A Review: Classification of Fossilized Radiolarian image using computational Intelligence Techniques

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Abstract : Radiolarians are a type of planktonic protozoa suspended along the water column in the oceans and are important biostratigraphic and paleoenvironmental indicators for palaeogeographic reconstructions. Radiolarian paleontology is still considered to be the most affordable way to date deep ocean sediments. Using under a binocular microscope, the help of a fine brush is used to collect the radiolar shells from the part remaining on the sieve. The resulting radiolar fossils are displayed under the Scanning Electron Microscope (SEM) for detailed taxonomic studies. For the systematic identification of fossils examined, it is necessary to scan the work done up to daylight. Conventional methods for identifying radiolarians are time consuming and cannot be scaled by the detail or scope required for large-scale studies. Automatic image classification allows these analyzes to be done quickly. In Automatic image classification, a method for automatic classification of fosilized radiolarian images obtained by Scanning Electron Microscope (SEM) has been proposed.

IndexTerms - MatLab, Nuero Solution Software, Microsoft excel, Various Transform Technique.

I. INTRODUCTION

The simplest definition is "the study of ancient life". Paleontology seeks information about several aspects of past organisms: "their identity and origin, their environment and evolution, and what they can tell us about the Earth's organic and inorganic past". Paleontology or palaeontology is the scientific study of life that existed prior to, and sometimes including, the start of the Holocene Epoch (roughly 11,700 years before present). It includes the study of fossils to determine organisms' evolution and interactions with each other and their environments . Paleontological observations have been documented as far back as the 5th century BC. The science became established in the 18th century as a result of Georges Cuvier's work on comparative anatomy, and developed rapidly in the 19th century. Paleontology is one of the historical sciences, along with archaeology, geology, astronomy, cosmology, philology and history itself. This means that it aims to describe phenomena of the past and reconstruct their causes. Hence it has three main elements: description of the phenomena; developing a general theory about the causes of various types of change; and applying those theories to specific facts. When trying to explain past phenomena, paleontologists and other historical scientists often construct a set of hypotheses about the causes .

Paleontology lies on the boundary between biology and geology since paleontology focuses on the record of past life but its main source of evidence is fossils, which are found in rocks. For historical reasons paleontology is part of the geology departments of many universities, because in the 19th century and early 20th century geology departments found paleontological evidence important for estimating the ages of rocks while biology departments showed little interest. Paleontology also has some overlap with archaeology, which primarily works with objects made by humans and with human remains, while paleontologists are interested in the characteristics and evolution of humans as organisms. When dealing with evidence about humans, archaeologists and paleontologists may work together – for example paleontologists might identify animal or plant fossils around an archaeological site, to discover what the people who lived there ate; or they might analyze the climate at the time when the site was inhabited by humans In addition paleontology often uses techniques derived from other sciences, including biology, osteology, ecology, chemistry, physics and mathematics.

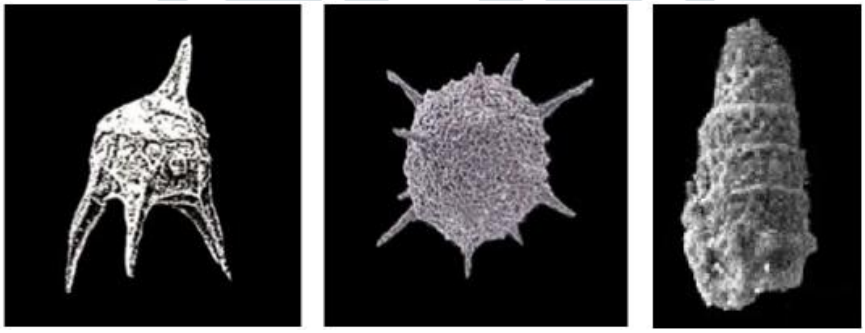
For example, geochemical signatures from rocks may help to discover when life first arose on Earth, and analyses of carbon isotope ratios may help to identify climate changes and even to explain major transitions such as the Permian–Triassic extinction event. A relatively recent discipline, molecular phylogenetics, often helps by using comparisons of different modern organisms' DNA and RNA to re-construct evolutionary "family trees"; it has also been used to estimate the dates of important

evolutionary developments, although this approach is controversial because of doubts about the reliability of the "molecular clock".[12] Techniques developed in engineering have been used to analyse how ancient organisms might have worked, for example how fast Tyrannosaurus could move and how powerful its bite was. A combination of paleontology, biology, and archaeology, paleoneurobiology is the study of endocranial casts (or endocasts) of species related to humans to learn about the evolution of human brains.Paleontology even contributes to astrobiology, the investigation of possible life on other planets, by developing models of how life may have arisen and by providing techniques for detecting evidence of life.

Body fossils and trace fossils are the principal types of evidence about ancient life, and geochemical evidence has helped to decipher the evolution of life before there were organisms large enough to leave body fossils. Estimating the dates of these remains is essential but difficult: sometimes adjacent rock layers allow radiometric dating, which provides absolute dates that are accurate to within 0.5%, but more often paleontologists have to rely on relative dating by solving the "jigsaw puzzles" of biostratigraphy. Classifying ancient organisms is also difficult, as many do not fit well into the Linnaean taxonomy that is commonly used for classifying living organisms, and paleontologists more often use cladistics to draw up evolutionary "family trees". The final quarter of the 20th century saw the development of molecular phylogenetics, which investigates how closely organisms are related by measuring how similar the DNA is in their genomes. Molecular phylogenetics has also been used to estimate the dates when species diverged, but there is controversy about the reliability of the molecular clock on which such estimates depend.

However, classification or recognition of the microfossil that appear in these images is difficult task and needs human experience. But, if we consider the amount of the area that is covered by the paleontologist , it is more effective to provide automatic intelligent recognition or classification that simulates human experience. microfossil SEM images Classification System developed to simulate human experience by classifying microfossil images, This purposed work is organized as the follows: In this purposed work, microfossil SEM images Classification System which was developed to simulate human experience in the recognition of underwater shapes by using Pattern Averaging and Back Propagation Learning Algorithm, will be presented.

The reliability and the success of these systems are depend on the effectiveness of applied data pre-processing techniques and neural networks which can be used for efficient modeling of human's visual system during the recognition or classification of patterns. Neural networks have an important part in the modelling of human experience and decision making process into computers. some microfossil SEM images are shown in below figure 1



(a) (b) (c)

Figure 1:(a) Hozmadia reticulata (b) Triassospongosphaera multispinosa
(c) Triassocampe aff. scalaris Dumitrica

II. LITERATURE REVIEW

Till date what is the status of the related research work has been inspected hear A number of techniques have been deployed for red tide Algae classification.

RadSS: A Radiolarian Classifier using Support Vector Machines paper published in 2016 authors of this paper is Louise Ann Apostol , Edanjarlo Marquez , Perlita Gasmen , Geoffrey Solano ,a University of the Philippines, ManilaUniversity of the

Philippines, Diliman used in the study image processing and support vector machine and achieve 93.33% result accuracy in classification of radiolarian.[2]

Classification of radiolarian images with hand-crafted and deep features published in 2017 Authors of this paper Ali Seydi Keçeli a, Aydõn Kaya a, Seda Uzunçimen Keçeli b, used in the study Deep learning Image features Radiolarian image Pattern classification and achieve 10% percent of the feature size reduces the mean execution time of the classifiers by %36 comparing to 100% feature size.[1]

Automatic recognition of complete palynomorphs in digital images published in year 2015 Authors of this paper J. J. Charles used in the study classification , microfossils , image analysis , segmentation ,palynomorph and achieve The final automatic recognition has accuracy of 88%.[3]

Microfossils shape classification using a set of width values published in year 2006 authors of this paper Roberto Marmo,Sabrina Amodio used in the study Multilayer perceptron neural network and achieve 87.10% result accuracy.[7]

or also be study Automatic classification approaches before taxonomy used in the study. Apostol et al. fossil A method for classification of radiolarian images He has proposed. A dialing using Fourier transform, rotational and scale insensitive method, Fimbres-Castro and [4]. Radiolaria images Another method using transfer learning on felted et al. [5]. Also similar features with radiolarians
automatic classification of plankton images and There are several methods for access retrieval. Dividing interests (ROI) into pieces, removing attributes and find similarities or image classification steps are. For example, many visual partitioning algorithms It is absent; threshold based, color based, texture based, model based etc. [6]. Wavelet identifiers [8] and textural
[9], morphometric as granulometric properties [10] properties, contour and boundary shape, directed gradients (HOG) histogram [11] etc. Specification [12, 13] Classification and image access approaches. Diatom and phytoplankton image classification [14-16]

From the rigorous review of the above mentioned papers , it is observed that no method has reported accuracy of more than 93.33%. We need to improve the accuracy and for that a new system is required to be developed.

III. RESEARCH METHODOLOGY

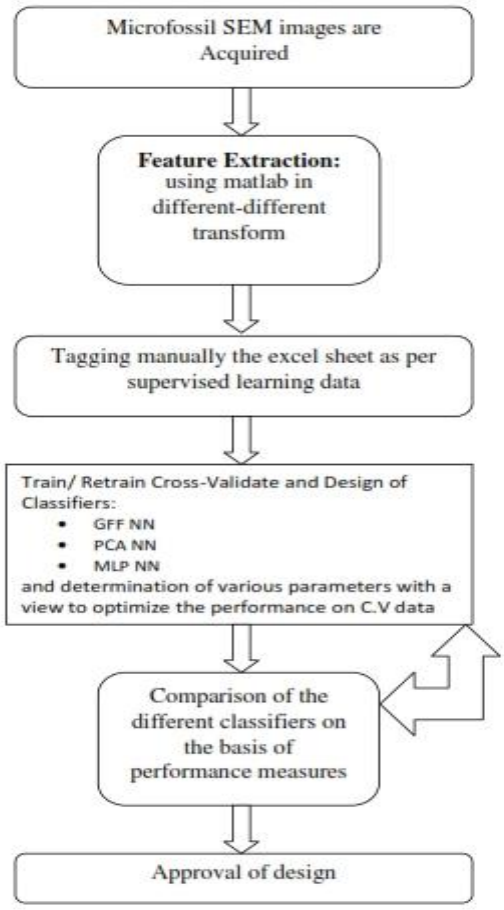


Figure 2:Flow chart

It is proposed to think about the grouping of three sort of microfossil SEM images Using Neural Network Approaches.. Information securing for the proposed classifier intended for the Recognition of three sort of microfossil SEM images. .The most vital un corresponded includes and in addition coefficient from the images will be extricated . In order to extract features, statistical techniques, image processing techniques, transformed domain will be used.

Computational Intelligence techniques include the following will established techniques.

i) Statistics
ii) Image processing
iii) Learning Machines such as neural network .
iv) Transformed domain techniques such as HISTOGRAM,WHT, DCT etc.

For choice of suitable classifier following configuration will be investigated.

i) Support Vector Machine.
ii) Principal component analysis (PCA) Neural network.
iii) Generalized Feed Forward (GFF)Neural Network

For each of the architecture, following parameters are verified until the best performance is obtained.

i) Train-CV-Test data
ii) Variable split ratios
iii) Retraining at least five times with different random initialization of the connection weights in every training run.
iv) Possibility different learning algorithms Standard Back-Propagation, and learning rules such as Conjugate gradient , Quick propagation, Delta Bar Delta,Momentum
v) Number of hidden layers
vi) Number of processing elements of neurons in each hidden layer.

After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.

i) Mean Square Error
ii) Normalized Mean Square Error
iii) Classification accuracy
iv) Sensitivity

In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

Research Objectives:

i) To maintain the correctness & accuracy in three sort of microfossil images Classification even though the input images are contaminated by known or unknown noise.
ii) To increase the classification accuracy for the Images of three sort of microfossil

IV. Conclusion

This paper demonstrated how to using artificial neural networks(ANN)could be used to build accurate five type of red tide algae image classifier and i am also try to achieved result more accurate and reliable.

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