Chapter 11

Anatomization of dry and wet cleaning methods for general to rural and remote installed of solar photovoltaic modules

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Dust accumulation on the PV module restricts solar radiation and reduces the efficiency of the PV module. To improve the efficiency, it is essential to remove the dust deposited on the PV module thereby improving the performance. The main concern of the cleaning system is the additional cost of the equipment. This chapter proposes a low-cost drying and cleaning method using a vacuum cleaner and pressurized water pump to clean the dust accumulated on the module. In this work, the considered experimental setup consists of an 80 W polycrystalline solar PV system with three sets of the array (sets A, B, & C) installed at Kamaraj College of Engineering and Technology, Tamil Nadu, India. The experimental set-up is exposed to solar radiation for a week with set A left uncleaned and sets B and C cleaned by dry and wet cleaning methods. It was found that for the case I wet cleaning has improved the efficiency by 1.21% and for case II by 0.92% compared to dry cleaning. The wet clean inning method reduces the operating temperature of the module compared to the dry cleaning method. The proposed work is a low-cost method that involves a low cost, less manpower, and is more conventional for a roof-top installed in a remote location, where the readiness of skilled labor is not accessible.

11.1 Introduction

The growth of PV systems attained enormous growth over the last decade because of government scheme formation, subsidies, and development in PV technology [1–4]. The performance of the PV module is affected by environmental factors such

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A jigsaw puzzle-based reconfiguration technique for enhancing maximum power in partially shaded hybrid photovoltaic array—methodology

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1. Introduction

The gap between energy generation and demand has widened due to the depletion of natural energy sources and rapidly increasing energy demand. India is the second-largest country in terms of population, having a diverse economy and energy consumption profile. For developing countries like India, energy demand is the primary concern for sustainable development. To meet the energy demand, India has doubled its renewable energy installation in the last 5 years [1]. International bodies related to the energy crisis and climate change have insisted that all countries increase their renewable energy capacity. Globally, the contribution of renewable energy generation has increased by 26%, with a major share of 64% in the total electricity generation. Hence, in recent years, the contribution of renewable energy sources has increased compared to coal and natural gas [2]. Among the possible renewable energy sources, the solar energy-based power generation system has been found to be a simple installation, pollution-free, long life, and with less maintenance. Photovoltaics (PV) has become familiar due to the reduction in the price of the module and government subsidies [3].

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A jigsaw puzzle-based reconfiguration technique for enhancing maximum power in partially shaded hybrid photovoltaic array—Implementation

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1. Introduction

The PV modules are grouped together to form a PV array to meet the load requirements. During the uniform irradiation condition, the PV array produces a uniform row current, whereas partial shading may result in uneven row current results in multiple peaks in P−V characteristics [1]. Based on the literature review discussed in the previous chapter, the hybrid configuration is found to be optimal under partial shading conditions (PSCs). The performance of the PV configuration lies on the reconfiguration technique [2−5]. To validate the effectiveness of the proposed jigsaw (JS) puzzle pattern, its performance is compared with the existing puzzle patterns like ken-ken (KK) [6], skyscraper (SS) [6], odd-even (OE) [7], and Latin square (LS) [8]. The most commonly occurring shading patterns like short narrow, short wide, long narrow, and long wide are considered. The performance of the various configurations is analyzed in terms of global maximum power point (GMPP), power loss (PL), mismatch loss (ML), fill factor (FF), execution ratio (ER), and performance enhancement ratio (PE). The effectiveness of the JS puzzle arrangements is validated by experimental verification.

This chapter is organized as follows. Section 11. presents the partial shading scenario. Section 11. describes the performance parameter considered for the analysis.

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Applying machine learning techniques to build a hybrid machine learning model for cancer prediction

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Abstract

With the arrival of the latest advancements in the area of medicine, massive amounts of information related to cancer are being collected and available on the market to the medical analysis community. However, forecasting disease is one of the foremost, fascinating, and difficult responsibilities of physicians. Machine learning methods are becoming a preferred tool for medical researchers. In our proposed method, a hybrid machine learning model (HMLM) is built using ensemble learning techniques, using stacking of models such as multilayer perceptron (MLP), decision tree (DT), support vector machine (SVM), and logistic regression (LR). Initially, preprocessing is done and then the output is passed to the feature selection method, where each feature is ranked in accordance with the dependent attribute. Once the features are selected, HMLM is used for classification. The output is then validated using a confusion matrix and also by calculating the score of the model. The proposed model performs well with the reduced number of features and gives higher accuracy than existing models.

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- 6.3 Dataset description
- 6.4 System methodology
- 6.4.1 Dataset analysis
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- 6.4.4 Evaluation metrics

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Chapter 2
Use of Socio-Cognitive and Affective Computing to Teach Emotions to Autistic Children

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ABSTRACT

Learning aids in the development of attitude. It encourages the individual to learn new skills. It is critical to master three learning domains: cognitive, affective, and psychomotor. The cognitive computing system instantaneously processes data and gives solutions to questions. Affective computing is the development of tools that can recognise, understand, examine, and replicate human brains. Communication and behaviour are impacted by autism spectrum disorder (ASD), a developmental disease. ASD leads to have difficulty in interacting with society and communicating with society. It states that people with ASD have 1) difficulty in conversation and contact with other people, 2) symptoms that interfere with the person's ability to function normally in the society, and 3) restricted interests and repetitive behaviours. In the chapter, a computer-based model is developed for various emotions, facial expressions, and voice and body language. The aim is to develop a computer-based model that supports the autistic children to understand emotions and express their feelings.

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Plant Microbiome for Plant Productivity and Sustainable Agriculture pp 137–210

The Beneficial Plant Microbial Association for Sustainable Agriculture

Sivakumar Natesan, Shyamkumar Rajaram, Devaprakash Manoharan & Thirumalaivasan Ramachandran

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Abstract

Microbes are ubiquitous and can associate to colonize plants and exhibits different modes of interactions. Plant beneficial microbes could colonize both the phyllosphere and rhizosphere to promote the various aspect of plant growth and other various compartments in plants. These beneficial microbes are generally called plant growth-promoting microbes (PGPMs), they can become an excellent alternative to remove or reduce the use of various toxic agrochemicals including synthetic chemical fertilizers and biocides. The association of PGPMs provides nutrients, protection against pathogens as well as various environmental stress responses either direct or indirect mechanisms. The soil and rhizosphere microbes beneficially associate either the root surface or phyllosphere region of the plant and influence the growth and health fitness of crops. Some microbes directly interact with the plant to develop a

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Image Fusion Algorithms for Real World Applications

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Introduction

The process of integrating the features present in two or more source images and to retain all these features in a new single image is called Image Fusion. The goal of image fusion is to increase the scope for human perception and interpretation. The process of image fusion is expected to meet the following criteria: (a) all information of source images should be preserved in the fused image completely (b) artifacts should not be introduced in the fused image during fusion process and (c) misregistration and noise should be avoided in the fused image. Based on the feature extraction algorithms, image fusion produces the output with more accurate and relevant information needed for specific applications. For example, image fusion is used to produce all-in-one focus (multi-focus) image from source images of different focus, in the field of machine vision. In the field of medicine, the input images from different modalities are fused to facilitate the physician to do more accurate and efficient medical diagnosis and treatment. Multi exposure image fusion is used to enhance the dynamic range of imaging sensors and detectors in a more simple and efficient way. It fuses set of under and over exposure images to form high dynamic range images. In remote sensing, image fusion is used to form a single image with high spectral and high spatial information. Visible and Infrared images are fused for object detection, image enhancement and surveillance. Also image fusion is performed in three different processing levels namely pixel level, feature level and region level. The image fusion at pixel level considers only the features of each and every pixel to form pixel of fused image. The feature level image fusion extract the features of source images over a window of size 3X3 or 5X5. Region level fusion requires segmentation procedures to separate the different objects in the scene and features of the object are extracted to make decisions to form the fused image. Spatial Fusion (SF) and Transform fusion are the two approaches of image fusion. Spatial fusion methods