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11-12 Nov. 2022

Showing **1-25** of **46**

Rahul Bharat Thota; K R M Vijaya Chandrakala
Publication Year: 2022 , Page(s): 1 - 6

Abstract HTML

Modeling and Attenuation of Conducted EMI in DC-DC Converters Using Hybrid Filter

Rahul Bharat Thota; K R M Vijaya Chandrakala
2022 International Interdisciplinary Conference on Mathematics, Engineering and Science (MESIICON)
Year: 2022

IoT Based Bridge Automation with Hybrid Power Supply
Suchismita Dutta; Kingsuk Majumdar; Dola Sinha
Publication Year: 2022 , Page(s): 1 - 6

Abstract HTML

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Suchismita Dutta; Kingsuk Majumdar; Dola Sinha
Publication Year: 2022 , Page(s): 1 - 3

Abstract HTML

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Rajib Sadhu; Rimi Paul
Publication Year: 2022 , Page(s): 1 - 5

Abstract HTML

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Year: 2022

Counterfeit Money Detection: A Hybrid Semi-Supervised GAN-based Approach
Wissal Khemiri; Wael Jaafar; Amal Tarifa; Jihene Ben Abderrazak
Publication Year: 2022 , Page(s): 1 - 6

Abstract HTML

Harvesting Renewable Energy Through Maglev Windmill

Publisher: IEEE

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Abstract:
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Contents

Harvesting Renewable Energy through Maglev Windmill

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Abstract **- India being home to an extraordinary variety of climatic regions ranging from tropical in the south to temperate and alpine in the Himalayan in the North with an average wind speed of 15m/s. With raging population the electricity demand has been increasing steadily. Renewable energy sources are the now being incorporated along with the non-renewable energy sources to cope with the growing power supply. This paper proposes vertical axis wind turbine (VWAT) with a blend of Magnetic Levitation. Magnetic Levitation, or Maglev, is a method by which an object is suspended above another object with the help of magnetic field. Magnetic suspension in wind turbines is more advantageous than the conventional windmills as it eliminates friction due to any mechanical bearings. It thus makes it possible to harness wind energy even from low wind velocities with higher efficiency. This paper aims to achieve frictionless harnessing of the wind energy to give personal residential supplies.**

Keywords – Renewable Energy Source, Renewable Energy Harvest, MAGLEV Windmill,

I. INTRODUCTION

Windmills have been one of the most innovative ways of harnessing nature's energy since the ancient times. With evolution of technology ancient windmills have now evolved as machines which not only harness energy but also add on to aesthetic beauty.Different technologies have been adapted by the researchers for the design of windmill, throughout the world. Various inventors have achieved patents for the windmill designs. Kazadi [1]described the male female magnetic arrangement to levitate a primary part while rest is fixed to rigid support. Choi and Jenkins [2] have placed a set of cylindrical magnet corresponding to another layer of rectangular magnets with other bearing magnets for axial stabilisation. Mazur [3] invented a wind turbine with multiple sets of magnets with opposite polarity, which provides sufficient force to levitate the rotor. But disadvantage of this system is, it requires lot of space and maintenance and also it is immovable at lower wind speeds. Rowan and Priest-Brown [4] designeda lift and drag-based vertical axis wind turbine which ismagnetically levitated and the turbine base is mounted on coils. This system has high operating cost and mainly used for large scale production of electricity. Floating turbines are designed by Walter et.al. [5], which reduces the weight as well as energy losses to a great extent and allowing offshore installations. Jhon M et.al.[6] developeda prototype of vertical axis windmill with fixed arrangement of coils placed in a circular manner and numerous neodymium magnets spinning over the coils along with the turbine to generate power. According to Hill and Joseph [7], the bearings are made frictionless by using magnetic repulsion hence rendering the mill to operate under any wind condition and reduce the losses. The model is not implemented functionally though. Whereas Nagarkar et.al. [8] proposed the placement of the coils with a magnetic case itself so that it can be both levitated and at the same time it can generate power whenever the windmill is rotating. In this paper the authors have introduced the windmill operated with magnetic levitation and consider the repulsion forces of the magnets.

The paper is arranged as follows, in the methodology, the fabrication process of the prototype is discussed. The results have been analysed in section 3 and some conclusions have been made at the end.

II. METHODOLOGY

A prototype windmill has been built incorporating Maglev Technology using PVC pipes, ring magnets, copper wire, plastic sheets and PLA material. The ring magnets levitate the wings by repulsive magnetic force to provide an almost frictionless harnessing of the wind energy to give personal residential supplies and difficult places in the absence of enough solar radiation and water. The Ferrite ring magnets are carefully divided into two groups each containing five magnets. One group for the top part and another group for the bottom part of the mill. Each group are sub divided in three groups of magnets; two groups containing two ferrite ring magnets each and fixed to permanent supports and a single magnet in between them. Similar arrangement has been made for the bottom group of magnets. These groups are so arranged that their orientation becomes S-N-N-S-S-N.The 3-D printer uses the PLA material to make the curved wing holders and also a circular mid ring where the middle magnet is impregnated. The artificial wind stream created by a table fan with different speed mode. Also an anemometer is used for calculating the average speed of the table fan. Figure. 1 shows the front and angular views of the fabricated Maglev windmill.