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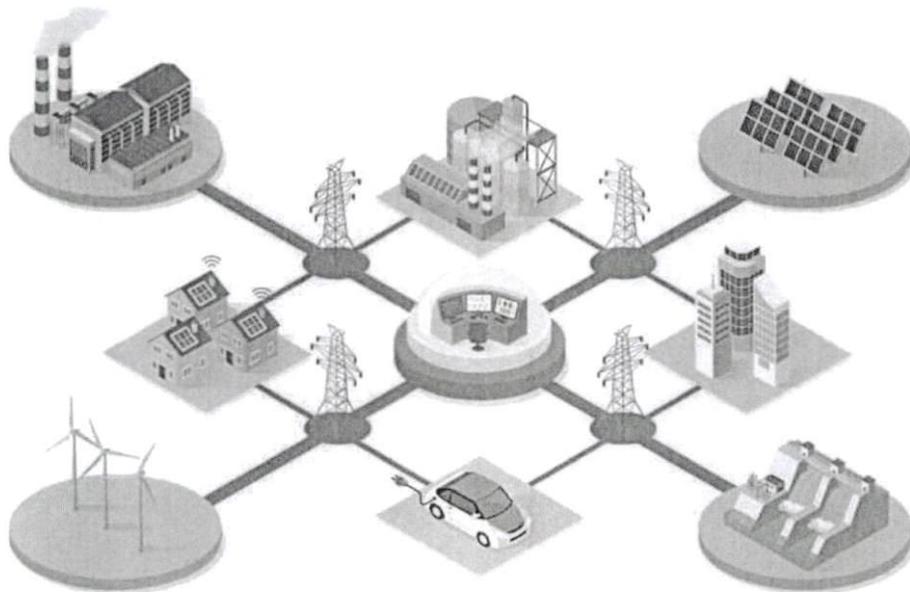
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RENEWABLE ENERGY: RESEARCH, DEVELOPMENT AND POLICIES

# APPLIED SOFT COMPUTING TECHNIQUES FOR RENEWABLE ENERGY



Amit Kumar Thakur • Rajesh Singh  
Ajay Kumar Kaviti • Anita Gehlot  
J.V Muruga Lal Jeyan  
Editors

*S. V. Murugan*

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performed on various engines are considered to be time consuming and the expenses met to perform these experiments are too costly, so the need of soft computing techniques involved in this area.

Soft computing can be better described as the process to find the solution to an inexact problem. Soft computing has showed lot of potential in giving the researchers the exact solution may be in case of validating or predicting the performance and emission parameters. Artificial Neural Network (ANN), Adaptive Neuro Fuzzy Inference system (ANFIS), Fuzzy Expert System (FES), Response Surface Methodology (RSM) and Support Vector Machine (SVM) are the various soft computing techniques widely used.

This book focuses on to carry out the comprehensive review and various other experimental works of various researchers who have carried out the work on these various soft computing techniques on various engines with various alternative fuels On the basis of modelling techniques, time is saved to a great extent and the capital investment involved is comparably very low. Various modelling techniques are being readily used to predict the performance parameters for various engines and modelling techniques have become the readily available tool to compare and validate the experimental work being carried out by researchers to get accurate matching with the experimental data. The benefit of this issue will be at large in connecting with varieties of work done in the field of Biomass which includes wood and wood waste, municipal solid waste. Landfill gas and biogas, Ethanol, Biodiesel, Hydropower, Geothermal, Wind, Solar. Thus soft computing techniques are fast and reliable hence, they can be a substitute for conventional experiments.

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*Chapter*

## BIOMASS

***P. S. Ranjit\* & Amit Kumar Thakur#***

\*Professor, Department of Mechanical Engineering, Aditya Engineering College (Autonomous), Surampalem, Andhra Pradesh, India

# Associate Professor, Department of Aerospace, School of Mechanical Engineering, Lovely Professional University, Phagwara, Punjab, India.

### ABSTRACT

In countries including Sudan, Rwanda and Tanzania, Biomass contributes some 33% to the structural-enhancing scrutiny, from roughly 90% to 45% in Pakistan, to 30% in China and Brazil, and to 10-15% in Mexico, which is continually South Africa. These rates also alter irregularly as nations utilize auxiliary companies/oil suppliers daily. The main considerations are that in the next century there will be a reduction in the size of two or more billion citizens currently subject to biomass and what is the method for making the change in the circumstances of this reliance on biomass (neighbourhood and across the world)? "Consistent" [1]. In 1996 the World Bank conceived that ' vitality agreements would include the production and usage of biofuels as well as their existing forces.' Different countries draw much from their essential energy from biomass. In essence, 4% of the United States, 14% of Hungary, 18% of Sweden and 20% of Finland. 2 EJ/year, in any event, potentially supplies biomass essentiality, in West Europe and is roughly 4 per cent of the necessary imperatively (54 EJ). The estimate indicates natural capacities between 9.0-13.5 EJ in Europe focused on locations, rates and regenerative shops in 2050.

  
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*Chapter*

**HYDROGEN – PRESENT & FUTURE ENERGY**

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Andhra Pradesh, India

**ABSTRACT**

Hydrogen may be classified as a renewable energy carrier next to electricity. Hydrogen development includes a range of domestic choices, including green energies and nuclear plants. Over the long term, hydrogen also reduces the dependency on imported energy and greenhouse gas emissions and other pollutants. Hydrogen may be considered the fundamental element in existence. Hydrogen is one of the essential elements of the earth's crust. Hydrogen, as a substance, is not necessarily contained and must be generated on earth. The explanation is that hydrogen gas is lighter and thus sinks into the atmosphere. Relevant components in the form of a composite, including biomass, gas and oil, also contribute to natural hydrogen.

The maximum energy density of hydrogen has that weight gasoline. The lowest carbon content is methane, on the other hand. It's a gas which is the lightest component of it at the average temperature and pressure. Hydrogen is the secondary energy supply, commonly called a fuel tank. Energy carriers are used to move, store and deliver electricity most easily. Electricity is the most common form of power supply.

Hydrogen would have a range of benefits as a theoretically sturdy electricity carrier. For some instances, a considerable amount of hydrogen is healthy to carry, such as deep fuel storage, liquid hydrogen for tanks, and the release of hydrogen by chemical compounds through heating. Additionally, hydrogen is used as an active, low pollutant fuel that is ideal for transportation, heating and power production in places where electricity is hard to find. The distribution of hydrogen through pipes is, in some instances, simpler than for long-range cables.

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*Chapter*

## SAFETY ASPECTS IN HANDLING AND STORAGE OF ULTRA HIGH PURITY GASEOUS HYDROGEN

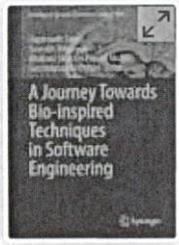
***P. S. Ranjit***

Professor, Department of Mechanical Engineering,  
Aditya Engineering College (Autonomous),  
Surampalem, Andhra Pradesh, India

### ABSTRACT

Hydrogen is typically preserved in two ways and provided as compressed hydrogen or cryogen. The most growing way of storing hydrogen is steel or composite cylinders/tanks in different sizes and capacities. Often they may be packed in a box or deposited for transport in a basket known as a cascade. Owing to its tiny molecules, hydrogen is prone to spill easily into some brittle structures, fractures and/or poor joints in storage tanks rather than certain traditional gasses under similar strain. Though hydrogen is typically non-corrosive and does not interfere with the storage materials in vessels, it may absorb material fragmentation at the grind structure. Additionally, a loss of hydrogen protection can happen in the event of fires and the construction content used in storage tanks will be damaged. In the worst case scenario, a hydrogen storage tank that generates a blow wave and flight projectiles/missiles could result in a catastrophic failure. Therefore, good quality requirements must be established and adhered to in the hydrogen storage facilities to ensure container integrity. This chapter provides an analysis of the main safety and technological issues relevant to the decisions created for hydrogen storage. This should be pointed out that, as this technology is more widely used and frequently utilized—unenergized discharges, fires, and their containment capacity and handling for domestic combustion engines—this chapter primarily concentrates on hydrogen storage systems.

  
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**A Journey Towards Bio-inspired Techniques in Software Engineering** pp 141–165

## A Study on Application of Soft Computing Techniques for Software Effort Estimation

[Sripada Rama Sree](#)  & [Chatla Prasada Rao](#)

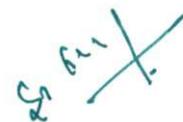
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### Abstract

Software is everywhere. Now-a-day' s software plays an indispensable role in all the fields like Education, Medical, Insurance, Marketing, Stock Exchange etc. The major goal of software organization is to achieve the Win-Win condition. As per the Standish Group Chaos Survey, only 30–40% of the software projects are successful. One of the main reasons for failure of the software projects is inaccurate estimations of the cost and schedule. In the conventional software development Algorithmic and Expert Based techniques are used to predict the effort, duration and cost of the software project. But they are not providing



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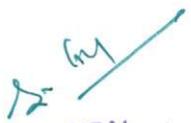
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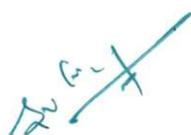
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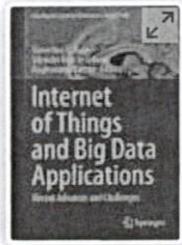
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**Internet of Things and Big Data Applications** pp 263–270

## Periodical Development of Digital Watermarking Technique

R. Vasantha Lakshmi, S. Shyam Mohana, N. Radha & Durgesh Nandan 

Chapter | First Online: 25 February 2020

514 Accesses

Part of the Intelligent Systems Reference Library book series (ISRL, volume 180)

### Abstract

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Digital watermarking technique used to hide the information. Wide uses of internet that has increases the access of digital data like image, audio and video. There is a chance to theft the data without permission of the owner of data. To protect the copyrights of information digital watermarking is required. In this paper, the brief review on digital watermarking techniques is evaluated and described. The watermarking is produced since the image contented and could be preserved as an arithmetical impression of finger print of the image. By way of a change based on procedure is cast-off to encrypt the evidence in the histogram area that

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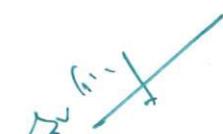
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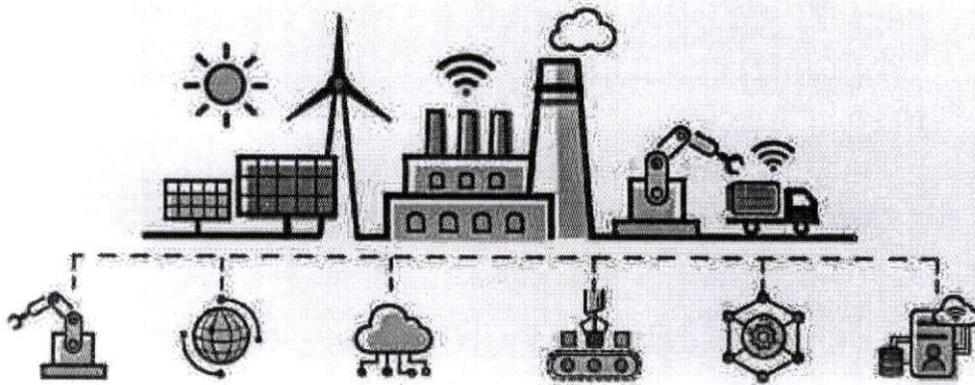
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RENEWABLE ENERGY: RESEARCH, DEVELOPMENT AND POLICIES

# ENERGY HARVESTING TECHNOLOGIES FOR POWERING WPAN AND IOT DEVICES FOR INDUSTRY 4.0 UP-GRADATION



Rajesh Singh • Anita Gehlot  
M.A Inayathullaah • Anuj Jain  
Editors

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time application.

Chapter 9 proposed an architecture where in the bins XBee network is used to connect nearby control unit of local municipal authority and from the control authority, LoRa network is used to communicate to long range and also these bins are assisted with solar panel for providing the power supply to devices that are existed in the architecture. Chapter 10 presented the study to optimize the process parameters for biofuel production by transesterification of algal oil using KOH as catalyst. (Imprint: Nova)

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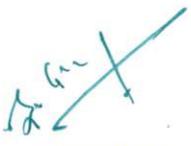
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*Chapter*

## ENERGY HARVESTING AND STORAGE

*P. S. Ranjit<sup>1</sup>, Amit Kumar Thakur<sup>2</sup>*

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<sup>2</sup>Lovely Professional University, India

### ABSTRACT

Petroleum derivatives are limited and environmentally expensive. Practically, Eco-friendly energy can be obtained from nuclear fragmentation or capture from neighboring sources. A vast amount of energy, such as sunlight, wind, and tide, is generally accessible and vast developments are being made to capture it productively. Unlike the completion of the scale, there are tiny amounts of 'waste' energy that could be helpful when captured. The recovery of even a small amount of this energy would have an essential financial and ecological effect. This is where energy harvesting takes place.

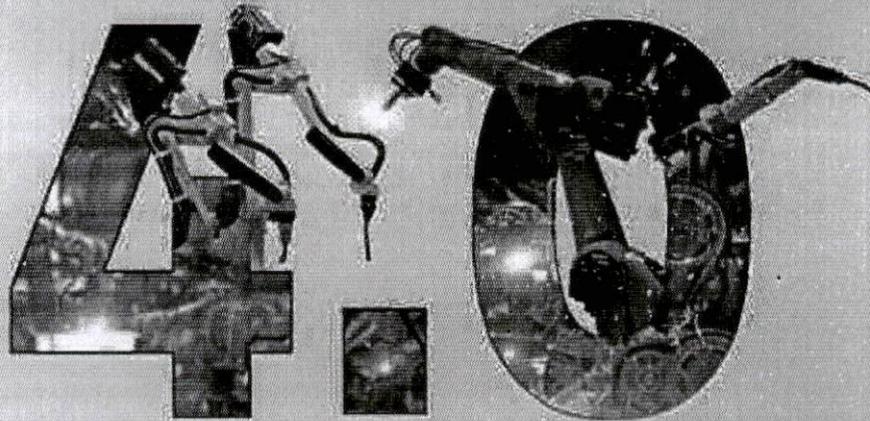
Energy harvesting is a method by which energy is obtained from external sources captured and stored for tiny, wireless independent devices, which are used in portable electronics and wireless sensor networks. The historical backdrop of energy harvesting goes back to the windmill and the waterwheel. People have been searching for ways to store energy from heat and vibration for many centuries. The desire to power sensor networks and mobile devices without batteries is one of the driving forces behind the quest for new energy harvesting devices. An attempt has been made in this section on energy harvesting (thermal and solar energies) and energy storage for sustainable development.

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# LoRA and IoT networks for Applications in Industry



Anita Gehlot • Rajesh Singh  
Ravindra Kumar Sharma  
Kamal Kumar Sharma  
Editors

NOVA

*Dr. Anita Gehlot*  
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importance of fire safety in smart city and building along with the role of IoT for meeting the requirement.

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## Chapter 4

# ESSENTIAL ASPECTS OF DAY TO DAY LIFE AND ITS INFLUENCE ON INDUSTRY 4.0

*P. S. Ranjit<sup>1,\*</sup> and Amit Kumar Thakur<sup>2</sup>*

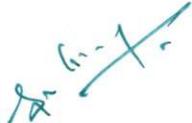
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### ABSTRACT

Some of the vital elements that play an important role in our day to day life are food, power, and transport. These are regarded as major factors of human existence. Based on this perspective, the chapter deals with significant sustainable elements of smart agriculture, lighting, and parking. Firstly, smart agriculture is a methodology for altering and reorienting rural generation frameworks and food value chains to promote and ensure the safety of sustenance in the context of environmental change. Secondly, lighting incorporates the use of both counterfeit light sources, such as lights and lighting devices, just as standard lighting is done by sunlight. The central theme of the chapter deals with smart parking. Finding a parking space for drivers to park their vehicles has always ended up with the disillusioning problem. Identifying an appropriate parking space has been troublesome factor for drivers since it creates a heavy traffic jam at the

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