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Microinverter for PV Grid Integration

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Abstract

Photovoltaic (PV) generation is incredibly important for several reasons, impacting both the environment and our energy security. MPPTs and Power electronics inverters are deployed in PV generation systems to maximize the power generation capabilities of PV system and make it suitable for consumer utilization. A microinverter in PV systems converts DC electricity generated by a single solar module into AC. Unlike traditional inverters that handle the entire solar array's output, microinverters are typically installed on individual panel basis. This allows each solar panel to operate independently, optimizing energy production and providing better performance in partially shaded conditions. Microinverters also offer monitoring capabilities, enabling users to track the performance of individual panels in real-time. This paper discusses MATLAB simulation and results of grid integrated micro inverters. The micro inverters are tuned to maximize the power produced by PV panels and deliver steady power to the grid. The THD value with microinverter is recorded to be 3.08%

Keywords: Photovoltaic, maximum power point tracking, micro inverter, grid integrated photovoltaic systems

I. INTRODUCTION

A Maximum Power Point Tracking (MPPT), is used in solar PV systems, inverters and charge controllers to maximize the efficiency of solar panels by dynamically adjusting the operating point where the panel generates the maximum power. MPPT continuously tracks the voltage and current output of the solar panels, adjusting them to ensure the system operates at the most efficient point on the current-voltage (I-V) curve. This helps maximize the energy harvested from the sunlight, especially in varying weather conditions or when the intensity of sunlight changes throughout the day [1].

Over the years several MPPT techniques have been devised by researchers, designer and engineers. The most common forms being hill climbing (HC), incremental conductance (INC) and perturb and observe (P&O) [2]. The hill climbing method periodically adjusts the operating point of the solar panels and observes the change in power output. If the power increases, the system continues in that direction until further adjustments have a diminishing effect. P&O is simple and widely used, but it can oscillate around the maximum power point [3]. The INC technique uses the derivative of the power with respect to the voltage to determine the maximum power point. It adjusts the operating point based on the sign of the derivative, helping to converge quickly to the optimal point. INC is more precise than P&O but is computationally more intensive [4]. Hill Climbing is a heuristic search algorithm that incrementally adjusts the operating point in the direction that increases power output. While it can be effective, it may suffer from oscillations around the maximum power point.

The choice of MPPT technique depends on factors such as system complexity, cost and the desired balance between accuracy and simplicity. The MPPT techniques are often deployed for the entire PV array and hence it suffers from the issues such as partial shading, temperature differences, mismatch between solar panels etc. To overcome this issues or limitations the traditional MPPT is our often replaced with distributed MPPT [5].

In distributed MPPT, the MPPT functionality is implemented at the level of individual solar modules or panels within a larger PV system. Unlike a centralized MPPT system that controls the entire array from a single point, distributed MPPT involves having MPPT capabilities integrated into each solar inverter associated with individual panels. In distributed MPPT, each solar panel operates with its own MPPT controller, allowing it to find and operate at its optimal power point independently of the other panels. This is particularly advantageous in scenarios where panels may experience varying sunlight conditions or shading. Distributed MPPT can lead to improved overall system efficiency by preventing the performance of one shaded or less illuminated panel from affecting the entire array. Each panel can operate at its maximum power point, contributing to higher energy yields. Distributed MPPT systems often come with real-time monitoring capabilities. This allows users to track the performance of individual panels, diagnose issues promptly, and optimize the system for maximum energy production [6]. Implementing MPPT at the level of individual solar panels increases system complexity. The need for MPPT controllers at each panel adds components, wiring, and potential points of failure, making installation and maintenance more intricate. The additional hardware required for distributed MPPT can lead to higher upfront costs compared to centralized MPPT systems [7]. This cost factor may be a consideration for smaller-scale solar installations or projects with tight budget constraints. Coordinating and communicating between multiple MPPT controllers distributed across the solar panels can introduce communication overhead. This may require

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Advancements in Plant Leaf Disease Detection: A Comprehensive Review of Latest Trends and Technologies

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***Abstract*—In the face of increasing global challenges in agriculture, the accurate and timely detection of plant diseases has become imperative for ensuring food security and sustainable crop production. Different machine-learning approaches to detecting plant leaf diseases are reviewed in this paper. This study focuses on the evolution of methodologies, challenges encountered, and the current state-of-the-art in this field. Leveraging the power of machine learning for plant disease detection holds promise for early diagnosis and effective disease management. The review synthesizes research findings, highlights critical advancements, and identifies potential areas for future research to contribute to the ongoing efforts in precision agriculture and smart farming.**

Keywords*— *agriculture, deep learning, farming, machine learning, plant leaf

I. INTRODUCTION

Agriculture is pivotal in sustaining human life, providing the foundation for food production and economic development. However, the global agricultural landscape is constantly challenged by various factors, among which plant diseases stand out as a significant threat to crop yield and quality. Plant diseases can lead to substantial economic losses and food shortages, emphasizing the need for innovative solutions to monitor and manage these threats effectively.

One of the critical challenges in plant disease management is the timely and accurate detection of diseases, as early diagnosis can facilitate prompt intervention strategies. Traditional disease detection methods frequently depend on visual inspection by trained agronomists, which is a laborious, tedious, and prolonged job that may lead to human errors. In recent years, the integration of machine learning (ML) techniques in plant disease detection has emerged as a promising avenue, offering the potential for rapid, reliable, and non-invasive identification of diseases.

Laboratory testing remains a fundamental approach in plant disease detection, involving the isolation and analysis of pathogens. Pathogens causing plant diseases are extracted from infected plant tissues and cultured in a controlled laboratory environment. This process allows researchers to observe and identify the specific pathogens responsible for the observed symptoms. Techniques such as plating on selective media are employed to encourage the growth of pathogens. Microscopic examination further aids in the precise identification of pathogenic organisms. While effective, laboratory testing is often time-consuming and resource-intensive, requiring specialized skills and equipment.

These traditional methods, while valuable, have limitations such as being labor-intensive, time-consuming, and sometimes reliant on the subjective interpretation of visual symptoms. In recent years, the incorporation of machine learning techniques with precision agriculture and plant disease identification has promisingly addressed some of these challenges, offering more efficient and objective approaches to identifying and managing plant diseases.

Visual inspection has long been a primary method for detecting plant diseases. Trained agricultural experts play a pivotal role in this process, employing their expertise to examine plants for tell-tale signs of diseases visually. These signs may include leaf discoloration, lesions, wilting, or any other anomalies in growth patterns. Additionally, field surveys conducted by agricultural extension workers or plant pathologists contribute to the comprehensive crop health assessment. This method relies on the visual acuity of experts, making it essential to have well-trained individuals capable of identifying subtle yet significant symptoms indicative of various plant diseases.

II. LITERATURE REVIEW

A recent study [1] introduced a lightweight deep-learning method that inevitably classifies and sorts the plant disease, leveraging a vision transformer to provide farmers with valuable visual information. The real-time automated classification system is built on the VIT technique, which offers improved efficiency in processing. The authors explored convolutional Neural Networks (CNN) and combinations of CNN and ViT techniques. These techniques efficiently categorize plant diseases. The model incorporated CNN and attention blocks to enhance prediction speed. The proposed models, Model 3 and Model 4, demonstrated maximum convergence accuracy for plant village datasets like wheat rot. While the RGB version of photos contributed to increased accuracy, the study lacked a comprehensive evaluation of model correctness, and the convergence score was identified as a less-than-ideal metric in the context of deep learning experiments.

On a related note, Bandi [2] presented a model focusing on plant leaf disease stage categorization and detection. A deep learning model, You Only Look Once version 5 (YOLOv5), was employed to detect plant leaf diseases. Subsequently, the U2-Net architecture was utilized to remove the background of diseased leaves, and stage

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PV integrated interleaved flyback inverter for residential application

Shubhangi Patil ✉; Swapnil Y. Gadgune

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Different Approaches for Optimising the Micro-machining Quality Parameters of Composite Materials Using Electrochemical Discharge Machining (ECDM) for Societal Application—A Review

| Conference paper | First Online: 23 September 2023

| pp 865–875 | Cite this conference paper

Techno-societal 2022

(ICATSA 2022)

Nikhil P. Ambole, Vijay K. Kurkute & Mukund L. Harugade

Included in the following conference series:
Techno-Societal 2016, International Conference on Advanced Technologies for Societal Applications

Abstract

Electrochemical discharge machining (ECDM) is a nonconventional machining process used to make micro features on composites, glass, and ceramics. Different composite materials have been studied during the ECDM process, such as silicon carbide, fibre composites, ceramic composite, polymer composite, etc. Composites are very useful in aerospace, automotive, medical, and electronics due to their hard, brittle and better strength-to-weight ratio. Consequently, the micro-machining of composites by conventional machining is challenging due to its hard and brittle nature. To overcome these challenges, ECDM is a promising option. ECDM is a hybrid machining process based on electrical discharge machining (EDM) and electrochemical machining (ECM). In this paper, different hybrid techniques have been reviewed, which are employed to enhance the machining performance of ECDM. Magnetic field (MF), ultrasonic vibrations (UV), stirring effect, LASER assistance, and

Assessment the Level of Controllers Agreement Supported by Product Photography

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(icieng 2024)

Magdalena Diering, Agnieszka Kujawińska, Wojciech Rudzki, Mukund Harugade & Ivan Pavlenko

Part of the book series: Lecture Notes in Mechanical Engineering ((LNME))

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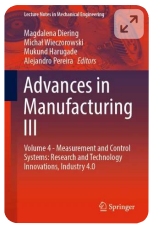
Abstract

Despite the availability of advanced optical systems, visual inspection is still of great importance, especially when classifying products as good or bad. The paper discusses research work aimed at formulating a concept of visual Measurement System Analysis study supported by product photography and, using a selected example from industry, its verification under laboratory conditions. Product photography, in particular interactive rotational photography, provides tools that can be used to improve control and measurement systems based on visual inspection. The work was carried out on the example of a product manufactured for the medical industry – a disposable transducer for determining haemodynamic parameters of blood. As part of the verification of the concept, a study was carried out – visual inspection was compared, i.e. the level of compliance of evaluation decisions made on physical objects and on their digital counterparts. The verification of



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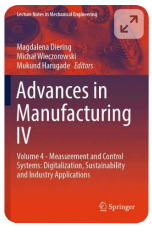

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Vishal Patil, D. G. Kumbhar & Kailasnath Sutar

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Abstract

In current scenario wind energy is the most favored nonconventional source of power generation due to several reasons. As per the International Renewable Energy Agency (IRENA), the global wind power generation in 2021 was 8.20×10^5 MW. However, India able to generate around 0.4×10^5 MW. The horizontal and vertical axis is the two main wind turbine types. The horizontal axis turbine is generally utilized to build a wind power plant. However, the vertical axis wind turbine (VAWT) can use to fulfill an individual power requirement. It can be installed at the top of the household building, too. Researchers are working on improving the performance of wind turbines. The vertical axis turbine has several types, like Darrieus, Savonius, Giromill wind turbines etc. As vertical axis turbine is for personal use, they can be commercialized in rural or remote villages where the population has relatively dense. Savonius VAWT is simple to construct and install. It can generate electrical power irrespective of conditional parameters such as wind velocity, direction etc. This article presents the utilization of Savonius VAWT to fulfill the need of the rural area.

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Anaerobic Digestion: Addressing the Problem of Food Waste by Converting it into Biogas

verfasst von : Chetan Patil, Kailasnath Sutar

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Abstract

In some parts of rural India, biogas production is a crucial energy source. The statistics show that it is equivalent to 5% of total LPG production. It is a promising renewable source of energy. The resources required for biogas production are easily available in rural and urban areas. Biogas is mostly generated by using degradable wastes such as animal dung, agro-waste, industrial waste, poultry waste, vegetable, and food waste (FW), in addition to a combination of a majority of these wastes. The boost in the production of biogas can be helpful in reducing the load on traditional energy resources. Biogas production can be boosted by using various techniques, such as adding different additives, different pretreatment methods, and using the appropriate co-digestion technique. The present article discusses how biogas production can be boosted by using various techniques.

Different Approaches for Optimising the Micro-machining Quality Parameters of Composite Materials Using Electrochemical Discharge Machining (ECDM) for Societal Application—A Review

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Nikhil P. Ambole ✉, Vijay K. Kurkute & Mukund L. Harugade

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Multi-class Investigation of Acute Lymphoblastic Leukemia using Optimized Deep Convolutional Neural Network on Blood Smear Images

Publisher: IEEE

Monika Dangore ; Ashwini S R ; Aishwarya Ghanashyam Chendke ; Radha Shirbhate ; Yogesh Kisan Mali ; Vishal Kisan Borate **All Authors**

Abstract:
Cancer of the bone marrow, often known as Acute Lymphoblastic Leukemia (ALL), is characterized by the unchecked growth of lymphoid progenitor cells. It affects both child... **View more**

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Abstract:
Cancer of the bone marrow, often known as Acute Lymphoblastic Leukemia (ALL), is characterized by the unchecked growth of lymphoid progenitor cells. It affects both children and adults and is the most prevalent form of childhood cancer. There have been considerable advances in the diagnosis and treatment of acute lymphoblastic leukemia in recent years. The ability to accurately assess risk and develop an appropriate treatment strategy relies on a diagnosis that takes into account all relevant clinical, morphological, cytogenetic, and molecular aspects. However, in order to enhance survival and quality of life for those afflicted by this aggressive hematological malignancy, more research and clinical trials are required to address the issues associated with resistance, relapse, and long-term toxicity. Therefore, in this research a deep optimized convolutional neural network is proposed for the early detection and diagnosis of ALL. The deep optimized CNN model architecture comprises of five convolutional blocks with 13 conv layers, 5 max pool layers. The proposed deep optimized CNN model is tuned using the hyperparameters such as epochs, batch size and optimizers namely Adam and A
outperformed using Adam optimizer

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PERFORMANCE EVALUATION OF A SEWAGE TREATMENT PLANT (STP)

G. D. Mali*, D. S. Mali**

** Assistant Professor, Department of Civil Engineering,*
Padmabhooshan Vasantraodada Patil Institute of Technology (PVPIT), Budhgaon (Sangli)
*** Associate Professor, Department of Environmental Management,*
Chhatrapati Shahu Institute of Business Education and Research (CSIBER), Kolhapur

ABSTRACT

Increase in population and urbanization has lead to water depletion and deterioration in water quality. Construction of Sewage Treatment Plants (STP) based on latest technologies in different parts of the country is necessary to reduce the problem of water pollution. The purpose of STP is to reduce the excessive contaminants from sewage and make the sewage reusable. Sewage treatment helps to reduce the pollution level of the water bodies and reduce the use of water by ensuring that treated water is used for irrigation & flushing toilets. Thus, the efficient working of the STP is utmost important. Anaerobic and aerobic biological processes are commonly used for wastewater treatment. The efficiency of individual units of STP determines the overall performance of the plant and quality of the final treated effluent in accordance with the prescribed governmental standards.

The aim of this study is to evaluate the performance of a sewage treatment plant of Kolhapur city located at Kasba Bawada. The treatment plant under study is based on sequencing batch reactor which is a modification of standard activated sludge process. Analysis of sewage quality of this plant is essential as most of the treated sewage is discharged in the Panchganga river. The results of this evaluation will help to determine whether the effluent discharged into the river is within the limits given by pollution control board.

During the entire study period it is observed that the overall performance of the treatment plant is satisfactory and the treated effluent is safe for disposal in Panchganga river.

INTRODUCTION

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has presented a paper titled "**Analytical Review Assessment of Flat Slab Buildings with RCC and Composite Column**" co-authored by **S. A. Mulla, A. U. Kurle, P. N. Patil, S. N. Digole, A. K. Salunkhe, N. S. Bembade** in the National Conference on **Emerging Trends in Civil Engineering (ETCE-23)** organized by **Department of Civil Engineering** on 28-29 December 2023.

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Mr. Shritej M. Sadakale

has presented a paper titled "**Review on Construction of Hybrid Wetland for Domestic Wastewater**" co-authored by **P. A. Suryawanshi, A. C. Chavan, S. S. Patil, S. S. Satpute, A. K. Salunkhe and N. S. Bembade** in the National Conference on **Emerging Trends in Civil Engineering (ETCE-23)** organized by **Department of Civil Engineering** on 28-29 December 2023.

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ETCE32

Pervious Concrete for Rainwater Harvesting: A review

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Abstract

Water scarcity along with water logging are one of the major environmental problems in recent years. In a developing country like India, sustainable development is of utmost importance. For the above-mentioned environmental problems, various environment-friendly solutions are given. Pervious or Porous concrete is one of such solutions. It is lightweight concrete also known as No-fine concrete due to absence of fine aggregate. Pervious concrete is an environment friendly solution for rainwater harvesting also as it allows the water to percolate thus, increasing the level of groundwater table. It significantly helps in reduction of runoff and proves to be one of the best alternatives for stormwater management. The porous concrete pavements can be used for parking lots, sidewalks, residential streets, walkways and also for apartment walkways where the traffic load and intensity are quiet low. This review paper includes the previous work carried out in pervious concrete. From this paper it can be concluded that the porous concrete can be used for rainwater harvesting in pavements, where there is minimum traffic load.

Keywords: Concrete, Pervious, Porous, Traffic, Walkways

Introduction

In an era marked by environment friendly materials and sustainable construction practices, use of new innovative materials and techniques has increased considerably. Among all these green porous concrete has emerged as a promising solution for critical problems like water scarcity, storm water management and urban flooding.

Due to global warming and climate change, many regions across the world are facing unpredictable rainfall patterns which further cause droughts and floods both. Traditional used pavement surfaces in urban areas are impermeable in nature. This property of pavement prevents rainwater from naturally infiltrating in the ground. Due to this groundwater is not getting recharged. Porous concrete plays an important role here to recharge groundwater by collecting storm water and allowing it to seep into the ground thus reducing storm water runoff Use of green porous pavement can also reduce the effective cost of project. The green porous concrete mixture contains little or no sand; creating voids. It is a very lightweight concrete also known as no-fine cement. The green porous concrete is mainly used for making pavements.

The excessive use of impervious covering has left series with challenges of increase in runoff volume, back erosion flooding, and deputation of water poverty. Today this problem post considerable risk to the sustainable development of cities and suburbs. Permeable concrete is special type of concrete with high porosity use for concrete flatwork application that allows water from precipitation and other resources to pass through it, thereby reducing the runoff from a site and recharging ground water levels. A few new fast draining concrete pavement solution, it rapidly directs excess water away from streets, parking surfaces, driveways and walkways. Unlike conventional concrete, it has a high void content of between 20 – 35%. This allows surface water to drain through in to the sub-strata and dissipate naturally, reducing the risk of surface water flooding and water course contamination. Permeable concrete is a concrete paving solution with improved permeability characteristics compared to convectional permeable concrete. A permeable solution offers significant benefits over traditional solutions. The combinations of trafficking surface and drainage system in a single element creates benefits in construction process and in construction and environmental costs.

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of PVP Institute of Technology, Budhgaon, Sangli. has presented a paper titled Use of Coconut shell as a Partial Replacement for Coarse Aggregate in Concrete: A Review at the INTERNATIONAL CONFERENCE on THE CHANGING WORLD (Industry, Sustainability, Info-Tech & Mankind) organized by CHHATRAPATI SHAHU INSTITUTE OF BUSINESS EDUCATION AND RESEARCH (CSIBER), KOLHAPUR, India from 15th March 2024 to 16th March 2024.

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of P.V.P.I.T., Budhgao. *has presented a*

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Analytical review assessment of flat slab buildings with RCC and composite column

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Abstract

Now a days in India due to lack of land we are adapting vertical construction like apartments and due to height limitations in construction of apartment the sufficient headroom is compromised, hence To overcome this problem "Flat slab" refers to a structural system used in buildings where the floors are supported directly by columns without beams. Flat slabs provide more headroom and flexibility in space planning since they eliminate the need for beams flat slabs are favored in construction for their simplicity, efficiency, and potential cost savings, especially in buildings where open spaces and flexibility in design are desired.

Numerous studies on the properly designed flat slabs and composite columns with adequate reinforcement can offer good structural strength and durability and also resists to earthquake loads. This paper focuses on broad literature review based on flat slabs and composite column helps to study of them in single paper.

Keywords—Flat Slab, RCC Column, Composite Column, Composite Structure.

Review on Construction of Hybrid Wetland for Domestic Waste Water

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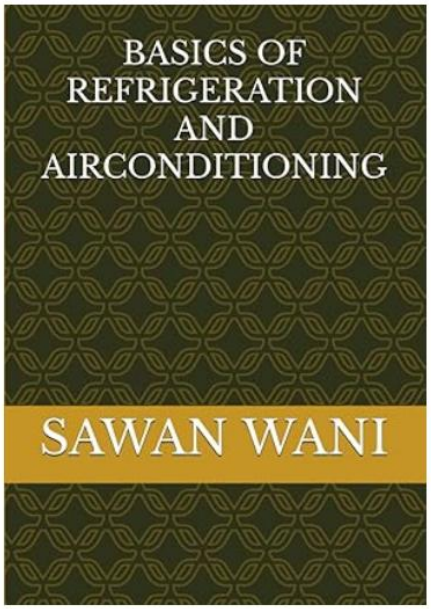

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