of improving the voltage profile & reducing THD of distribution system by regulating the voltage using PR (Proportional-Resonant-Controller) and MPC (Model-Predictive) controller. This work proposes U-P-Q-C for Thirty Three Bus Systems .The objective of this work is to enhance-voltage-profile of T-T-B-S. The T-T-B-S in open loop & closed loop-TTBS- U-P-Q-C using PR and MPC-controllers are-modeled,pretend &their consequences are represented. Responses are estimated as a time of settle and error in steady state. The outcomes indicate that MP Controlled T-T-B-S system has better response than PR controlled T-T-B-S system.

1 Introduction

Ideal mode of power networks in altering receiving end responses be a tricky issue. For regular network modules most of the substiutional elements introduced for enlarging functionality of respective devices. Just like bank of capacitors, loading taps, potential controllers etc.Evaluation of ideal locations of respective elements for such apparatus for regulating responses requires formulization of in service optimal approach. Effect over power-energy to be the most affordable parameter in practice to identify locations of substitution elements [1-4].General case of withholding devices be insertion of capacitors [1-2],re configural of networks[3],allocating DG's[4] etc.Even though entair methods will make PE-reduction, over it will be complications of adopting such innovations. Fixing capacitors be a simplest mode to dominant loss reduction of energy. When secondary end is alternative in nature, finest regulation is difficult.

Likewise set of capacitors are modulated with simplest procedures [2].Further variations in positional aspects from single point to some other develops interruptions. Identifying a system response will goes with suitable deployment of E-loss. PQ-issue will be treated as a un-standard-voltage, current/frequency which exhibits a mal-operation for recieving end devices. User level distribution-models, smoothen industrial-loads and crucial commercial-operations all effects from various levels of outages and service - ditortions which makes suitable damage for incidents suited in running-down-time, mis match-generation, similar task-models and other parameters [5]. The paper

over-whelms about power quality conditioner(PQC), it suits to execution towards series-shunt APFs. Objective of the UPQC is to substitute element as for potential flickers/im-balances, reactive-powers, opposite-sequence currents and harmonies. Other side, it has the ability to improve quality of power at installation sectors on distribution-networks or industrial-power-systems [6].

It is pretended to represent a wide variety of suitable conditioner modules to 1-ph (2W) and 3-ph (3W and 4W) systems, various substitutional-models, latest innovations in the fields. It is mentioned that somany-researchers will be considered various titles to conditioner suited to similar-function, tasks, applications or topologies with selection [7-11].S-PV arrays are integrates to DC-links for PQC-S-PV via simple-boost-converter. It is regulated by MPPT-algorithm for operating PV-array at top stream locations.series-compensators-control will based on liberation of points of Common-Coupling-Voltage-Template for utilising 2 cascaded-SOGI-band-pass-filter.

Parllel-compensating-controller will depends on extractive fundamentals load- current. If load-current is highly un-linear, a mix of CSOGI&DSC considered for extracting fundamentals in service element of load by that ref-signal for parllel-compensators are developed. Design and performance analysis of 3phase solar-PV-integrated-UPQC[12-13].1-phase-non-transformer-conditioner-(NT-UPQC) will be represented. Non other than not any isolated-transformer, recommended blocks considers 4-switching-elements only, framing 2-half-

Improvement of Load Regulation in 33- Bus Closed loop Distribution System using Sliding Mode Controlled Unified Power Flow Controller

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Abstract— Recent developments in FACTS-devices have produced conditioner equipments to mitigate sag and attenuate Total Harmonic Distortion (THD). U.P.Q.C has been urbanized as a FACTS controller between feeding end & far end of distribution system. The UPQC is capable of improving the voltage profile and reducing THD of distribution system by regulating voltage using FOPID (Fractional-order-proportional-integral-controller) and utilizing SMC (sliding-mode-controller) controller. This work proposes UPQC for Thirty Three Bus System (TTBS) .The objective of this work is to enhance-voltage-profile of TTBS. The TTBS in open loop & closed loop-TTBS UPQC using FOPID and SMC-controllers are-modeled pretend and their consequences are represented. The outcomes are estimated in terms of settling-time, steady-state-error. The outcomes indicate that SM Controlled TTBS system has better response than FOPID controlled TTBS system.

Keywords—Fractional order PID controller (FOPID), U-P-Q-C, Thirty three Bus Distribution System (TTBS), Sliding Mode Control (SMC).

I. INTRODUCTION

Now a day's power eminence is the utmost crucial in individual-levels of conduction&dissemination. It's frantically crucial to mind out of the tolerable capricious for-energy eminence. NG-hingrani [1], had offered elementary perception for user-levels. This one gave a consistency for stream-powers. Chellali Benachaiba-etal. [2], 2009, described-DVR-which was-a-constraining-element for-satisfactory-voltage-variations. Likewise contributed scheme of-potential re-establishment by the side of the-PCC, -DVR-ideologies &also labeled almost the various means of-voltage-infusion.DVR-can knob equally unhinged &hinged situations excellently.Mehmet Ucar-et al.[3*], 2008, intended the-PQ concept called immediate-Reactive~ Power-concept, alternative regulator purpose had been recommended-for 3phase4wire and 4leg analogous-APF, centered by that scheme, for compensation of Q, current-harmonic-rejections, & steadying case consignment-current values in un-impeccable source-voltage considerations, im-balanced-un-straight burden. Kamrhan & Habeatler-[4], had suggested novel route considering the-killjoy control, that luxuries UP-QCS-inverter relationship as a-single unit. The entire idea had

been displayed using a 3phase-arrangement-SAF. It likewise utilized a full-request-prescient state onlooker. Displaying the framework as a single-multi-info, multi-yield-method had various gains. It demonstrated quicker powerful reaction and consistent state exactness and in this way giving improved altered response for freely regulated conversion devices. KH Kwain-et-al [5], 2009, proposed MPC structure for the U-P-Q-C. Usage of KALMAN-channels made it simple to withdrawal for head & symphonious elements to assigned burden load, the provided potentials. MPC to be planned dependent for state -space-model for U-PQ-C.SMC demonstrated helpful in controlling the blunder in provided voltage &the heap current consequently directing both gracefully voltage &burden current. It was useful in moderating burden variety, hang &hike. Bheem-Sing-et-al. [6], 2012, recommended control strategy for to D-VR for-ex-DVR so as to conquer the delinquents holds nature for intensity & standardize points value. To guideline for direct -transport value of D.V.R & terminals-voltage–FOPID-devices are utilized.Syn- ref outline speculation was moreover used to liberate major part of voltages. V-Kadkikar-[7], 2005, suggested simple technique to-U-P-Q-C.

Steady state examination &numerical-investigation of U-PQ-C was given. Equal APF kept up the general force levels at whole system. Harmonic-currents will be reimbursed capably from suggested framework. YashPal e.t.a.l. [8], introduced new approach to 3P4W U-PQ-C. Unit vector layout control framework was used to modulating arrangement A-PF, when Icosɸ model was opted for controlling equal A.P.F. These methods suggests lightening to V-I sounds burdens-adjusting, sag-swel-rushes.

These techniques helped viably for reducing set period, no. of sensors.S.P.Das.et.al [9], 2007, suggested 2control plan models for U-PQ-C. These 2control plans depended on the kind of voltage pay technique; they are U-PQ-C-Q &U-P-Q-C-P. The ampleness of the 2control plans was tried. U.P.Q.C-Q will successfully differentiate Var among 2compensators however non-viable for regulating lopsided drops. U-PQ-C-P will calms flexibly potentials-im-balancing problem moreover close for making hangs and swels. Amprish- Chandhra .et.al [-

Review of Power Quality Issues and Mitigation Techniques in Electrical Power Systems

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Abstract—Power quality complications are treated as interrupted voltage, current or frequency which reflects as malfunction of connected elements at end levels. User system models, smoothen loads of industries and crucial, regular operations of all effected by kinds of outcomes & line distortions, they can impact with economy of the whole system. Here the power quality includes the enhancement of voltage quality, source power factor, control of harmonic distortions, voltage sags and swells. The devices selected for power quality improvement are DSTATCOM, Hybrid active power filters, Dynamic voltage restorers, static var compensators TVSS,CVT etc.

Keywords— Power quality issues, voltage sag, Hybrid active power filters, DSTATCOM, DVR, SMES.

I. INTRODUCTION

For popularly forcing demands at genuinely measures, flexible outcomes and growing multiple cases of effective loads may reflects to raised awake for quality of power from users and utilities. Usual cases of PQ-dissimilarities are sags, swells, distortions in harmonics and minimal p.f [1].

Sag can be a least time (10-msec to 1-min) procedure for which drop in RMS-voltage value happens [2].Its value ranges (10-90) % of base voltage and its period from half a cycle to one min.Sag is effected from a fault in utility system, a fault inside user facility or huge increase of load current, just like motor-starting or energising of a transformer. These are one of the usual happening issues of power quality. In industries voltage-sags expectancy is often, effects with critical issues. User side regularly impacts with distortions of user end devices treated as saviour PQ-issues [3].

Swells and rise in voltages will reflects as more heating, tripping as well as malfunction of industry elements such as rotating devices. Electronic devices are more smoothen towards harmonics because its control depends on peak-value or 0-crossing of voltage supplied; these are all affected by HD [4]. Improvement of PE devices such as FACTS & custom cases will be introduced and innovative models of giving power systems.

Hybrid Active Power filter (HAPF) models are designed with active & passive elements in line or shunt been suggested, targeten to hike compensation capabilities of PPFs and diminishes voltage & current ratings of APF's, like wise it leads to improve its performance. This topologies consists of lots of passive elements like transformers, capacitors, reactors and resistors. By that increases its area and cost for whole system [5-8].

II. POWER QUALITY ISSUES

Recent survey by experts of power quality denotes that half of all PQ-related complications be due to grounding & its bonds N-G: Voltages, loops, GND-currents and other related issues. Following symptoms are observed for PQ's. it.

- Mis-operation of equipments on the same day.
- Trip/Brakings without any loading.
- Control apparatus stops without any reason.
- Electronic equipments fails to work for frequent basis.
- Equipment functions in one place & malfunctions at other.

Problems of PQ are getting significance due to these reasons.

- ✓ Communities being gradually dependent for electricity. Little shortages of power be a big economic impact for industry users. A longer distortion effects regularly for all tasks of developed community levels.
- ✓ Invention of latest PE-equipments like VSD's and SMPS come towards another more distortions in supply system.

In order to avoid problems listed above, latest equipments introduced here as,

- ➢ Line-Voltage-Regulators
- ➢ Tap changers

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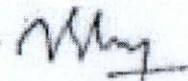## TRANSFORMATIONS IN ENGINEERING EDUCATION

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Speed Control of an Induction Motor Fed by an Inverter Using dSPACE Controller

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Abstract. This paper presents the design and implementation of Inverter system for driving three phase Induction motor using DSPACE DS1104 controller with the controlling objective space vector pulse width modulation (SVPWM) technique. AC motor drives are commonly used over DC motor drives because of their more advantages. Induction motor is the most commonly used AC motor drive for various industrial and domestic applications. The project will be commenced by a basic understanding of SVPWM inverter, components used in the design and study the mathematical equations of the Induction motor. The performance of SVPWM based Induction motor (IM) in open loop is presented with simulation. Here the hardware implementation of the three phase inverter which is fed to a three phase induction motor driven by DSPACE CP1104 is been implemented.

1 Introduction

AC motor drives are commonly used over DC motor drives because of their more advantages. Induction motor is the most commonly used AC motor drive for various industrial and domestic applications. Generally Pulse Width Modulation (PWM) technique is used for driving a motor drive. In this paper design of variable speed induction motor drive using Space Vector Pulse Width Modulation (SVPWM) inverter is explained. PWM signals are generated using a DSPACE Controller.

1.1 Open loop Block diagram

Block diagram of single phase or three phase induction motor drive fed by an inverter driving in open loop is given below.
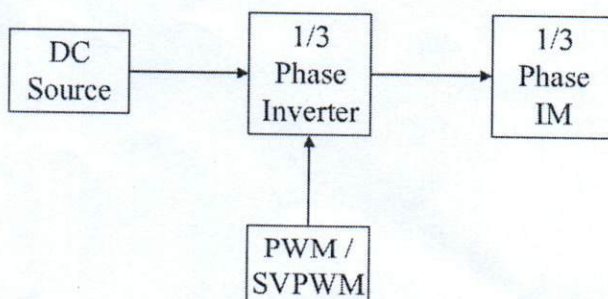

Fig. 1. Open Loop Block Diagram

2 Inverter

Depending on the supply inverters are classified in to two types. They are

- Single-phase Inverter
- Three-phase Inverter

2.1 Space vector pulse width modulation

Space vector pulse width modulation (SVPWM) is a pulse width modulation (PWM) technique which is used to apply to a three phase induction motor. The main objective of this technique is to use a dc voltage source and by means of six IGBT switches produce a three phase sine waveform in which frequency and amplitude is adjustable.

To implement space vector pulse width modulation, the voltages equations in abc reference frame can be transformed in to the stationary d-q reference frame that consists of horizontal and vertical axis

Academic Science

Image Recognition theory for Natural Language using Images and Text

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Abstract— The efficient processing, association and understanding of multimedia based events or multimodal information is a very important research field with a great variety of applications, such as knowledge discovery, document understanding, human computer interaction, etc. A good approach to this important issue is the development of a common platform for converting different modalities (such as images, text, etc) into the same medium and associating them for efficient processing and understanding. Thus, this talk here presents the development of a methodology capable for automatically converting images into natural language (NL) text sentences using image processing analysis methods and graphs with attributes for object recognition, and image understanding. Then it converts graph representations into NL text sentences.

Keywords— Natural Language, Expressive text-to-speech (TTS) synthesis, feature engineering, sentiment analysis, text classification

I. INTRODUCTION

Human beings use their vision capabilities and language to perceive the world around them and to communicate it to others. Given an image they can easily give a language description of it and similarly when something is described in language, they can very well create an image out of it. For human being this is a mundane activity, but imbibing these capabilities in machine, is a challenging task. It requires the knowledge of research areas like computer vision and natural language processing. Although, both the fields have emerged from Artificial Intelligence and are today active area of research in themselves, is treated by the researchers of each field in isolation. Research taking place in one of the field seems to be less benefitted from the other one. Both the fields have flourished separately and have given exciting applications but majority of current applications have not exploited the visual and textual information jointly. However, there exists many real world problems which require knowledge and expertise from both the field as the co-occurrence of visual and textual data is natural and significant and easily available; for example subtitles in the videos, tagged images on social networking sites etc. Also with the tremendous growth of visual and textual data on web as well as private repositories has generated requirement of searching organizing and mining this data for varied reasons. So it is natural and mandatory to explore the possibilities, how the integration of both the field can be achieved and where it would be beneficial for the resultant application. For the completeness of the content, we explain further, both the tasks i.e computer vision and natural language processing and activities involved in it in the following sub-sections. Further, the paper reviews previous research on the efforts and systems created using the concept of integrating computer vision and natural language processing. We describe the research issues and challenges those would be encountered while bridging the gap between computer vision and NLP.

II. NATURAL LANGUAGE PROCESSING

A. NLP

NLP means enabling computers to derive meaning from spoken or written text in natural language input. The spectrum of NLP also includes generating sentences in natural languages by computers just like we humans do. Figure 1 shows the list of tasks that are performed in a typical Natural Language Application.
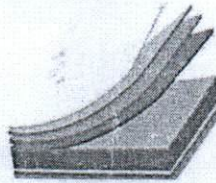
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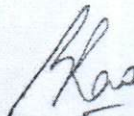
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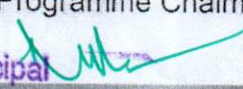
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SENSORLESS SPEED CONTROL OF BRUSHLESS DC MOTOR USING FUZZY CONTROLLER

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Abstract— **This paper proposes a fuzzy controlled integrated speed – Sensorless approach for the speed control of Brushless DC Motor (BLDCM). This speed sensorless approach employs a load observer to estimate the disturbed load torque, and thus develops a speed sensorless algorithm. For the load observer, the inputs are mechanical rotor inertia constant and the friction coefficient, which are estimated using the recursive least-square rule. Thus this approach is insensitive to motor parameter variations and integrated drift problem. The proposed algorithm is simple when compared to extended Kalman filter in estimating the speed. A comparison is made among fuzzy controller, modified model reference adaptive control and PI controller. It is found that the fuzzy controller has superior performance over other two controllers. The proposed scheme is simulated using MATLAB/SIMULINK.**

Keywords— *BLDCM, Fuzzy Controller.*

I. INTRODUCTION

Recent investigations of AC motor controls have been based on two motor drive frame works – Vector control and Direct torque control. The former, using axes transformation from the three phase electric terminal axis and some control algorithms, controls the motor in a simple environment, and involves more complex computing algorithms compared to the later. The later, without the inner current loop, controls the motor using switching table at the desired torque and flux, but exhibits a ripple speed response, even though its drive framework is simpler than that of former. This study adapts the vector control motor drive to develop a new speed sensorless vector control for a Brushless DC Motor (BLDC).

The BLDCM is same as the permanent magnet synchronous motor. However, the former name refers to the driving method, and later refers to structure. The BLDCM has been extensively used in industry because it has high power density, large torque and high efficiency. One of its shortcomings is the need for sensors to support position or speed feedback control, such as an encoder or resolver. These sensors add to the cost and weight of motor drive and reduce the reliability of the system. Research on speed – sensorless control of BLDCM, based on estimating the position or speed of rotor by making measurements at the input terminals has been conducted to solve these problems. Studies in this field can be grouped into three categories:

1) Back EMF based approaches [1], [2]
2) State observer based approach [3] – [5]
3) Estimator based approach [6], [7]

First two methods are sensitive to both the time-variant motor parameters and the integrator drift problem that arises in measuring process. Estimator based approach, which is used an estimator such as the extended Kalman filter to estimate the speed, require complex computing algorithms and suffer from the initial-value problem. Additionally they can only be applied if a high performance PC or DSP is available.

The torque observer [8] was employed as feed forward compensator for the position controller. The torque observer was derived from mechanical dynamic equation with estimated parameters namely the mechanical rotor inertia constant and friction co-efficient. Based on this approach the paper proposes a new speed sensorless approach, which has simpler computing algorithm and is uninfluenced by the time variant motor parameters or the integrator drift problem.

The performance of speed-sensorless approach is governed by the type of controller. For better performance, MMRAS, an adaptive control algorithm is used for the speed controller. The performance of speed controller influences the speed sensorless approach. Therefore modified model reference adaptive system (MMRAS) [11], an adaptive controller algorithm is used in speed control of BLDCM to improve the performance of the speed sensorless approach [9]. In this paper fuzzy controller is being employed in place of MMRAS.
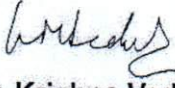
II. SPEED-SENSORLESS TECHNIQUE

Synchronously rotating reference frame (d-q axis) of the vector control drive is adapted here to analyze the BLDCM.

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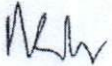## ICTIEE 2016, Pune

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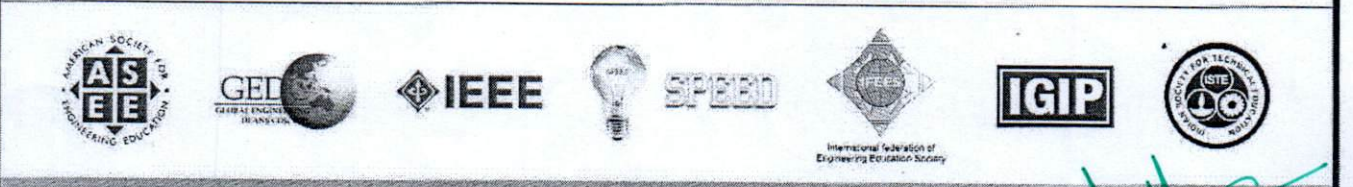
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