Modeling of Plasma Arc Welding of Inconel 617 Super Alloy Plates using RSM

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Abstract:

In the present work, an attempt is given to study the outcomes of input process parameters, namely weld current, weld speed and plasma gas flow rate on the bead geometry, that is bead width (BW) and bead height (BH) of Plasma Arc Welded Inconel 617 plates. In the present study, Bead on Plate (BoP) welding was done on 2 mm thick plates with the help of experiments designed using central composite design of experiments (CCD). The non-linear regression equations developed during this study were validated through experimental test cases. Further, it was depicted that the developed regression models were found to forecast the bead geometry with a reasonably good accuracy.

Key words: Inconel 617 super alloy, plasma arc welding, bead geometry, RSM, regression models.

1. Introduction

Plasma arc welding is an advancement of Gas Tungsten Arc Welding Process (GTAW) with a better control due to its constricted Nozzle and gas stream. It is seen that the constriction increased the heat per unit volume of the plasma arc [1]. Due to this, high temperatures in the order of $11000°c$ will be developed, and is suitable for welding high temperature resistant alloys like Ni based super alloys. In addition to the above fact, it is important to note that the weld distortion will also be very less, which makes the Inconel 617 to be used for elevated temperature applications, like gas turbines, nuclear reactors and boilers. Central composite design (CCD) of experiments is a methodology by which one can conduct experiments to establish the non-linear regression models, which are extensively used to model various manufacturing processes. This technique was also applied for welding processes to determine the relation between input and output parameters of arc welding process. Gunaraj et al. [2] used CCRD with five-level four-factor to develop the mathematical models that were utilized to forecast the weld-bead geometry in the SAW. Further, they analyzed the outcome of OC voltage, plate-nozzle distance, weld feed rate and welding speed on output parameters, like bead width, penetration, reinforcement and dilution using RSM technique. Elangovan et al. [3] developed a mathematical model using CCD. In their research, they considered welding parameters, namely rotational speed of tool, axial force, welding speed and tool pin profile as inputs and tensile strength of AA6061 alloy as output parameter. Further, Sivaprasad et al. [4] used response surface method (RSM) based on CCD of experimental procedure to carryout experiments on Inconel 625 material with Pulsed current Micro plasma arc welding. Nanda et al. [5] developed second-order response surface model to predict the depth of penetration of duplex steel alloy 2205 weld bead due to variation of current, torch speed and arc gap. Moreover, Babu et al. [6] reported the effect of axial force, welding speed and rotational speed to predict the maximum tensile strength of the joint on aluminum alloy 5059 using central composite design. The results were analyzed with the help of

Effect of alkali treatment on tensile properties of short madar fibre reinforced polyester composites

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Abstract

Natural fibre reinforced polymer composites were fabricated with madar fibre as reinforcement and polyester as matrix. The madar fibres were treated with 10% NaOH solution (Mercerization) for surface modification. The composite samples were made with different weight proportions (2.5% to 15%) of both untreated and treated fibre in polyester according to ASTM standards using hand layup technique and tested for tensile properties. From the results, it was seen that there was improvement in the tensile strength of untreated madar fibre reinforced polyester composite to a value of 23.33MPa with increased fibre content up to 10% and with further addition of fibres there was drop in the strength. There was a significant outcome of alkali treatment on tensile strength of composite. The strength of alkali treated madar fibre reinforced composite was increased to a value of 26.23MPa with increase in the treated fibre content up to 15% which is 12.43% higher than that of untreated fibre reinforced polyester composite. There is increase in the modulus of untreated madar fibre reinforced polyester composite to a value of 493.23MPa with increased fibre loading up to 10% and with further fibre loading the value is reduced. It was also depicted that the modulus of treated fibre reinforced composite increased to a value of 444.57MPa with increased fibre loading up to 15% but the value is 9.86% less compared to that of untreated fibre composite. The % elongation of untreated fibre reinforced polyester composite decreased with increase in fibre content and was same with the treated fibre reinforced polyester composite also.

Key words: Madar fibre; Alkali Treatment; Polyester; Tensile Strength;

1. Introduction

From the past three decades the natural fibre reinforced composites have become promising substitutes to glass fiber reinforced polymer composites in several applications. It is experimentally proved that adding of natural fibres to the polymer improves strength, stiffness, thermal and acoustic insulating properties of that polymer composite and it is also found that these composites have high resistance to fracture and biodegradability[1-2]. Several natural fibres such as sisal, coir, bamboo, flax, jute, hemp etc. are used as reinforcing materials for thermosetting and thermo plastic composites [3-5].

The cellulose of natural fibre contains large quantity of hydroxyl group and gives hydrophilic property to natural fibre when utilized to reinforce hydrophobic matrices. Hence the effect is a poor resistance to moisture absorption and very poor interface leading to reduction in strength of composite [6]. To overcome such difficulties and to increase the bonding strength of fibre, chemical treatments are used. Among various treatments, treatment with alkali solution is one of the best among various

Evaluating Tensile Properties of Animal and Hybrid Fiber Reinforced Polyester Composites

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Abstract

Partially degradable composites were made with short Goat hair at different weight percentages in polyester matrix and also hybrid composite with Madar fiber and Goat hair at different weight ratios in polyester matrix using hand layup technique. The tensile properties of goat hair-polyester composite and hybrid fiber composites were evaluated. From the results, it is observed that the tensile strength of goat hair-polyester composite was increased up to a fiber content of 7.5% (24.7 MPa) and then reduced with further fiber addition in the composite. The strength of hybrid composite is increased up to 12.5% (27 MPa) madar fiber and goat hair loading and then reduced with further hybrid fiber loading. The strength of hybrid composite is 9.31% higher than the goat hair fiber composite. The tensile modulus is increased in both the composites with increase in fiber loading. The tensile modulus of goat hair fiber reinforced composite at 15% of fiber loading is high and the value is 367 MPa and for hybrid fiber it is 444.13 MPa at 15% of hybrid fiber loading which is 21.01% higher than the goat hair fiber composite. The %Elongation at break of goat hair fiber composite gradually decreased and higher value of elongation is obtained at 2.5% of the fiber loading. For the hybrid fiber it is first increased and then decreased to 4.4% at 15% of fiber loading.

Key words: Polyester, Madar Fiber, Goat Hair, Hybrid Composite

1. Introduction

Bio fibers like agave, sisal, coir, hemp, flax, jute, banana etc. are now considered to be best alternatives to synthetic fibers for reinforcing polymer composites. Natural fibers have numerous advantages over established reinforcing synthetic fibers such as carbon fiber, glass fiber etc. For applications such as the automotive, construction or packaging industries they posses high strength and toughness, light weight, non-corrosive nature, good thermal properties, low cost, low density, biodegradability and renewability [1].

The chief chemical constituents of the plant fiber are cellulose portion, hemicellulose portion and lignin. The amount of these constituents will alter from one plant to another and also from various parts of same plant based on age, species. These basic components partially determine the physical properties of the fiber. Table 1 shows an average of chemical composition of few plant fibers [2-7].

Animal fibers like wool, feathers, hair, silk etc., are said to be next most significant resource of natural fibers after plant based fibers for reinforcing composites. Even in terms of availability the animal fibers are next most important natural fiber after plant fibers. Many sources from each type of animal fibers are wool, silk, hair, and feather [8].

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Evaluating Tensile Properties of Successive Alkali Treated Continuous Pineapple Leaf Fiber Reinforced Polyester Composites

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Abstract

Among natural fibers, Pineapple leaf fiber (PALF) is a rich cellulosic fiber with relatively inexpensive and abundantly available. The composites were fabricated with short PALF as natural fiber reinforcement for polyester matrix. Interfacial bonding of constituents is primary need in all the composites used for load bearing applications and inappropriate bonding may lead to premature failure of the composite. Chemical treatments on natural fibers are considered to strengthen the interface between fibers and matrix. Among various treatments, alkali treatment is one of the famous treatments on natural fibers and is also called mercerization. In this research, the PALF is chemically treated with 10% sodium hydroxide and followed by bleaching with H_2O_2. The composite specimen were then fabricated with untreated and treated short PALF with various weight proportions up to 30% in the polyester matrix as per ASTM standard and the samples were tested for tensile properties. The results revealed that there is an improvement in tensile strength of composites with increase in the fiber weight fraction in both the cases with and without treatment of fibers. There is 37.71% increase in tensile strength of untreated fiber composite compared with plain polyester. It is also depicted that the composite with treated fiber at 30% fiber loading obtained maximum tensile strength of 88.7Mpa which is 22.68% higher than untreated fiber composite and 68.95% high compared to plain polyester matrix. There was an increase in % elongation of composite initially with increase in the untreated or treated fiber loading in the polyester matrix and then it is reduced with further addition of fibers. Also the increase is less in treated PALF reinforced composite. Moreover, both successive alkali treated and untreated PALF reinforced polyester composites have shown increasing trend in tensile modulus with increased fiber loading. The tensile modulus for untreated fiber composite with 30% fiber loading is 78% higher than that of plain polyester. The modulus is further increased with successive alkali treated fiber composite at 30% fiber loading by 38% compared to untreated fiber polyester composite.

1. Introduction

Bio fibers such as sisal, coir, hemp, flax, jute etc. are now considered as serious alternative to synthetic fibres for reinforcing thermoplastic as well as thermoset composites. Natural fibres have several advantages over

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Modified Flower Pollination Algorithm to Optimize WEDM parameters while Machining Inconel-690 alloy

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Abstract

Flower Pollination algorithm (FPA) is one of the global optimization algorithms and was found to outperform genetic algorithm (GA) and particle swarm optimization (PSO) algorithm. In order to improve the performance of existing FP algorithm, a modified FPA has been proposed in the present work. Further, super alloys are finding wide range of applications including power generation turbines, aircraft, nuclear power, automobiles, rocket engines, and chemical processing plants. These materials exhibit superior mechanical and chemical properties. They are found to retain hardness at elevated temperatures, be resistant to corrosion and have low thermal conductivity. Machining of these alloys with conventional processes is very difficult. Wire electrical discharge machining (WEDM) is one of the modern machining techniques and it can machine materials, irrespective of their hardness, as it is a non-contact machining process. Inconel-690, one of the nickel-based alloys is widely used in nuclear power and aerospace applications. The influence of WEDM process parameters such as pulse on time, pulse off time, peak current and servo voltage on responses such as material removal rate (MRR) and surface roughness (SR) has been studied while machining Inconel-690. Mathematical models are developed to predict these responses. The proposed modified FPA has been used to optimize WEDM process parameters. Further, this method has also been applied for simultaneous optimization of the responses. As the current method is found to yield encouraging results, it can be extended to solve other optimization problems also.

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Effect of boron carbide particles inclusion on the mechanical behaviour of S2-Glass fiber based polyester composites

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Abstract

The requirement for very high-performance composites is increasing day by day due to their demand for use in various structural applications. Even though the conventional composites are able to provide high performance for several of the applications, the demand to push the capabilities of the available composites is becoming a great research interest for many of the researchers and engineers. With the increased capabilities of materials, the man explores the unknown frontiers in different fields. One easy to achieve high performance from the existing material is to change their configuration and make hybrid composites with improved properties out of them. The mixing of ceramic particles with the matrix material and then preparing the fiber reinforced composite material using that matrix material is one method hybridization in composite materials. The main focus of the current research work is to predict the elastic properties of the hybrid composites where continuous S2-glass fibers are reinforced in a polyester matrix emended with micro boron carbide particles. The influence of inclusion of boron carbide (B_4C) particles on the elastic properties of the S2- Glass fiber based polyester composite at different fiber volume fractions was inspected using the technique of finite element analysis (FEA). The predicted elastic properties using FEA were compared with the analytical results. The outcomes suggest that B_4C micro particles are one of the better reinforcement options for enhancing the elastic properties of the fiber reinforced polyester composites.

Keywords: B_4C micro particles; S2 Glass fibre; Polyester polymer; Two-Step Approach, FEA.

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An Unbiased Privacy Sustaining Approach Based on SGO for Distortion of Data Sets to Shield the Sensitive Patterns in Trading Alliances

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Abstract Distribution of data in the organizations which are having cooperative business is a common scenario for getting the benefits in the business. Modern technology in data mining has permitted to extract the unknown patterns from the repositories of enormous data. On the other hand, it raises problem of revealing the confidential patterns when the data is shared to the others. Privacy-preserving data mining is an emerging area for the research in the domain of security to deal with the need privacy for concerns of confidential patterns. The original database is to be transformed to conceal the confidential patterns. Along with concealing the confidential patterns, another important parameter that is to be addressed is attaining the balance between privacy and utility of the database which are generally inversely proportional to each other. Another challenging aspect in the transformation process is reducing the side effects, miss cost, and false rules that may occur by mining the transformed database. In this paper, a new method has been projected for concealing of association rules that are sensitive by carefully selecting the transactions for transformation using computational intelligence technique social group optimization. The

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Soil Degradation Characteristics of Short Sisal/PLA Composites

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Abstract

Fully biodegradable composites were made-up of short sisal leaf fiber as a reinforcing member and Polylactic acid (PLA) as matrix. The biodegradation rate of untreated sisal/PLA (UTS/PLA) and successive alkali treated sisal/PLA (10TS/PLA) composites was found by evaluating the weight loss, mechanical strength and surface roughness before and after soil burial test. The results revealed that UTS/PLA composites have degraded much rapidly than that of 10TS/PLA composites. It is found that there was a loss in weight of 15.20% for UTS/PLA with 25% of fiber content and weight loss of only 5.56% with 10TS/PLA composites after keeping the samples for 90days in soil. The surface roughness on composites was predicted with 'Ra' value and increase in surface roughness of the composite was observed with increase in fiber loading and the increment was slightly high for 10TS/PLA compared to that of untreated fiber composite as well as pure PLA. After burial of composites in the soil for 90days, a huge drop in the tensile strength was observed for both UTS/PLA and 10TS/PLA composites. The drop is 26.5%, 54% and 56.31% for plain PLA, UTS/PLA and 10TS/PLA composites respectively. From the experimentation it is confirmed that PLA and its composites can be subjected to degradation in soil at a reasonable speed and also it is recommended that the amount of degradation within a span of time can be controlled by fiber treatment with alkali as well as fiber loading.

1. Introduction

Recyclability, renewability, biodegradability and green emissions are the advantages offered by bio polymers. Among all the bio polymers Polylactic acid (PLA) is considered to be the most extensively used biopolymer which is said to be linear aliphatic thermoplastic polyester which can be prepared from renewable type of resources such as corn and sugar cane [1–3]. It has several superior properties such as stiffness, transparency, gloss and UV stability than those of many synthetic polymers like polypropylene, polyethylene, polyvinyl chloride etc. PLA is naturally produced by ring opening polymerization and straight poly condensation [4, 5]. As PLA possess high strength, bio compatibility and thermal plasticity, it is widely used as material for packaging [6].

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Evaluating Tensile Properties of Phragmites Karka Fibre Reinforced Polyester Composites

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Abstract

Short Phragmites Karka fibre reinforced polyester composites were fabricated using hand layup technique and tensile properties were evaluated. For better adhesion with matrix, the fibers were chemically treated with 10% NaOH for specific period of time. Both untreated and treated fibres with different weight fractions (2.5%, 5%, 7.5%, 10%, 12.5% and 15%) were mixed with polyester matrix to fabricate the composite. The results indicated that, there is improvement in the tensile strength of polyester composite with untreated fibre up to a fibre content of 7.5% and then decreased. However the strength was increased with addition of treated fiber up to 15%. It was also seen that there was an increase in tensile modulus of composites with untreated and treated fibre up to 15% weight fraction; however the tensile modulus of composite with untreated fibre is higher than that of treated fibre composite. The % elongation is high in treated fibre composite than that of untreated fibre reinforced polyester composite. The strength of untreated fibre reinforced polyester composite at 7.5% fiber loading is 33.40MPa which is 13.2% higher than plain polyester resin where as the strength of treated fibre reinforced polyester composite at 15% fiber loading is 39.74MPa which is 34.7% higher than plain polyester resin. Also the tensile modulus of untreated fibre polyester resin at 12.5% is 737.18MPa which is 89% higher than plain polyester where as the tensile modulus of treated fibre at 15% is 630.85MPa which is 62.6% higher than plain polyester composite. The % elongation of plain polyester is 4.3% lesser than treated fibre reinforced polyester composite and 2.72% greater than untreated fibre reinforced polyester composite. It is concluded that Phragmites Karka fibre can be an emerging natural fiber reinforcement to enhance the tensile properties of polymer composites.

1. Introduction

Now a day plastics are most commonly using materials, they find lot of applications in various fields. It is experimentally proven that adding natural fibers to the plastic improves strength, stiffness, thermal and acoustic insulating properties of plastic and it is also found that these composites have high resistance to fracture and biodegradability[1-2]. Several natural fibers like sisal, coir, flax, jute etc. are used as reinforcing materials for thermosetting and thermo plastic composites.

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Evaluation of Tensile Properties of Nanoclay-Filled Madar Fiber-Reinforced Polyester Hybrid Composites

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Abstract In the present work, an effort has been made to improve the mechanical properties of natural fiber-reinforced polyester composite using nanoclay. The composite specimens were prepared with varying weight proportions of short-madar fiber in the polyester matrix from 2.5 to 15% at an interval of 2.5% without and with nanoclay of 1%. The samples were then tested for tensile properties and the results were analyzed. The results showed that the tensile strength of composite was increased with increased fiber loading up to 10%, and with further addition of fibers, there was decrease in the tensile strength. The maximum value attained for 10% fiber loading was 23.33 MPa. The tensile strength of nanoclay-filled madar fiber-reinforced composite is increased to a value of 25.16 MPa up to 10% fiber loading and then with further addition of fibers along with nanoclay, the tensile strength is reduced. It is also observed that there increase in the modulus of madar fiber composite to a value of 520.2 MPa up to fiber loading of 15% and the tensile modulus of nanofilled fiber composites is increased to a value of 460.35 MPa up to fiber loading of 15% which is 11.5% less compared to that of composite without nanoclay. It is observed that there is reduction in the percentage elongation at break for madar fiber-reinforced polyester composite with and without nanoclay filler. The drop is 43.7% in madar fiber composite and it is much higher in composite filled with nanoclay.

Keywords Polyester · Madar fiber · Nanoclay · Tensile strength

1 Introduction

From several decades, lignocellulosic natural fibers have been widely used in the development and fabrication of partially degradable polymer composites. Environmental safety and use of renewable materials for making greener world have lead

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Optimization of Weld-Bead Parameters of Plasma Arc Welding Using GA and IWO

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Abstract Plasma arc welding (PAW) of Inconel 617 plates is an important and critical process for many engineering applications such as combustion cans, high-temperature nuclear reactors, and transition liners in aircraft due to its high depth-to-width ratio. Therefore, finding the combination of optimal input process parameters of the said welding process is an essential task to be carried out before employing it in various applications. In the present study, bead-on-plate (BoP) trails of PAW are performed on Inconel 617 plates after conducting the experiments designed based on the central composite design of experiments (CCD). During experimentation, welding speed, welding current, and gas flow rate are considered as input process parameters, and bead width and bead height of BoP trails are treated as responses of the PAW process. The nonlinear regression equations developed for both the bead width and bead height are optimized with the help of two population-based optimization algorithms, namely genetic algorithm (GA) and invasive weed optimization (IWO) algorithms.

Keywords Plasma arc welding · Bead-on-plate trails · Optimization · Genetic algorithm · Invasive weed optimization

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Selfish Node Detection IDSM Based Approach Using Individual Master Cluster Node

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Abstract- Mobile Ad hoc Network (MANET) is an group of mobile nodes collection. It forms a non-permanent network dynamically without using the existing network infrastructure or centralized administer. Due to short communication range between every other mobile node present in the ad-hoc network, network hopes places an vital role to deliver an packet from one node to another node in the wireless network. Every node present inside the network is responsible for forwarding packets to its neighboring nodes. Many resource constraints like CPU power, battery, bandwidth and some of the nodes may not participate in packet forwarding towardsdta resource reduction. The selfish node behavior presenceleads to partition the network and makes an negative impact in the operation of the network. To overcome such circumstances selfish node detection is needed. There are lot of techniques to identify the selfish node where it took more computational resources and time-consuming process to identify selfishness of the node. In this paper, the intrusion detection system monitoring (IDSM) approach is used for selfish node detection for monitoring the entire network using the single node and the clustering is used to increase the efficiency and also reduces the network energy consumption which leads in the reliable quality service throughout the network.

Keywords-*MANET, IDSM, Selfish node*

I. INTRODUCTION

A mobile Ad-hoc Network (MANET) is anself-organizing systemof mobility stations connected by wireless links to form a network [1]. There exists many applications of MANET in military and civilian fields [2]. Military applications of MANET allow communications among soldiers and vehicles to form an information network, which is very sensitive to reliability and security. Civilian applications include collaborative work in the business environment to exchange information, personal area networks and vehicular networks (VANET). Other applications may be related to

scientific and research studies, such as monitoring wild life using sensor networks, and emergency networks to rescue people in situations where the infrastructure is not deployable, such as in earthquakes. The main characteristics of MANETs are the mobility of the nodes, and the limitedness of their power, storage and computation resources. Because of mobility, nodes are not continuously connected with each other. When this happens, new paths among nodes should be explored and routing tables should be reconfigured to reflect the new network topology. Moreover, because of the limited power, storage and computation resources, data delivery through this network depends critically on the cooperation among network nodes to receive and forward data packets.

One of the major challenges to deliver data in MANETs is selfishness [2]. Majority of the proposed protocols in MANET assume that mobile users are not selfish and they have the same degree of participation toward the other users. Selfish nodes want to maximize their individual benefits. For example, they may not relay messages of other nodes, or may willingly relay messages of their friends or the nodes inside their communities but not for strangers. A selfish node does not undergo with the packet transmission, It affects the performance of the network more solemnly. Some works are conducted for solving the selfishness problem. The main concern of these works is to detect selfish nodes, such as the work done in [3]. However, our concern is what to do after detection of the selfish nodes. In [4] and [5], selfish nodes are isolated from route selection. This system depends on a centralized entity that monitors all the system parts to decide about nodes to isolate. Although isolation techniques outperform selfishness unaware techniques, they still suffer from the unbeneficial selfish nodesin the network and the overload they cause to its bandwidth. Moreover, the previous distributed techniques exchange a lot of information throughout the network, causing a huge overload on the network bandwidth and high consumption of the nodes power.

Improvement of Machining Characteristics by EDM with Graphite Powder-Mixed Dielectric Medium

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Abstract In the present research, experimental investigations are carried out to study the influence of graphite powder on the machining of EN-19 during electric discharge machining (EDM). During experimentation, paraffin is used as dielectric medium and brass rod is considered as electrode. The nonlinear regression models that represent the relationship between the input and output parameters are established by conducting the experiments after following the concept of central composite design (CCD) of experiments. The statistical acceptability of the established regression models is verified with the help of analysis of variance (ANOVA), and also the correctness in estimation of the developed models is tested with the help of experimental test cases.

Keywords PM-EDM · Graphite · Paraffin · Central composite design

1 Introduction

EN-19 is one of the hard and high-strength iron–carbon alloys that exhibited high resistance to wear. These properties of EN-19 alloy make the machining tough with the help of conservative methods. On the other hand, EDM is the most frequently used method for machining such high-strength and hard materials with good surface

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Weld Quality Prediction of PAW by Using PSO Trained RBFNN

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Abstract Selection of process parameters in welding environment is more complex while determining the weld bead quality. For the selection of best parameters, artificial intelligence tools like neural networks blended with stochastic optimization technique like particle swarm optimization (PSO) proved to be very effective. In this paper, an attempt has been made to predict the weld bead quality using neural network trained PSO. Bead on plate experiments was conducted using plasma arc welding on superalloy Inconel material. Multiple regression mathematical equations developed by response surface methodology (RSM) were used for the analysis. The developed methodology will be very useful for automation.

Keywords Particle swarm optimization · Bead on plate trails · Plasma arc welding · Radial basis function neural networks

1 Introduction

Plasma arc welding (PAW) is said to be well-accepted arc welding process due to its high productivity. The welding strength depends on the geometry of the weld bead, material properties, and microstructure. The current study deals with weld bead geometry analysis of plasma arc welded Inconel 617 superalloy plates, which is reliant on several input process parameters such as welding current, voltage, speed of weld, plasma and shielding gas flow rates, torch standoff distance, torch angles, and others. At the same time, costly materials like superalloy Inconel 617 found

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Performance of Quasi Oppositional Butterfly Optimization Algorithm for Cluster Head Selection in WSNs

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Abstract

Wireless sensor networks (WSNs) technology is attracting the most of researchers and industry due to its application in wide contexts that include the military, surveillance, monitoring of habitat, health care, public safety and environmental monitoring. The consumption of energy is a crucial challenge faced in the WSN research. Clustering is an efficient technique for limiting the energy consumption of WSNs. But considering the hierarchical and cluster-based WSNs, the cluster heads utilize a high-level of energy because of data aggregation from various sensor nodes and transmit the same to the sink node. So, proper cluster head (CH) selection is required for sensor nodes' energy conservation to prolong the network's lifespan of the WSNs. In this paper, a CH selection protocol is proposed that is based on the quasi oppositional butterfly optimization algorithm (QOBOA). The proposed method is compared with original butterfly optimization along with certain existing algorithms with respect to the networks' lifetime and efficiency of energy. Simulation results show that the QOBOA based CH selection scheme outperforms the existing ones.

Keywords: Butterfly optimization algorithm;Cluster head;Data aggregation;Network lifespan.

1. Introduction

The WSNs contains a group of small-sized, self-aware and low energy nodes deployed over a target area that is scattered. Such nodes not only periodically collect information that is locally available from a particular area of target as well as communicates that data to a mobile Base Station (BS) [1]. The low-cost sensors are available owing to the

Defect characterisation using pulse compression-based quadratic frequency modulated thermal wave imaging

Shaik Subhani[1], Gampa V.P. Chandra Sekhar Yadav[1], Venkata Subbarao Ghali[1] ✉

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Abstract: Quantitative depth estimation, along with enhanced defect detectability, is of utmost importance for subsurface analysis in thermal wave imaging for a variety of applications. However, the size and the depth of the subsurface anomalies influence this quantitative analysis due to the non-consideration of back reflection from the defect boundary in addition to three-dimensional scattering effects. This study explores an experimental validation of an analytical model for quantitative depth analysis of subsurface anomalies in thermal wave detection and ranging using quadratic frequency-modulated stimulation with pulse compression based signal processing approach and presents the depth resolution feature by considering the back reflection at the defect boundary. It also presents a study on the influence of the size of the anomaly and bandwidth of the stimulation on quantitative depth prediction using the experimentation carried over a carbon fibre reinforced plastic and mild steel specimen with artificial flat-bottom holes.

1 Introduction

The quantification of defect depth plays an important role in the fabrication of highly durable, strength and quality materials. In the last few decades, it has gained attention towards the development of novel evaluation procedures and post-processing approaches. Infrared non-destructive testing gained interest due to its non-contact, whole field and simple examination procedure to assess the structural integrity of an object without impairing its future usefulness. It uses the thermal variation over the specimen to analyse subsurface features.

In active thermography, a predefined stimulation is used along with the suitable post-processing approach, is used for the enhanced defect detection. It became popular due to techniques like pulsed thermography (PT) [1], lock-in thermography (LIT) [2] and a variety of non-stationary thermal wave imaging methods. A short and huge-powered pulse is used in PT along with raw thermogram analysis limited its applications due to the effects of non-uniform radiation and non-uniform emissivity. It led to the application of thermal signal reconstruction and principal component analysis, phase analysis and so on. In pulse phase thermography (PPT) [3] stimulation is the same as in PT but processing method is like phase analysis and so on. These approaches received widespread industrial applications in a variety of fields like aerospace, mechanical and civil engineering etc. Furthermore, pulse compression friendly NSTWI methods like frequency modulated thermal wave imaging (FMTWI) and coded thermal wave imaging (CTWI) were developed to promote more depth resolution.

FMTWI makes use of a low frequency chirped stimulus using low peak power sources and capable of providing the depth scanning using a sweep of a band of frequencies for a pre-specified duration. Mulaveesala and Tuli [4] introduced FMTWI and demonstrated it using an electrothermal modelling for a mild steel specimen. They proposed a Helmholtz model solution for a parabolic heat equation and experimentally demonstrated the depth scanning capability of it using phase-based analysis.

Augmented with pulse compression-based post-processing, it can provide a better depth scanning, depth resolution along with fine subsurface details. This pulse compression based processing concentrates the imposed energy into a narrow region and minimises noise to explore better subsurface features than any contemporary processing modalities for FMTWI. Further pulse

compression based three-dimensional defect detection capability of FMTWI was experimentally demonstrated and its edge over a phase-based approach was verified and tested on a variety of materials. Tabatabaei et al. [5–7] applied the same from the photothermal perspective and studied its time delay based detectability. Kaiplavil and Mandelis [8] introduced truncated-correlation photothermal coherence tomography (TC-PCT) as the highest-energy localisation modality in a parabolic diffusion-wave field. It uses a pulse-chirped radar approach in which a broadband thermal relaxation chirp is cross-correlated with a sequence of delay-swept and pulse-width-truncated references. The truncated pulse width determines the depth (axial) resolution, while the delay with respect to the excitation chirp controls the depth range. Liu et al. [9] performed linear frequency modulated ultrasound excitation thermal wave imaging (LFM-UTWI), which exhibits better defect detectability than ultrasound LIT, and the main peak value of cross-correlation (CC) between thermal wave signal and linear frequency modulated signal has better detectability than other schemes of LFM-UTWI. Mulaveesala and Tuli [10] proposed various novel NATWI approaches like LFMTWI, and its digitised version DFMTWI. The limited depth resolution of the LIT due to the fixed driving frequency of the exciting heat sources is overcome by the proposed technique along with improved depth scanning due to enhanced power and spectral width in DFMTWI. They experimentally proved the same using experimental mild steel sample. A pulse compression approach is used to detect subsurface discontinuities using LFMTWI and DFTWI.

Ghali et al. [11] introduced 7-bit Barker CTWI (BCTWI) using a three-dimensional pulse compression based modality and compared it with phase-based analysis. Later it was acronym as thermal wave detection and ranging (TWDAR) and tested for coded stimulations like Barker and Golay CTWI approaches supported by this pulse compression-based post-processing approach to extract fine subsurface details. Tabatabaei and Mandelis [12] carried bi-phase based coded stimulations on similar lines in their Thermo photonic RADAR applications for the testing of dental carries and for various other materials. In a series of papers, Lie et al. presented thermo photonic RADAR-based detection in carbon fibre reinforced plastic studies using a Fourier transform (FT)-based mathematical model and used to identify the orientation of fibre lay-up [13–15]. This paper presents a proper theoretical model for quantitative assessment of subsurface

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A 7-Level Cascaded Multilevel Inverter Using Multicarrier Technique

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Abstract—This paper presents cascaded H- bridge multilevel inverter using multicarrier technique. the cascaded multilevel inverters are suitable for various high voltage, high power applications, the transformer less multilevel inverter is very advantageous. These simulation results are carried out for different modulation index and the result proves that THD (Total harmonic distortion) is reduced with increase in modulation index The output that is obtained from multilevel inverter has less power loss with low total harmonic distortion

Keywords—Cascaded Multilevel Inverter, Multicarrier Technique Introduction, Total Harmonic Distortion.

I. INTRODUCTION

NOW-A-DAYS Because of increasing oil prices and environmental concerns, electrical vehicles are gaining increased attention due to their higher efficiencies and lower emission associated with the development of power electronics and motor technologies. on the other hand, the power converter technology is continuously developing the multilevel Inverter is the modern way of converter using. in electric vehicle applications. The concept of multilevel inverter was introduced by "Nabae" in 1981.the term multilevel inverter is nothing but it generates higher-voltages waveforms from lower voltage components. due to increase in voltagelevelsit produces better voltage waveform. the multilevel inverter are classified into three types they are Diode clamping multilevel inverter, flying capacitor multilevel inverter and cascaded multilevel inverter, In general, cascaded multilevel inverter may be classified in two groups. The first one refers to the amplitude of isolated DC sources devoted to supply each H-bridge cell. If the amplitude of all sources is equal, then the inverter is called symmetrical, otherwise, if at least one of the sources present different amplitude, then it will be called asymmetrical multi level inverter is a power electronic device built to synthesize a desired AC voltage from several levels of DC voltages .Multi level inverters have been an important development in recent years, owing to their capability to increase the voltage and power delivered to the motor with semi conductors which are available today. Multilevel inverters have gained more attention in high power applications because it has got many advantages. It can realize high voltage and high power output by using semiconductor switches without the use of transformer and dynamic voltage balance circuits. When the number of output levels increases, harmonics of the output voltage and current as well as electromagnetic interference (EMI) decrease. The basic concept of a multilevel inverter is, to achieve higher power by using a series of power semiconductor switches with several lower voltage dc sources to perform the power conversion by synthesizing a staircase voltage waveform .To obtain a low distortion output voltage nearly sinusoidal, a triggering signal should be generated to control the switching frequency of each power semi conductor switch

The proposed control algorithm eliminates the total harmonic distortion in the output. 7-level cascaded H-bridge inverter obtained results validate the voltage control strategy and confirm the high dynamic performance of the proposed method, presenting very low torque ripple.

II. MULTILEVEL INVERTER TOPOLOGY

Multilevel inverters have attracted much attention in high power electronics applications as the solution of needs for higher power ratings and the reduction of the output harmonic distortion, voltage stress (dv/dt) and EMI phenomenon. Multilevel began with the 3-level converter, then several multilevel converter topologies have been developed. Multi-level Inverters provide more than 2 voltage levels. The basic principle of a multilevel inverter is to connect semiconductor switches in series so that the converter can operate with power ratings of several megavolt amperes and at medium voltage levels (1kv to 35kv) that exceed the individual switch voltage ratings. The output voltage waveform will be synthesized from several levels of capacitor voltage sources. As the number of levels increases, the obtained output waveform approaches the sinusoidal wave with less distortion, less switching frequency, higher efficiency etc...

Each single DC sources is associated with a single H-bridge converter &AC terminal voltages of different level converters are connected in series & can generate three different voltage outputs +Vdc, -Vdc and zero. This is explained with the help of figure the AC outputs voltage waveform is the sum of the individual converter outputs. Cascaded multilevel inverter is

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It was picked to set up an interconnection approach that grants sharing the relationship of information correspondence
without the mediation of an individual. The Internet of Things structure has permitted various contraptions to be
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information the load up has reduced, which was not the condition with more pre-arranged suggestions to get the
information, For example: progressed assault and different edges. In any case, a couple of hypotheses, for instance,
fake mindfulness, man-caused mental aptitude and significant figuring out how to have a great deal to show their
capacity and the certified advantages of preparation heterogeneous information of various estimations and different
specialists expected to treat it. With the results obtained, the proposed research work has used significant learning
hypothesis in order to choose a security understanding on the interconnection of lightweight information; also the
TCP/IP has been utilized to control the transmission of information, calculation rehearses for social affairs. To present
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advances of the Internet developments of the current articles as of late proposed as a framework with a lightweight and
particularly different strategy for an IoT affiliation. Second, the current businesses of man-made thinking, endeavoring
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Current headway on significant article identification is broad, progressing for the most part from the unstable extension of Convolutional Neural Networks (CNNs). In Computer Vision (CV) society, the examination on saliency location is more mainstream contrasted with the conventional manual item discovery. As of late striking article location is being utilized in different exercises such item following, and picture acknowledgment and so on Profound Learning CNNs have been successfully utilized to the errand of Salient Object Detection to a generally decent degree. In this paper, we propose a clever notable item identification method grounded on a blend of Recurrent Neural Networks (RNNs) and CNNs. Comparative with the current profound learning procedures, the created framework is fit for utilizing the manual customary strategy of Object Detection which utilizes saliency maps for extra exact inductions. The created framework utilizes two discrete frameworks to recognize striking articles and approve 1mil data. In this paper, we propose a clever article recognition network by thinking about the distinction between the two undertakings. In the proposed framework, the consideration map for object order is created by zeroing in on the most recognizable article part as for object arrangement.
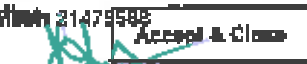
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The emergence of distributed computing with adaptability, improved access to information and cost savings makes this innovation available and rapidly developing. Due to the rise in distributed computing, companies are turning to used distributed computing. Despite the fact that distributed computing offers countless benefits to customers, the above review reveals that the entry of distributed computing to healthcare remains low. With a compelling cloud risk assessment system, cloud customers will get assurance from this innovation. Study on the approach to assessing the dangers of the cloud that is still an infant and the complexity of distinguishing the security dangers that are actually being discussed. This article investigates the hazard assessment measure by introducing the technique into the hazard assessment measure. The hazard assessment is a key step in the hazard assessment measurement. Analyze the outcome of the hazard investigation measure and decide whether to recognize or support the hazard rules to resolve the hazard review. From our investigation, the NGTechinque is familiarized with thinking about examining the dangers that the previous stage causes. Since the hazard assessment depends on the authorized destinations, the internal and external environment and the perspectives of the partners, NGT promises convincing results. Not only does this review add to the focus on synthesizing dangers and dangers in a systematic way, but implicitly, the NGT measure makes partners which are aware of the current threatening circumstances for security cloud in the partnership. Equivalent,

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Takagi–Sugeno–Kang Fuzzy Controller-based Single-Stage Grid-Connected PV System

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Abstract Grid-connected solar power plants are widely established in many places worldwide. Photovoltaic (PV)-based grid connected solar plants are attracting recently due to improvement in controlling of power converters. Single-stage grid-connected systems can reduce the number of converters connected in power plants which result in reducing the cost of the system. However, DC to DC converters are generally used in PV systems to enhance the operation of maximum power point for best utilization. The inverters also can be used to extract maximum power from PV systems through new controlling techniques in power electronics devises. Therefore, an extra DC to DC converter is not required to make PV at its maximum power point condition. However, this technology can be used for small-scale solar power plants since all PV arrays in solar power plant cannot receive the same irradiance. Takagi–Sugeno–Kang (TSK) fuzzy controller has significant priority than proportional plus integral controllers when rapid changes are there in input. Hence, TSK-based single-stage controller is developed in this paper for grid-connected 1MW solar plant. Generally distribution system is connected with unbalanced loads, hence these unbalanced loads will create forcefully unbalanced currents in electrical grid. Unbalanced grid currents further create many problems to other loads. Therefore, the proposed controller is designed to help making grid currents balanced during unbalanced local loads. Further, the inverter can compensate reactive power demanded by local loads to minimize reactive power supplied by grid. Extensive results are

ADALINE LEAST MEAN SQUARE (ALMS) BASED MULTI-LEVEL INVERTER WITH PARTICLE SWARM OPTIMIZATION FOR PV SYSTEM

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Abstract.

This paper deals with a three-phase, four-wire multi-level inverter, based photovoltaic (PV) system with a lower total harmonic distortion (THD) to increase the system's stability and reliability. The active power filter plays a vital role in the compensation of power quality issues and maintaining the total harmonic distortion level within the IEEE-519 standards. The proposed method develops the active power filter with a voltage source converter (VSC) which is controlled by the Adaline-least mean square algorithm(ALMS) with the hysteresis current controller (HCC). The proposed method is compared with the recursive least mean algorithm (RLS) and found lower THD levels. The ALMS algorithm maintains the constant DC capacitor voltage level thereby compensating for the power quality issues under varying load conditions. The partial swarm optimization (PSO) MPPT technique is used to maintain constant and extract maximum power from the PV panels. The performance of the PSO-based multi-level inverter with the ALMS algorithm is developed and validated by using MATLAB/SIMULINK with reduced THD levels under unbalanced load conditions.

Keywords: PSO-MPPT, Adaline-based LMS, multi-level inverter, recursive least square, total harmonic distortion, power quality.

1. INTRODUCTION

The best source of energy that can be produced is the renewable energy source for clean and sustainable energy [1]. Power from natural sources such as solar, wind. The energy from the non-replenishing sources can be harvested and given to the power grids via an inverter that is connected to the grid. The energy produced by solar panels and other renewable forms of energy is DC in nature. The function of an inverter is to alter a DC input source voltage to a symmetrical AC output voltage in desired amplitude and frequency with a minimal amount of harmonics [2] However, inverters produce an alternative square wave at the output, thus increasing the THD of the waveform. The output generated from the inverter must a sinusoidal wave with a reduced amount of THD also output frequency should match with line frequency. The output sinusoidal with the lowest distortion is achieved in inverters by using high switching frequency along with various other Pulse Width Modulation (PMW) techniques [3,4]. There are many advancements in the development of the Multi-Level Inverter (MLI) to improve the power quality that most energy obtained can be effectively put to use. Deterioration of Power Quality, because of harmonics, happens in distribution systems and electric transmission

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Modified Grey Wolf Optimization Algorithm for PV Fed Water Pumping System Driven by Switched Reluctance Motor under Partial Shading Condition

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Water Pumping Systems (WPSs) are playing a major role in society for fulfilling human's daily needs. Generally WPSs are consuming much power and burden on main electric grid. The best idea to decrease load on utility grid is to establish a standalone Photovoltaic (PV) fed WPS in both rural and urban areas. Usually WPSs are necessary for agriculture, drinking and industrial purposes. However, an electrical motor is required to drive the mechanical pump for adding the underground water to the utility point. Among many motors, switched reluctance motor (SRM) is attracting many scholars to use in WPS due to many advantageous. To obtain maximum torque which is required to lift the water from high depth from ground an 8/6 pole SRM is considered in this paper. However, using batteries in WPS will lead system more expensive as well as required frequent maintenance including replacements due to less life span of batteries as compared with PV modules. Hence, PV powered SRM driven battery less WPS is implemented with sliding mode controller (SMC) based speed sensorless direct torque controller (DTC) in this paper. Moreover, Modified Grey Wolf Optimization (MGWO) algorithm is integrated with Perturbed and Observed (P&O) algorithm to harvest maximum energy from PV modules during normal as well as partial shading conditions. Hybrid MGWO-P&O mechanism is integrated with converter controller to avoid an extra DC to DC device for using maximum power point tracker of PV modules. Extensive results by using MATLAB/Simulink platform are examined in this article under many situations to validate the proposed method.

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Hybrid computation is an important step in multiple-user mm Wave MIMO systems to reduce complexity and expense while obtaining an acceptable sum-rate. Prior research on hybrid precoding was frequently driven by optimization or pessimistic methods. These techniques either offer more intricacy or function less then optimally. Furthermore, the quality of the channel information plays a significant role in how efficient these tactics are. In this article, we introduce a deep learning (DL) method that improves productivity while requiring less computation time than current approaches. In reality, we employ MIMO using a convolutional neural network (CNN) (CNN-MIMO) in order to generate an analogue precoder and combiners using a false channel matrix as the source. The process is split into two main sections. We first create a successful detection method, which allows us to choose the best precoder and combiners from a predetermined coding system while achieving the highest possible total rate as result labels, the chosen complex and precoders are employed when the input-output pairs are generated during the CNN-MIMO training stage. We assess the effectiveness of the applied methodology using a variety of intricate computations and demonstrate that the suggested DL framework performs better than conventional methods. CNN-MIMO provides a potent hybrid precoding technique. The suggested method is also easier to calculate than an alternative relying on codebooks and optimization.

The Emerging Role of the Knowledge Driven Applications of Wireless Networks for Next Generation Online Stream Processing

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Rajesh Singh[5] and Dr. Devesh Pratap Singh[6]

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Abstract—The present article discusses the use of stream processing to gather data from large-scale WIFI networks. Along with the foundational techniques for deliberate sampling, data collecting, likewise network monitoring in wireless networks, we also examine how understanding extraction may be viewed as an ML problem for applications for large-scale data streaming. We highlight the major This article discusses advancements in large data stream processing methods. We also look more closely at the database collection, edge detection, and methods for machine learning that may be used in the context of WIFI analytics. We discuss challenges, academic research, and the results of wireless network monitoring and stream analysis. Further research is anticipated into other dataflow improvements, such as pattern recognition and optimization algorithms.

Keywords: Machine Learning, Wireless Communication, Regression Analysis, Internet of Things, Big Data

1. INTRODUCTION

Wireless communication tracking presents a number of extra challenges in compared to wired data capture Methods from the connected world, including checking variables after data has passed via a WIFI router, are inapplicable not the network, context as they don't accurately reflect the state of the wireless network at that moment. These protocols do not support diversification. While methods for evaluating network health rely on active measurement, they also have an impact on the metrics that are examined since they alter how the wireless connection is currently functioning. In other cases, indirect methods are employed at the price of some data accuracy, such as taking images, utilising sensors for band studies, or monitoring channel use using wireless access counters.

Due to the continued growth in the use of smartphones and The output of mobile data over mobile devices has expanded because to Internet of Everything (IoT) devices. From 2012 to 2017, smartphone networks increased by a total of thirteen, and from 2016 to 2017, peak load increased by 71%. In 2017, devices that could connect to both commercial and Wi-Fi networks generated 54% of the traffic; a recent research predicted that by 2022, this number would rise to 59%. Most users at both institutions and businesses linked through the school's Wi-Fi____33 router, which is often free of charge, to

the Internet or internal services. Making better educated judgments is possible because to the data regarding users, connections, usage, [1] and mobility patterns that can be learned by observing and managing such a huge Wi-Fi____33 router.

1.1. SDN (Software Defined Networking):

SDN is a technique that provides programmed 5G networks intelligence and flexibility, enabling them to coordinate and regulate apps in a more fine-grained and network-wide way. SDN creates a generalized control plane with the ability to enforce smart management choices in network services. This fills the gap between managing experience quality and service delivery in 5G [79]. SDN may provide context-aware QoE control and satisfy 5G Key Performance Indicators by maintaining network integrity, stability, and reducing latency for lag multimedia applications (KPIs). Intelligent solutions for key 5G network characteristics, such context-aware QoE control [33] and context-aware NFV adaption [38], may be offered and supported in 5G SDN/NFV-enabled systems.

1.2. NFV (Network Function Virtualisation):

NFV aims to provide service providers and operator the network flexibility they need to adapt to changing customers' requirements while spending less on capex (Capex) and operating expenditures (OpenX) thanks to more affordable, flexible software-based infrastructures. By providing a new innovation cycle of software-based Quality - of - service service deployment, it also shortens the time it takes to introduce new network services to the market [80]. The MEC, SDN, and NFV programmed seek to advance a future app 5G networking solution that offers customers automated and flexible network connectivity, as well as provisioning for the user's experience (QoE) [11].

1.3. Online Streaming:

Real-time video may be sent over the Internet via online streaming, which is term for compression and buffering methods. When the server has sufficient buffer space to store data for the required period of time, as is the case with multimedia database systems that manage video databases, this tactic can be utilized [5]. Professional-grade multimedia with broadband impact at narrowband delivery speeds is made possible by the combination of the RealText and

Influence of SiO₂, MgO, and Fe₂O₃ metallic nano cutting fluids of AA6061 in MQL environment

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ARTICLE INFO

ABSTRACT

Metallic nano-lubricant tri-hybridization was used to study the mechanical and process of machining analysis for metallic nano-lubricant utilizing a predetermined volumetric ratio of SiO₂, MgO, and Fe₂O₃ metallic nanoparticles in cold-pressed coconut oil. For aluminium end milling, an alternative to dry and wet machining processes is needed because of the high productivity and surface quality requirements. As a result, the produced nanofluids were examined for rheological behaviour before being used in the milling of AA6061 to solve the problem. When compared to traditional approaches, the nanofluids performed admirably. Results show that tri-hybridized lubricant reduces cutting force, tool wear and surface roughness more effectively than monotype nano fluids. With nano fluids and low quantities of lubricant, the interaction between process variables can be studied using response surface methods. All three of these metrics were reduced while using hybrid cutting fluids and the results were within acceptable parameters.

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1. Introduction

Material is taken from the metal one piece at a time in a sequential operation until the desired shape is achieved [1]. They are required for almost all goods, and a few traditional techniques such as turning, drilling and milling are significant parts of manufacturing process. The widely used yet underutilized aerospace alloy made with composites is utilized in a vast range of applications, with aeroplane portions, gears, shafts, missile components, and military equipment [2–4]. Metal machining is best done using dry metal cutting. Due to material adhesion to cutting tools while dry-machining, a decrease in surface quality and an increase in tool wear occur [5,6]. According to scientific data, adhesion is the result of a combination of factors, including the type of feed rate, lubrication and tool and work materials [7,8]. Research has shown that

when low temperatures and high pressures are combined, BUE forms at the chip-tool contact, whereas BUL forms at a higher temperature. To address the aforementioned issue, proper lubrication is essential [9]. Both flood coolant systems and MQL (Minimum Quantity Lubrication) are important dry machining lubrication techniques [10,11]. As a result, MQL is more prevalent than the other approach, which is known as Small Quantity Lubrication. Air pressure helps to spray the cutting solution in this technique. Furthermore, owing to use of minimum cutting fluid, this technology eliminates environmental hazards, resulting in green and clean manufacturing [12–15]. The cost of eliminating fluid raises the overall cycle cost in several businesses. As a result, the researchers are striving to find a way to reduce costs while maintaining product quality [16]. As a result, researchers use the MQL approach as one of their cost-cutting alternatives. As a base fluid, MQL often uses plain cutting oils and vegetable oils [17]. Adding additives to cutting oils or vegetable oils to improve their lubricating characteristics is a hot topic right now in the world of research [18,19]. Com-

Investigation of torsional effect of UHPFR concrete hollow beams

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ABSTRACT

A significant handful of hollow ultra-high-performance fiber-reinforced (UHPFR) concrete beams have been tested for torsional strength. Various cross sections, wall thicknesses, and cross-section forms of UHPFRC hollow beams were tested in this study. An investigation of these materials is carried out to determine their failure mechanisms and their torque-twist and torque-strain curves. In addition, they are analyzed as well. The cracking and ultimate torques were calculated utilizing theoretical methodologies. Either with or without flange plates, significant fractures entering spirally in UHPFRC hollow beams led to the same failure. Despite the fact that cross-sectional dimensions had an impact on the ultimate torque, wall thickness and cross-sectional type had little influence on cracking torque. The cracking torque was well predicted by the American Concrete Institute code requirements, but the maximum torque was poorly predicted by the existing theoretical methodologies, according to an examination of actual and theoretical data. For hollow beams made of UHPFRC, the wall thickness should be estimated more precisely.

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1. Introduction

UHPFRC is a state-of-the-art cementitious compound with exceptional strength, toughness, and durability [1]. These structural components have good application possibilities in curvilinear structures with thin walls that span great distances because they are predominantly applied to stresses [2–3]. For certain types of loading situations, mechanical qualities and design approaches are still insufficient, which represents a considerable change in UHPFRC applications [4]. There have been numerous studies on UHPFRC associates below flexural and shear stresses, though there have been few examinations into the mechanism of failure and its design approach of UHPFRC associates below torsion, mainly in hollow followers [5]. A significant amount of research on torsional reactions of UHPFRC/UHPC beams with compact, hollow, or T-shaped cross-sections has been published in recent years. [6] looked at the impact of different steel fibre volume segments on

torsional reactions, while [7–9] discovered the adding reinforcements boosted strength slightly in multipurpose composites. The mechanical behaviour of UHPC hollow beams, on the other hand, differs significantly from that of solid sections. Compared to central UHPC restricted by a shear flow zone, the torsional property of core UHPC is dissimilar [10–11]. UHPC hollow beams' ultimate torque was predicted by [12] depend on the standard variable-angle softening truss model, which integrated the UHPC tensile strength's contribution. UHPC box girders under coupled torsion were the subject of research by [13]. The steel fibre volumetric ratio and the silica fume quantity were discovered to affect the torsional behavior of reactive ash concrete T-dimensions beams. Using torsional testing on reinforced hollow beams, [14] found that using normal concrete with synthetic fibres was more successful than using steel fibres. [15] Found that steel fibre higher-strength concrete thin-walled box rafters break and attain their ultimate torques under pure torsion, as anticipated by the formula. This experiment did not take into account important design elements, such as wall thickness and plate width, flange dimension [10–15]. Experiments and theoretical analysis were conducted by [20]

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A Novel Ensemble of Classification Techniques for Intrusion Detection System

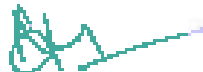Shaik Jakeer Hussain ✉, N. Raghavendra Sai, B. Sai Chandana, J. Harikiran & G. Sai Chaitanya Kumar

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Abstract

Massive volumes of data have been generated over time by various entities. This phenomenon is due to computer advancements. By recognizing attacks and employing acceptable practices, organizations have made the process of data inquiry extremely difficult. While Intrusion Detection Systems (IDSs) protect resources from threats, they are not up to the task of improving area precision, lowering false alarm rates, and identifying subtle threats. This paper proposes a design that combines data mining gathering estimations and association rules to lead

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Assessing Deep Neural Network and Shallow for Network Intrusion Detection Systems in Cyber Security

Deena Babu Mandru, M. Aruna Safali, N. Raghavendra Sai & G. Sai Chaitanya Kumar

Abstract

Intrusion detection system [IDS] has become a central layer that unites everything inside the most recent ICT structure on account of the consideration for advanced prosperity inside the ordinary world. Motivations to recall the weakness to search out the sorts of assaults and grow the intricacy of bleeding edge computerized assaults; IDS requires the need to hitch deep neural networks (DNN). During this report, DNNs will not foresee assaults on the N-IDS. A DNN with a learning pace of 0.1 is applied and

Statistical Analysis of Big Data Models in Android Malware Detection

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Abstract:
The term "malicious software" (or "Malware") refers to any software designed specifically to cause harm to a computer
system. Malware has also progressed in its ability to evoid detection and launch attacks in tandem with the
development of computing technology. Attackers are motivated to target Android vulnerabilities due to the growing
popularity and reliance on smartphones. There are several types of stealth software, but none are as dangerous as
ransomware. Ransomware is a type of malicious software designed to hold users' files and systems hostage in
exchange for payment. Numerous ransomware assaults may have been inspired by the meteoric rise in mobile
commerce. Desktop PCs and mobile devices are both vulnerable to malware. Microsoft Windows is the most used OS
for home desktop computers across the world. As a result, a breach in one system might potentially affect many others.
This research study offers a multi-stage system in which the initial stage makes use of features that are simpler to
extract with cheaper classifiers. Level 2 is considered for detection if the confidence of the level 1 classifier is below a
predetermined threshold. The proposed study is not only concerned on accuracy but also on cost, because integrating
many classifiers may not be possible due to the additional memory and computing requirements. In addition, the time
to output is crucial for the practicality of a malware detection tool. So as to strike a balance between accuracy and cost,
multilevel ensemble system with a modest number of classifiers has been considered.

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A Hybrid-Layered Framework for Detection and Diagnosis of Alzheimer's Disease (AD) from Fundus Images

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‹‹ Results

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Abstract:

Alzheimer's disease (AD) is the most common disease that can cause a brain disorder in a human aged above 65. Detecting and diagnosing AD becomes a more complicated and complex task by using various manual processes. DL and ML algorithms are most widely used to analyze the complex features from the medical data used to detect AD from various samples. Several types of sample formats are used to detect AD. This paper mainly focused on detecting the AD from the retinal fundus images. Analyzing the early symptoms of AD can prevent the patient's life from permanent eye loss. ML algorithms are having various drawbacks that use complex computations and more computation time for the processing of data. The AD prediction is done by using the fundus color images collected from the Kaggle dataset. ML follows various steps to complete the task such as training, pre-processing and algorithm implementation. In the existing approaches, a limited number of parameters are used. Another disadvantage of the traditional algorithm shows the low accuracy and unmatched results. This paper introduced the hybrid-layered framework is developed to detect the AD from the fundus images dataset. Several performance metrics such as precision, recall, F1-score, and accuracy are used to show the results.

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IOT-Ready Energy-Autonomous Parking System

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Abstract— Traffic is unavoidable due to the rise in the sheer amount of automobiles on the road and shortage of parking spots. Driver aggressive behavior and contamination of the environment would result from this traffic jam. These elements might get worse, especially during rush hour. Locating a place to leave a vehicle in an area with the highest flow density is practically difficult. The cost of fuel spent at this time, increased levels of emissions, and increased levels of hazardous gases are the outcomes. Identifying these issues and attempting to find an effective solution is difficult. Now a day's Users favor mobile phone-based solutions as the use of smart phones and associated applications increases. This article suggests a smart parking technique that uses IoT, Arduino, and Android apps.

Keywords— Smart Parking, IOT, Sensors, Low Energy, Arduino.

I. INTRODUCTION

The present day world is evolving quickly because of technical advancements and discoveries in science that make it possible to produce a wide range of smart systems, appliances, and devices. Home appliances, robotics, smart sensor networks, smart vehicles, automation, communication systems, smart transportation systems, and various other gadgets are among these. These technological benefits have made life more convenient, adaptable, and enjoyable for people. The IoT has modified the way individuals act by giving people different types of amenities and comfort alternatives to make daily living easier. A combination of components, including sensors, with the ability to communicate with other devices to exchange information in real time over the internet is known as Internet of Things [1]. Internet connection and sensors are required for the electronic devices to connect through internet of things [2, 3]. There is an exponential growth in IoT devices according to Research. IoT makes it possible to integrate, interact with, and communicate with sensors, digital electronic devices, and actuators that offer the necessary services more effectively to accomplish certain tasks [4, 5]. IoT security employs a variety of security controls, serving as a platform for further technical developments [6]. The explosive development and extension of the IoT has given a new dimension to the concept of building cities that are smart . The goals of the smart city are to lower operational costs, enhance

municipality administration, boost effectiveness, and enhance productivity [7]. The idea of a "smart city" encompasses the efficient administration of buildings, facilities, and smart transit systems [8], medical services [9, 10], educational system, usage of energy, security of the public [11]. The smart city concept's transport system must include a smart parking system as a key component. a scarcity of space for parking in urban areas is an important issue in small and overcrowded places. The average motorist requires about 8 minutes to locate an appropriate space for parking, and approximately one-third of the automobiles on the roads of large cities are looking for empty parking spaces manually [12]. Additionally, it wastes petrol and results in frustrated drivers and polluted air [13]. The petrol usage rate is impacted by congestion in the roadways [14, 15]. In a consequence, air pollution is caused by an increase in the emissions of carbon monoxide (CO), carbon dioxide (CO2), hydrocarbons (HCs), volatile organic compounds (VOCs), and nitrogen oxides (NOx). A contributing cause of seven million untimely deaths globally is air pollution. [16]. A study estimates that $100 billion will be lost due to congestion in the roadways. [17]. The answer to this problem is the Smart Parking System, which uses little to no human intervention to largely automate the task of finding available parking lots. This consists of the on-site hardware elements of an IOT unit that are used to determine whether parking spaces are available. The user receives a message from the Smart Parking System with complete information on the availability of parking spots, the option to reserve a space in advance, and directions to the parking lot. This Smart Parking System makes use of the IOT (Internet of Things) idea, which makes it possible to track and handle the hardware kits from a distance by just connecting to the internet.

II. LITERATURE REVIEW

When fighting against the issue of traffic management and congestion, dealing with parking is a typical challenge. Several projects have been carried out to ease the difficulty in managing automobile parking. P, Sadhukhan [18] used a meter in their model to collect parking fee automatically. To identify the vehicle A camera is used. This is accomplished by deriving the registration number from the number plate. Wi-Fi is used

A Novel Image Registration Hyper spectral Classification Method for Multi-Scale Image Segmentation Based on Morphology and Attributes

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Abstract— In this paper a novel image registration hyper spectral classification method based shape features and multi scale image segmentation is introduced. In this initially two images are taken one is image 1 and another one is reference image. Now to this input images multi scale segmentation is applied based on convex model. After applying segmentation the image is segmented into various parts. Now from the segmented part over ranged areas are removed. Image registration will be done based on the global spatial relation technique. Hyper spectral image is obtained and features are extracted. After features are extracted classification process is done, initially samples are trained and then classification is done by using PCA wavelet transform technique. By using C50 algorithm decision tree classification is applied. At last classified image is obtained with high accuracy and high quality of assessment. From experimental results it can observe that the accuracy, quality, precision, F1 score is increased and error rate is reduced.

Keywords— Novel Image Registration Hyper spectral Classification, Accuracy, Precision, Image Registration, Image Segmentation, Decision Tree Classification.

I. INTRODUCTION

Based on the different sensors, different viewpoints, different times, two or more images are overlaid at the same scene which is nothing but image registration. Basically image registration is the combination of two images that are sensed image and reference image. Based on the image conditions image difference is classified [1]. In this entire image analysis concept, image registration is the crucial step which will restore the data, performs image fusion and change the detection. Hence from last few decades image registration plays major role to extract the features and classify the image data based on the pairing concept. This image registration mainly utilized in the applications of Computed Tomography (CT), Geographic Information System (GIS), and Weather Forecasting and Creating super resolution images. Majorly the image registration is mostly utilized in the applications of computer vision, remote sensing and medical. It is already noted that image registration is frequently utilized in computer vision, remote sensing, and medical imaging. According on the method of picture acquisition, its applications may be split into four major categories in general: different views of view (multi view analysis). Several perspectives are used to capture the same spectacle in picture. A 2D or 3D picture of the scanned scene is intended to be enlarged [2]. Examples of applications, remote sensing is the process of combining images from the area which are being studied. Computer vision where shape recovery (shape from stereo) has taken place several times based on multi temporal analysis. Images of the same site are captured throughout the time, perhaps under different conditions, and frequently on a regular basis. The objective is to identify and access scene changes that happened between subsequent takes.

Medical imaging is the process of combining sensors that record anatomical body structure with sensors that monitor physiological and metabolic processes, such as those employed in positron Emission Tomography (PET), Single Photon Emission Computed Tomography (SPECT), or Magnetic Resonance Spectroscopy (MRS). Results may be applied for instance, in radiation and nuclear medicine model registration using scene data. Images from a scene and a model of the scene are captured [3]. The model might be a computer-generated representation of the scene, such a map or Digital Elevation Model (DEM) in a Geographic Information System (GIS), or it could be a "typical" specimen based on another location with a patient who is similar to the current circumstance [4].

Remote sensing is the process of transferring aerial or satellite data to maps or other GIS layers. Examples of computer vision include automated quality control and target template matching with live images.

Flow analysis of casson fluid with arrhenius activation energy and buoyancy forces Induced due to permeable elongated sheet embedded In a doubly stratified medium ☒

N. Vijaya ✉; P. Krishna Jyothi; A. Anupama; Ch. Manikya Rao

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The central Intention of this study is to find the Influence of chemical reaction and activation energy on an incompressible Casson fluid over elongated stretched sheet considering thermal radiation, heat source, permeability, thermal diffusion and boyancy effects. Similarity variables are inducted to transform PDE into ODE. To scrutinize the behavior of critical parameters on velocity, temperature and concentration profiles graphs and tables are portrayed. It is detected that velocity of the liquid lessen for progressive values of non-Newtonian rheology parameter, magnetic parameter, porous parameter and increases for higher values of thermal buoyancy number and solutal buoyancy number. It is analyzed that Newtonian rheology parameter, thermal radiation parameter and heat source increases temperature profiles where as opposite effect is observed in the case of thermal atratratified parameter. Prandtl number and Eckert number. This study also reported that concentration profiles accelerates for activation energy

Effects Of Submerged Friction Stir Welding On Mechanical Properties Of AA6061 In Seawater

Laxmanaraju salavaravu[1*], *Gopichand* Dirisenapu[2], *Lingaraju* Dumpala[3], *Murahari* kolli[4], *Rajyalakshmi* Bandi[5], *Kosaraju* Satyanarayana[6]

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Abstract. In this study, Al-Mg-Si alloy AA6061-T6 plates were joined in a seawater environment using the Submerged Friction Stir Welding (SFSW) technique, and process parameters were optimized using Taguchi L9 orthogonal arrays (OA). The parameters considered were tool rotational speed, tool transverse speed, and tool pin geometry. The MINITAB-17 software was used to analyze the responses using the signal-to-noise (S/N) ratio and analysis of variance (ANOVA). The optimum process parameters for tensile strength and joint Microhardness were determined. Furthermore, the ANOVA reveals that the tool rotational speed is the most important factor in determining joint mechanical properties such as UTS and Microhardness, with transverse speed and tool pin geometries coming in second and third. Experimental results confirm the effectiveness of this approach. The parent material microstructure and submerged stir welded samples were compared using metallographic scanning electron microscopy (SEM).

1. Introduction

Manufacturing joints require the typical materials with excellent mechanical properties and good surface finish.FSW is a solid-state welding process that becomes an alternate welds process using a third component as a tool and joining two butted faces of similar or dissimilar metals without melting the metal. A pin and shoulder are included in the rotating non-consumable tool. The tool pin is inserted between two workpieces in a line. Sabari et al. investigated aluminium hybrid combination welding, which is commonly avoided due to hot cracking and compound isolation issues.

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Optimization of process variables on Electrical Discharge Machining of novel Al7010/B₄C/BN hybrid metal matrix nanocomposite

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Abstract. In this paper, determination of optimum EDM input variables like discharge current (DC), pulse on time (Pon), pulse off time (Poff), and gap voltage (GV) on responses like material removal rate (MRR) and surface roughness (SR) using Taguchi technique on the novel Al7010/2%B₄C/2%BN hybrid metal matrix nanocomposite (HMMNC) manufactured through ultrasonic assisted stir casting (UASC) route. The various experiments were planned and carried out L_{16} orthogonal array and regression equations were established by using Analysis of variance (ANOVA) to examine the impact of pulse factors. The outcomes exposed that discharge current greatest effect factor on MRR and SR was found with % contribution of 82.07% and 86.86%. It is also identified that the optimum level conditions of pulse factors for MRR and SR is $A_4B_4C_1D_1$ and $A_1B_1C_4D_4$. The outcomes were further determined by utilizing confirmatory experiment. The machined surface morphology was observed through Scanning electron microscope (SEM).

1. Introduction

Aluminum metal matrix nanocomposites (AMMNCs) are becoming increasingly popular in industries such as automotive, aerospace, and nuclear due to their desirable characteristics, like high stiffness, superior strength, low density, corrosion resistance, and excellent electrical and thermal conductivity.

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An Improved Anomaly Detection in Wireless Sensor Network using Artificial Intelligence Evolving Optimization Tools

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Abstract:
To maintain the security and dependability of wireless sensor networks (WSNs), anomaly detection is essential. In this research, we present a decision tree-based approach that is more effective for anomaly identification in WSNs. The goal is to increase the network's ability to detect anomalous behavior with greater accuracy and efficiency. To do this, we first gather and preprocess sensor data from several network nodes. Then, from the gathered data, pertinent features are identified, collecting traits that can distinguish between typical and abnormal behavior. These characteristics include time series analysis methods, frequency domain analysis, and statistical metrics. After that, a decision tree model is built using a training dataset that contains instances of normal and abnormal behaviour that have been labelled. Unseen data instances are fed through the decision tree model during the detection phase. Each occurrence is classified as normal or anomalous once it has gone through the decision tree once. Alerts and notifications can be produced by linking the detection system with the network management architecture, enabling network administrators to quickly address possible risks or problems. We demonstrate the efficiency of our methodology in increasing anomaly detection accuracy compared to existing methods through experimentation and evaluation. An effective and reliable method for spotting anomalies in WSNs is the decision tree algorithm. Additionally, decision trees are a useful tool for anomaly detection in wireless sensor networks due to their adaptability, which makes it simple to integrate with the network's changing features.

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Abstract

SMART CAP : An IoT Based Assistant for Visually Impaired People

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Abstract— With 40 million visually challenged individuals, India has the highest blind population in the world (20% of all blind people). Additionally, approximately 90% of these individuals have no access to essential assistive devices. The article suggests 'Smart Cap,' a first-person vision-based aide, with the goal of providing these Indians with visual impairments with an insight into the outside world. With features including facial recognition, image captioning, word identification and recognition, and digital newspaper reading, the Smart Cap functions as a conversational agent fusing the World Wide Web of Things and Deep Learning.

A Raspberry Pi, a webcam, a microphone, headphones, a power supply, and cables for extension make up the hardware architecture. The individual using the device can communicate with their Smart Cap by issuing certain commands, which cause the associated feature module to activate and generate sounds. The DLIB'S forms the foundation of the facial recognition module, which is the most popular facial recognition software. The application of producing written explanations from a series of images and optical time series forecasting issues were the driving forces behind the development of CNN LSTMs. Text detection, as well as recognition, are performed using Google's Vision API service. The ability to read newspapers online is also offered, making the blind person aware of the latest events.

Keywords— Visually Impaired, Vision-based Aids, IOT, Face, Object and Text Recognition, OCR, News Scraping.

I. INTRODUCTION

People who have visual impairments encounter several difficulties during everyday activities, particularly with regard to travel, identifying goods and person recognition. In order to provide these visually challenged persons in India with an understanding of the outside world, the study suggests "Smart Cap," a first-person vision-based aide [1,2]. To address this challenge, this project aims to develop a system that utilizes the YOLO object detection algorithm, face recognition technology, and a Raspberry Pi to give assistance to vision-challenged persons [3,4].

The Smart Cap suggested in this initiative will assist those with visual impairments in numerous ways, like explaining the environment, identifying people, and reading text. It uses a web camera to capture the images. It consists of four modules they are

1) Face Recognition module
2) Object Recognition module
3) Text Recognition module
4) Online Newspaper

A USB webcam, a USB microphone, ESP-32, headphones, a power source, and cords for extension serve as the components that make up the design. By issuing particular instructions, the person using it can communicate with their Smart Cap, causing the associated unit to be activated and provide a sound signal. The technique of finding a face in an image and recognizing it involves two steps. CNN-LSTM encoder-decoder is synthesized for the picture captioning task. An LSTM architecture known as CNN-LSTM is created for sequence prediction issues including visual inputs, such as videos or photos, in mind. The goal of technology is to make life simpler for people.

II. LITERATURE REVIEW

Smart Cap is an IoT-based wearable device designed to assist visually impaired individuals in navigating their surroundings. This device provides users with real-time audio feedback about their environment, such as identifying nearby objects, people, and landmarks. The following is a review of the literature survey on Smart Cap:

"Smart Cap for the Blind: A Review" (2021) by R. S. Adhikari et al. This study presents a review of the Smart Cap and its features. The study discusses the various sensors used in the Smart Cap and their functionalities. The study also highlights the navigation system of the device, which is based on GPS and can provide the wearer with directions. The study concludes that the Smart Cap is a useful device for visually impaired individuals, as it can assist them in navigating their surroundings [5].

"A Wearable Device for Visually Impaired People" (2018) by R. M. Thakare et al. This study presents a detailed description of the Smart Cap and its features. The study also discusses the various sensors used in the Smart Cap, including ultrasonic sensors, temperature sensors, and infrared sensors [6]. The Smart Cap can detect obstacles and warn the wearer about their proximity. The study also highlights the ease of use of the device, making it accessible to visually impaired individuals [7].

"Face recognition system for visually impaired people based on Raspberry PI" by Xu, Y., Li, Z., Li, X., Chen, S., & Wang, Y. (2021). The study discusses the various sensors used in the Smart Cap.