Journal of Scientific & Industrial Research

CONTENTS

Management & Information Technology
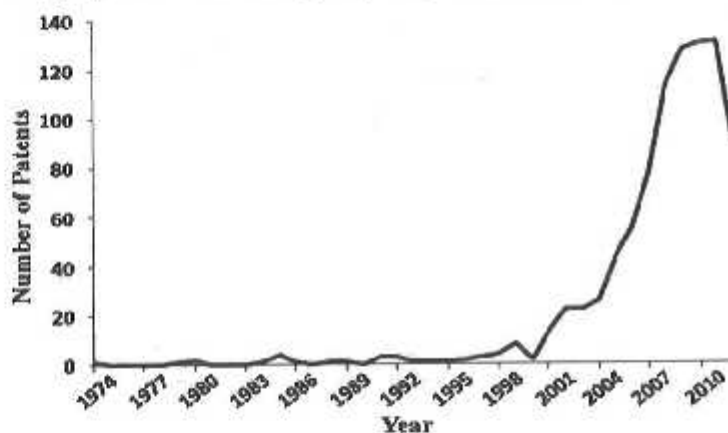
The paper discusses yet another approach of clustering datasets whose cluster numbers are not known beforehand. The suggested approach effectively determines the number of clusters or partitions while running the algorithm. The proposed method is only limited to partitional clustering inspired from the K-means algorithm. In this work a Modified Teaching-Learning-Based Optimization (MTLBO) is used to form the clusters and determine the number of clusters on the run. The comparison of the results obtained by MTLBO is done with the classical TLBO and Classical Differential Evolution (DE) technique. The results show that MTLBO gives better accuracy than the other two with respect to the number of function evaluations and cluster validity measures. Several benchmark datasets are simulated from the UCI machine repository and results are tabulated in the paper.

The number of patents with critical information related to various technologies is increasing by the day. This trend has led corporations and countries to consider patent analysis as an important element in their analysis methodology for research and development. The present study seeks to determine and forecast vacant technology with considerable development potential through an analysis of patents. In order to identify a vacant technology cluster, the unstructured patent documents need to be structured into groups of similar technologies by using k-means clustering.

Conventional key based authentication system normally associated with block cipher and allows the sender to send the packets with signature scheme. The relationship between the packets makes them vulnerable to packet loss, which is inherent in the internet and wireless networks. In addition, the lack of Denial of Service (DOS) resilience renders most of them vulnerable to packet injection in the hostile environments. In this paper we propose an Agent Based Secure Multicast Authentication (ABSMA) which utilizes the public key encryption in batch signature with efficient fast hashing algorithm. Our agent based architecture used for the identification of packet loss and injection and allows the host to resend the particular packets.
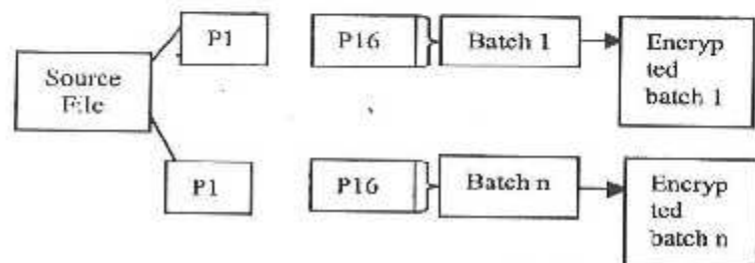


M S S Hameed & N Kannan

S & T and Industrial Research

3D model of 2NPD domain of FAS protein from *Mycobacterium tuberculosis* was refined using MD simulations for a time period of 10ns. Fluctuation in energy parameter which was noticed during heating stage remained fairly stable once the temperature was maintained at 300 K. The 2NPD structure attained global energy minimum at 1147th ps which in fact is the lowest energy state of the protein. RMSD of the trajectory structures showed that the intermediary stage remained fairly stable. Hydrogen bonding patterns revealed interaction of water molecules with hydrophilic amino acids of 2NPD. While the length of H-bond was 1.87 Å to 2.83 Å, bond angle varied from 33.6° to 50.2°. Residue numbers from 50 to 87 were involved in forming hydrogen bonds with water.

K V Ramesh, M Solanki, S Sharma & S Deshmukh

The application of ultrasonic effects to disperse nano sized particles in molten metal has been studied. Based on this technique, nano-sized SiC and B_4C particles reinforced with AL7075 aluminium nanocomposites were fabricated. XRD analysis reveals that uniform structure of nano composites was formed in the Al alloy. The microstructure of the nanocomposites was investigated by high resolution scanning electron microscope (SEM). Experimental results show a nearly uniform distribution and good dispersion of the SiC and B_4C nanoparticles within the aluminium metal matrix, although some small clusters were found in the matrix.
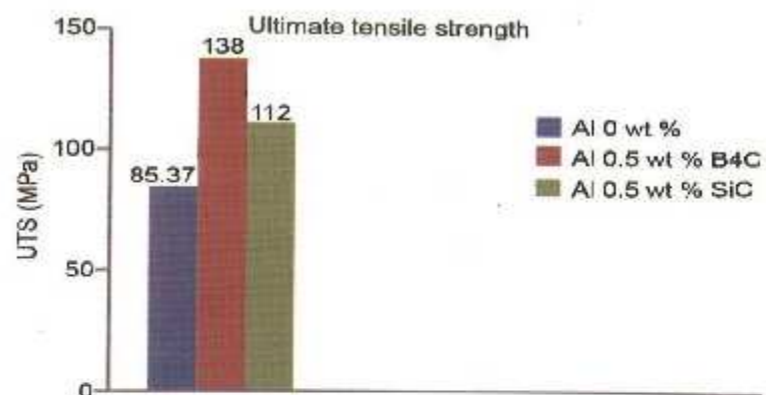

S Gopalakannan & T Senthilvelan

An alpha amylase producing fungal strain was isolated from spoiled food and identified as *Aspergillus awamori*. Production of extracellular α-amylase by *Aspergillus awamori* was studied in solid-state fermentation. Twelve different agro-residues such as wheat bran, maize bran, corn bran, millet bran, rice bran, green gram bran, black gram bran, cassava peel powder, cotton seed oil cake, coconut oil cake, sesame oil cake and groundnut oil cake were screened for α-amylase production using *Aspergillus awamori* MTCC 9997. Among them, cassava peel powder was found to be the best substrate for α-amylase production.
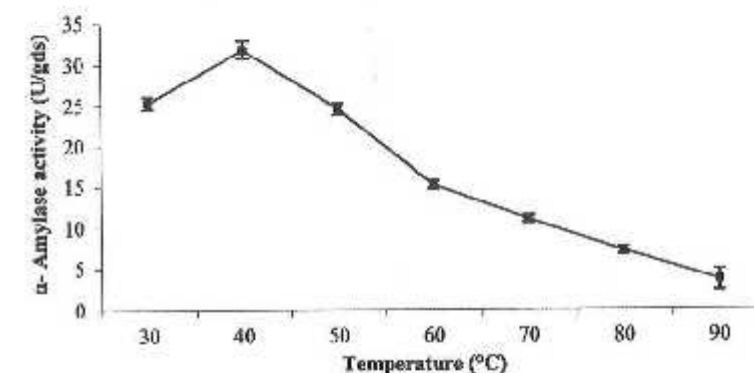
K Kalaiarasi & R Parvatham

Batch fermentation of a newly characterized *Bacillus* strain, *Bacillus* sp. Ti3, was investigated for PHA accumulation. Time course study revealed growth associated PHA production, with maximum PHA yield 0.6 ± 0.02 g/L and 44.1 ± 0.9 % PHA accumulation coinciding with the maximum biomass stage of 24 h followed by a time dependent decline due to onset of sporulation. pH 7 supported maximum PHA yield of 0.86 ± 0.01 g/L and PHA accumulation of 48.0 ± 0.72 %. Biomass of 2.1 ± 0.1 g/L and 0.92 ± 0.07 g/L PHA yield was obtained with 4% (v/v) inoculum. Glucose supplemented with casein hydrolysate gave the highest biomass 1.85 ± 0.02 g/L, PHA yield 0.96 ± 0.02 g/L and 51.6 ± 0.5 % PHA accumulation. Fermentation kinetic parameters of the *Bacillus* sp. Ti3 grown in batch cultures with optimized culture conditions accounted for 1.7 and 1.2 fold increase in PHA yield (0.57g/L to 0.96g/L) and PHA accumulation (44.1% to 51.6%).
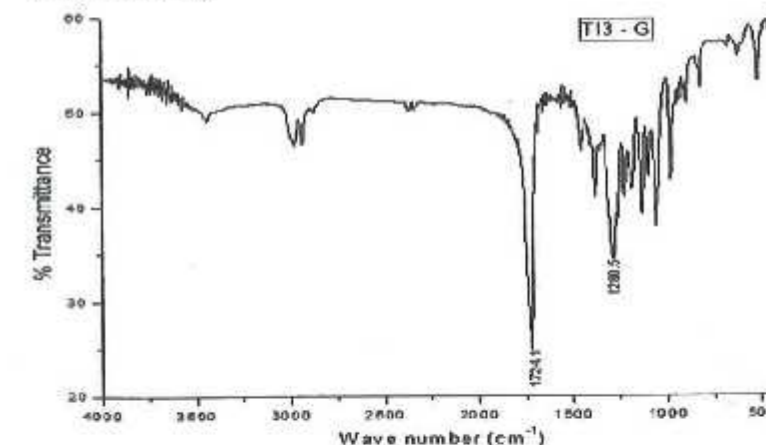

N Israni & S Shivakumar

Energy and Environment

Atmospheric pollution is a major disaster in the current century. The geometry of pollutants emission from various sources has been categorised as point, area and volume. Particulate matters (PM_{10} & $PM_{2.5}$), gaseous pollutants and volatile organic carbons (VOCs) are the significant pollutants from various source types due to natural as well as anthropogenic activities. These pollutants once entered into the atmosphere get transport due to the meteorological aspects and other reasons. Hence the cause effect of these significant species may adversely generate negative impacts on the environment called receptors. The current research work focused on the prediction of emission rate (Q, unit/sec) from an area source through a combined receptor-dispersion (shear) model analysis.
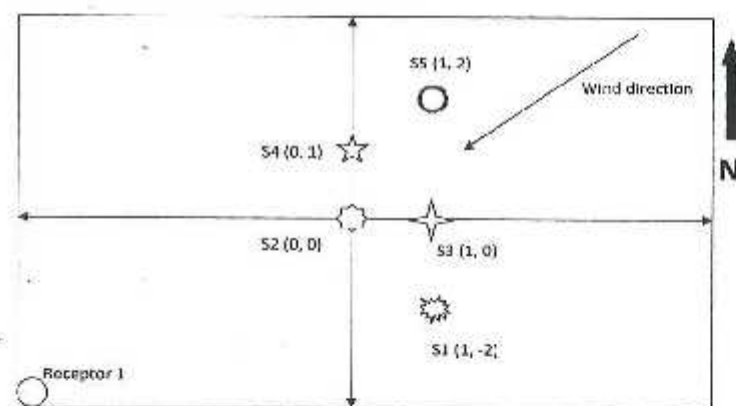
N Anu, M S G Nandagopal, V Aneesh & N Selvaraju

Air quality model (AQM) is an essential tool for management of air quality in near field region of an industrial complex. Model validation study using site specific input data can boost the consistency on accuracy of model's performance for air quality management. This study describes the validation of CALPUFF and AERMOD for assessment of NO_x concentrations in near field region of a steel industry in Bellary district of Karnataka state in India. Relative model performances are evaluated by comparing monitored and predicted pollutants using well referred statistical descriptors. Further, the performance of CALPUFF has evaluated with different dispersion options (i.e., PGT-ISC dispersion curve and similarity theory) and vertical layers option (i.e., two and ten vertical layers) in CALMET, meteorological pre-processor of CALUFF. Both models performed satisfactorily for predicting NO_x concentrations.
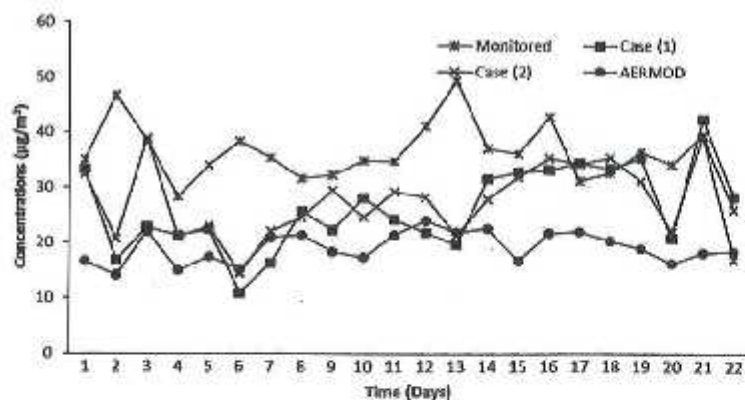

S Gulia, A Kumar & M Khare

Waste Utilization

The electricity production from waste water collected from food industry, oil mill, pharmaceutical industry, kitchen and sewage have been studied by microbial fuel cell duel chamber assembly. The set-up was fully designed in our laboratory using acid treated and platinum coated carbon cloth as anode and cathode respectively. Electricity generation and chemical oxygen demand (COD) removal efficiency of these types of water samples were monitored using only 50 mL of waste water in anodic chamber. All 5 samples shows good potential of energy, which is stored in the form of organic waste out of which, sewage waste water produces highest current density (1.025 mA/cm^2) and power density (804.0 $\mu W/cm^2$) at 7th day of inoculation.
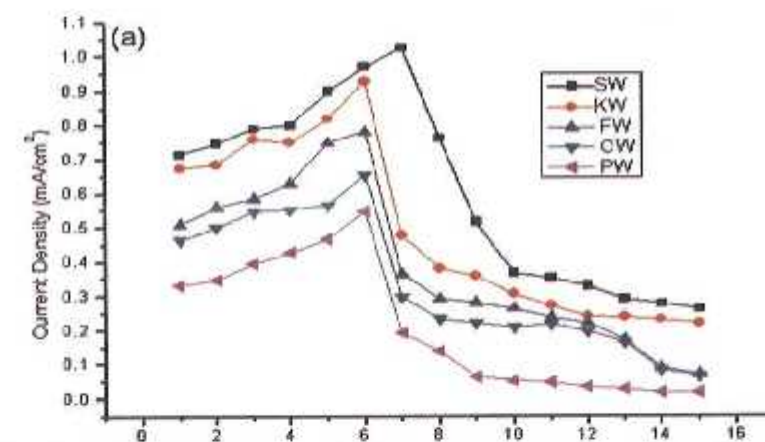
R Jain, D C Tiwari, S Sharma & P Mishra

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