

₹ 200

ISSN - 2249-555X

Volume : 1

Issue : 9

June 2012



Journal for All Subjects

www.ijar.in

Listed in International ISSN Directory, Paris.



ISSN - 2249-555X

Indian Journal of Applied Research

Journal for All Subjects

Editor-In-Chief

Dr A Kumar

Director, College Development Council (CDC)
Director, Internal Quality Assurance Cell (IQAC)
Professor in Management,
Department of Business Administration, Faculty of Management,
Bhavnagar University,

Editorial Advisory Board

Dr. S. N. Pathan
Maharashtra

Dr. SM. Ramasamy
Gandhigram

Dr. M. M. Goel
Kurukshetra

Dr. S. Ramesh
Tamil Nadu

Dr Ramesh Kumar Miryala
Nalgonda.

Dr. B. Rajasekaran
Tirunelveli

Dr. A. R. Saravankumar
Tamilnadu

Dr. Roy M. Thomas
Cochin

Dr. G. Selvakumar
Salem

Dr. Apurba Ratan Ghosh
Burdwan

Dr. Shrawan K Sharma
Uttarakhand

Dr. Sudhanshu Joshi
Uttarakhand

Prof. (Dr.) B Anandampilai
Pudhukottai

Advertisement Details

Position	B/W (Single Color)	Fore Color
Full Inside Cover	₹ 6000	₹ 12500
Full Page (Inside)	₹ 5000	-

Subscription Details

Period	Rate	Discount	Amount Payable
One Year (12 Issues)	₹ 2400	Nil	₹ 2400
Two Year (24 issues)	₹ 4800	₹ 200	₹ 4600
Three Year (36 issues)	₹ 7200	₹ 300	₹ 6900
Five Year (60 issues)	₹ 12000	₹ 600	₹ 11400

You can download the Advertisement / Subscription Form from website www.ijar.in. You will require to print the form. Please fill the form completely and send it to the **Editor, INDIAN JOURNAL OF APPLIED RESEARCH** along with the payment in the form of Demand Draft/Cheque at Par drawn in favour of **INDIAN JOURNAL OF APPLIED RESEARCH** payable at Ahmedabad.

1. Thoughts, language vision and example in published research paper are entirely of author of research paper. It is not necessary that both editor and editorial board are satisfied by the research paper. The responsibility of the matter of research paper/article is entirely of author.
2. Editing of the Indian Journal of Applied Research is processed without any remittance. The selection and publication is done after recommendations of atleast two subject expert referees.
3. In any condition if any National/International University denies accepting the research paper published in IJAR, then it is not the responsibility of Editor, Publisher and Management.
4. Only the first author is entitle to receive the copies of all co-authors
5. Before re-use of published research paper in any manner, it is compulsory to take written permission from the Editor-IJAR, unless it will be assumed as disobedience of copyright rules.
5. All the legal undertaking related to Indian Journal of Applied Research is subject to Ahmedabad Jurisdiction.
7. The research journal will be send by normal post. If the journal is not received by the author of research papers then it will not be the responsibility of the Editor and publisher. The amount for registered post should be borne by author of the research paper in case of second copy of the journal.

Editor,

Indian Journal Of Applied Research

8-A, Banans, Opp. SLU Girls College, New Congres Bhavan, Paldi,
Ahmedabad-380006, Gujarat, INDIA

Contact.: +91-9824097643 E-mail : editor@ijar.in

INDEX

Sr. No.	Title	Author	Subject	Page No.
1	Cost of capital: an empirical case study of hindustan unilever limited	Dr. Vinod K. Ramani	Accountancy	1-2
2	Self Revolution	Mohanapriya.P	Arts	3-4
3	Wound healing activity of Cestrum elegans	V. Subhaa, Dr. D. Sukumarb, Dr. V. Elangoc	Chemistry	5-6
4	Anti Bacterial Activity of Apigenin 7-0-(6"caffeoyl) neohesperidoside from chrysanthemum indicum	M.Jerome Rozario, Dr.A.John Merina, Dr.V.Srinivasana	Chemistry	7-10
5	Adsorption Studies of Cu (II) and Cr (VI) from metal solution using crosslinked chitosan-g-acrylonitrile copolymer	Shankar.P, Gomathi T., Vijayalakshmi.K, Sudha P.N	Chemistry	11-13
6	An Insight into Derivative Markets: Indian Perspective	Dr. C.Shobha, Dr. T. Hanumantha raya	Commerce	14-16
7	Vision and Planning	Dr. J. K Sehgal	Commerce	17-18
8	An Analytical Study of Employee's Productivity in Some Selected Nationalized Banks of India	Dr. Jyotindra M. Jani, Manish B. Raval	Commerce	19-20
9	New Products of Tourism in India	Dr. M. K. Maru	Commerce	21-22
10	Inventory Management in Sugar Mills - A Comparative Study	Promila	Commerce	23-25
11	Price -Mix Strategy of Jammu and Kashmir Co-Operatives Supply and Marketing Federation Limited in Jammu District of J&K State	Tarsem Lal	Commerce	26-28
12	Warehouse Management Information System: A New Perspective in Supply Chain Management	Dr. Vipul Chalotra	Commerce	29-30
13	A Study on Consumer Satisfaction of Aavin Milk in Salem City	Dr.A.Vinayagamoorthy, Mrs. M.Sangeetha, C.Sankar	Commerce	31-33
14	Hybrid Attribute Selection Process for Decision Tree Based Classification Algorithms	Mr. A. Jebamalai Robinson, Mrs. S. C. Punitha, Dr. P. Ranjit Jeba Thangaiah	Computer Science	34-36
15	Visualizing the validation of UML diagrams	Lavleen Kambow	Computer Science	37-38
16	Effectiveness of coconut palm insurance scheme in the coastal belts of India-A SWOT analysis	Prof. (Dr.) D. Rajasenan, Bijith George Abraham	Economics	39-41
17	An Analysis of the Efficiency of Selected Public and Private Banks in India during 2005-2011	Dr.Dinesh Kumar, Sanjeev	Economics	42-44
18	Measurement of Emotional Development of the Students	Dr. Nivedita K. Deshmukh	Education	45-46
19	A comparative study of effect of method of lecture and dramatization of Marathi teaching	Dr. Nivedita K. Deshmukh	Education	47-48
20	Peer pressure-problems and solutions	V.Vaithyanathan, Dr.P.Sivakumar	Education	49-50
21	Language Anxiety In Indian L2 Learners: Male or Female Learners - Who Scores High?	S. Gandhimathi, Dr.R.Ganesan	Education	51-52

22	Topological Characteristics of ECG Signal using Lyapunov Exponent and RBF Network	Abinash Dahal, Deepashree Devaraj, Dr. N. Pradhan	Engineering	53-55
23	Development of slicing package of solid model for cone and sphere in rapid prototyping	Dineshkumar M. Patel, Prof. P.D.Solanki	Engineering	56-58
24	Hardware modeling Simulation with COSSAP	Krunali Amrutlal Ratanpara, Devendra Soni, Shrenik Rajesh Golwelkar	Engineering	59-61
25	Coordination Of Pss And Statcom To Enhance The Power System Transient Stability	Lalit K. Patel, Kaushik M. Sangada, Sunil S. Changlani , Ankit M. Patel	Engineering	62-64
26	Cooling Performance Analysis of Heat Sink	Mr. Pritesh S. Patel, Prof. Dattatraya G. Subhedar, Prof. Kamlesh V. Chauhan	Engineering	65-57
27	Thermal Modeling and Analysis of Friction Stir Welding	Rankit Patel, Prof. Bindu Pillai	Engineering	68-70
28	Review on shrinkage defect – A case study	Mr. Ravi N. Kalotra, Mr. Gajanan Patange, Mr. J.K. Gohil	Engineering	71-75
29	Stream Function Formulation of Lid Driven Cavity	Mr. Zankhan C. Sonara, Prof. Dattatraya G. Subhedar, Mr. Kartik Patel	Engineering	76-78
30	Implementation of ABT (Availability Based Tariff) - its Treatment & Proceedings	Dilip m.Bhankhodiya, Dipak t. Vaghela	Engineering	79-82
31	Active Filters for Power Quality Improvement	Dipak t. Vaghela, Dilip m. Bhankhodiya	Engineering	83-87
32	Design and Analysis of Air Bearing using Orifice and Feed Hole Pocket	Nileshkumar T. Raval, Prof. M.Y.Patil	Engineering	88-90
33	Drip irrigation technique enhancing water and fertiliser use efficiency in cauliflower	Dr. S.S. Yadav, Dr. R.S. Meena	Engineering	91-92
34	Experimental and FEA Evaluation of Hybrid Joint Strength of Single Lap joint.	S. S. Kadam, P. A. Dixit	Engineering	93-96
35	CFD Analysis of Mixed Flow Submersible pump Impeller	Mitul G Patel, Subhedar Dattatraya, Bharat J Patel	Engineering	97-100
36	EVA: An Innovative Parameter for Shareholders' Wealth Measurement	Shri. Arvind A. Dhond	Finance	101-103
37	Profitability and consistency analysis of Textile Sector in India	Dr. K. S. Vataliya, Rajesh Jadav	Finance	104-107
38	Harmonious Relationship between Art and Music Critical vision (comparison)	Dr. Marwan Imran	Fine Arts	108-109
39	Land Use Pattern and Crop Combination Region in Satara District : A Geographical Study	Dr. Rathod S. B., Mane-Deshmukh R. S.	Geography	110-111
40	Garlic---Benefits and Uses	Dr. Sneh Harshinder Sharma	Geography	112-114
41	An Assessment of Thermal Comfort Zones in Terms of Tourists: A case study of Karveer Tehsil	Mr. Prashant Tanaji Patil, Miss. Mane madhuri maruti, Miss. Mugade Nisha Ramchandra	Geography	115-117

42	Hematological changes due to the impact of Lead nitrate on economically important estuarine fish <i>Mystus gulio</i>	Dr.S.Palani Kumar	Horticulture	118-119
43	Stress Management level in the employees of Manufacture Industries By considering key parameters with reference to Bhavnagar city	Dr. K. S. Vataliya, Adv. Ajay H. Thakkar	Human Resource	120-122
44	The Case of ABC Group-A Case on Performance Appraisal System	Shivani Sah	Human Resource Management	123-124
45	A Study On Performance Appraisal of Employees in Health Care Industry in a Private Multi-Speciality Organization	Dr. C. Swarnalatha, T.S. Prasanna	Human Resource Management	125-126
46	(Upnyas - Jansi ki Rani Laxmibai (vrundavanlal varma)	Dr. Sneh Harshinder Sharma	Literature	127-128
47	"Educational Technology for Professional Development of English Teachers: A Case Study of the College Teachers of English in Jammu Province"	Dr. Wajahat Hussain	Literature	129-130
48	The Reality of Sultana's Dream: A step towards success Rokeya Sakhawat Hossein	Riju Sharma, Ruchee Aggarwal	Literature	131-132
49	Road blocks of Match Industry in Andhra Pradesh: Certain Issues and Concerns	Anuradha Averineni	Management	133-134
50	Government's Assistance Towards the Development of Small Scale Industries in India with Special Reference to Krishnagiri District	B. Mohandhas, Dr. G. Prabakaran	Management	135-140
51	Effects of Role Stress on Employee Job Satisfaction and Turnover	Dr. T.G.Vijaya, R.Hemamalini	Management	141-144
52	"MNP – A major concern of Telecom Operators in Gujarat"	Mohsinali Momin, Dr. Deepak H. Tekwani	Management	145-147
53	A Study on Fiscal Support Provided by Vijaya Bank to Msme in Coimbatore City	Mrs. G. Murali Manokari, Mr. G. Lenin Kumar, Mrs. G. Sathiya	Management	148-150
54	Competencies for HR Professionals	GAYATHRI. M	Management	151-153
55	Cost and Strategic Management - Application, Framework and Strategies for the Growth of Sme Sector	Manisha gaur	Management	154-156
56	Development of Management Education System in India	Mr. Goudappa Malipatil	Management	157-158
57	Study on Volatility and Return of Major Indices of Indian Stock Market with Reference to Sensex And Nifty	Mr. Mukesh C .Ajmera	Management	159-160
58	A Need for an Epitome Shift in Management Education A study on Conceptual Teaching practices	Mrs. Vanishree K. Jamashetti, Mr. Sanjeev Rathod	Management	161-162
59	Personal Social Responsibility – A novel thought	Parul Jain, Dr. N.C Pahariya	Management	163-164
60	Green Marketing – A Consumer's Perspective in the Indian Scenario	Nidhi Srivastava, Preeti Pillai	Management	165-166
61	Challenges and Opportunities of Mobile Banking - An Indian Scenario	Sandhya.Ch.V.L	Management	167-169
62	A pragmatic study of civilizing amortment among The diverse countries	Mr. Vimal P. Jagad, Mr Mukesh .C Ajmera	Management	170-171
63	Celebrity Endorsement in India An Effective Tool of Sales Promotion	Piyush Shah, Dr. N C Pahariya	Management	172-176

64	A Study of Prominent Character Strengths and Their Relationship with Well Being Among Business Management Students	GarimaKamboj, DikshaKakkar	Management	177-180
65	Coffee Consumption in India: An Exploratory Study	Shri. Arvind A. Dhond	Marketing	181-183
66	Applicability of Retail Service Quality Scale (RSQS) in India	M. Ramakrishnan, Dr. Sudharani Ravindran	Marketing	184-186
67	Account Holders perceptions towards Self Service Technologies: a study of selected Private Sector Banks	Dr A Kumar, Prof Ankur Gangal	Marketing	187-189
68	Impact of Sales Promotion on Sales figures of Select International FMCG Brands	Dr.Sharif Memon	Marketing	190-193
69	Factors Affecting Green Product Design: Marketing Professional's Perspective	D. S. Rohini Samarasinghe	Marketing	194-196
70	The Impact of 'Ambience' and Variety on Consumer Delight: A Study on Consumer Behaviour in Ahmedabad	Dr A Kumar, Prof Vineeta Gangal	Marketing	197-200
71	Co-Relation of Social Justice with Human Rights: A Review	Dr. Monica Narang	Marketing	201-202
72	Study of Iron Status and Free Radical Activity in Plasmodium Falciparum and Plasmodium Vivax Malaria Infection	Sangita M. Patil, Ramchandra K. Padalkar	Medical Sciences	203-205
73	GOAL SETTING TENDENCIES, COMMUNICATION SKILLS AND WORK MOTIVATION VIS-À-VIS AGE DIFFERENCE – A STUDY ON PUBLIC SECTOR ORGANIZATION	Dr. Swaha Bhattacharya, Dr. Monimala Mukherjee	Psychology	206-208
74	Role of NGOs in Social Mobilization in the context of SGSY	Dr.Veershetty C. Tadalapur	Sociology	209-211
75	Age at menarche and its secular trend in rural and urban girls of bathinda district	Jyoti Sharma, Dr. Ajita	Sports Science	212-213
76	Effect Of Resin Finishing On Stiffness And Drape Of Khadi Fabric	Dr. Suman pant, Ms. Noopur Sonee	Textiles	214-216



Topological Characteristics of ECG Signal using Lyapunov Exponent and RBF Network

* Abinash Dahal ** Deepashree Devaraj *** Dr. N. Pradhan

*, **, *** #41/1, Opp Mohan Stores, 3RD Cross, Anjenaya Temple Street, Nagasandra, Bangalore-28

ABSTRACT

The electrocardiogram (ECG) signal is the recording of the bioelectrical activities of the cardiac system. It provides valuable information about the functional aspects of the heart and cardiovascular system. Early detection of heart diseases/abnormalities can prolong life and enhance the quality of living through appropriate treatment. Due to large number of patients in intensive care units and the need for continuous observation of such conditions, several techniques for automated electrocardiographic changes detection have been developed in the past ten years to attempt to solve this problem. Such techniques work by transforming the mostly qualitative diagnostic criteria into a more objective quantitative signal feature classification problem.

Keywords : ECG, Lyapunov Exponents, RBF Network

1. INTRODUCTION

Electrocardiography is an important tool in diagnosing the condition of the heart. Cardiac health care is the fastest growing market as cardiovascular disease is the leading cause of death in the world. Among the various medical or healthcare information, ECG is the best way to measure and diagnose abnormal conditions of heart. The electrocardiogram (ECG) signal is the recording of the bioelectrical activities of the cardiac system. It provides valuable information about the functional aspects of the heart and cardiovascular system.

Due to large number of patients in intensive care units and the need for continuous observation of such conditions, several techniques for automated electro-cardiographic changes detection have been developed in the past 10 years to attempt to solve this problem. The analysis of the ECG signals for detection of electrocardiographic changes has been performed by using the autocorrelation function[1], frequency domain features, time frequency analysis[2], and wavelet[3] transform. There are several other techniques under research in the field of automated classification [9] [12] [14].

The objective of the present study in the field of automated diagnosis of heart diseases/abnormalities is to extract the representative morphological features of the ECG signals (normal beat, congestive heart failure beat, ventricular tachyarrhythmia beat, atrial fibrillation beat) obtained from the PhysioBank database and to present the accurate classification model. As in traditional pattern recognition systems, the model consists of three main modules: a feature extractor that generates a feature vector from the raw ECG signals, feature selection that composes feature vectors (Lyapunov exponents), and a feature classifier that outputs the class based on the feature vectors (Radial Basis Function Network – RBF). A significant contribution of the present work is the composition of feature vectors from selected Lyapunov exponents which are used to train novel classifier (RBF Network trained on computed Lyapunov exponents) for the ECG signals. The basic block diagram of the study is as given in figure 1.

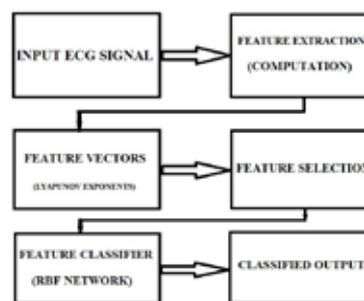


Fig.1 Block Diagram of Proposed Study.

2. DATA DESCRIPTION

PhysioBank database is a large and growing archive of well-characterized digital recordings of physiologic signals and related data for use by the biomedical research community. PhysioBank currently includes databases of multiparameter cardiopulmonary, neural, and other biomedical signals from healthy subjects and patients.

The waveforms of four different ECG beats (normal beat, congestive heart failure beat, ventricular tachyarrhythmia beat, atrial fibrillation beat) considered in the present study are shown in Fig. 2(a-d). The ECG signal examples (normal beat, congestive heart failure beat, ventricular tachyarrhythmia beat, atrial fibrillation beat) are presented in Fig. 3(a-d).

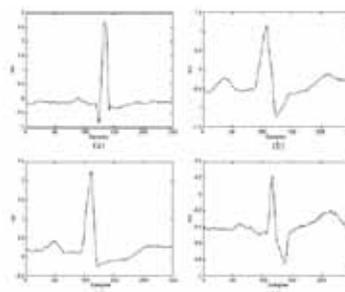


Fig.2 Waveforms of the ECG beats (a) normal beat, (b) congestive heart failure beat, (c) ventricular tachyarrhythmia beat and (d) atrial fibrillation beat.

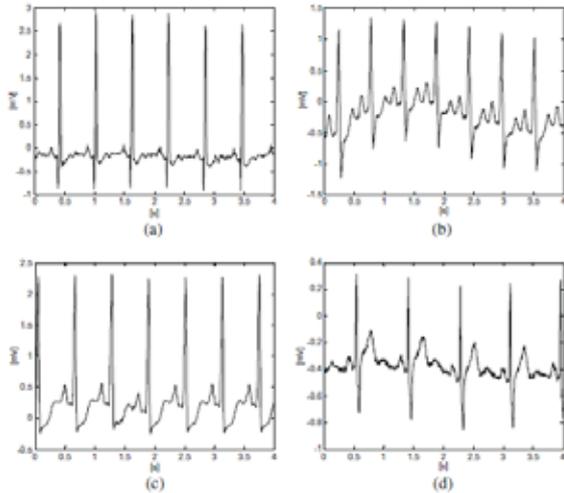


Fig. 3 ECG signal examples: (a) normal beat, (b) congestive heart failure beat, (c) ventricular tachyarrhythmia beat and (d) atrial fibrillation beat.

3. MATERIALS AND METHODS

Decision making was performed in two stages: feature extraction by computing Lyapunov exponents and classification using the selected Lyapunov exponents as inputs of the RNNs. The basic block diagram is as shown in fig.1.

3.1 Lyapunov Exponents

Numerous methods for calculating the Lyapunov exponents have been developed during the past decade. In the present study, the Lyapunov exponents are estimated from the observed time series. Lyapunov exponents are a quantitative measure for distinguishing among the various types of orbits based upon their sensitive dependence on the initial conditions, and are used to determine the stability of any steady-state behavior, including chaotic solutions [10] [12]. The reason why chaotic systems show aperiodic dynamics is that phase space trajectories that have nearly identical initial states will separate from each other at an exponentially increasing rate captured by the so-called Lyapunov exponent.

Consider two (usually the nearest) neighboring points in phase space at time 0 and at time t, distances of the points in the i-th direction being $||\delta x_i(0)||$ and $||\delta x_i(t)||$, respectively. The Lyapunov exponent is then defined by the average growth rate λ_i of the initial distance,

$$\frac{||\delta x_i(t)||}{||\delta x_i(0)||} = 2^{\lambda_i t} \text{ (} t \rightarrow \infty \text{) or } \lambda_i = \lim_{t \rightarrow \infty} \frac{1}{t} \log_2 \frac{||\delta x_i(t)||}{||\delta x_i(0)||}$$

The existence of a positive Lyapunov exponent indicates chaos. Generally, Lyapunov exponents can be extracted from observed signals in two different ways. The first is based on the idea of following the time-evolution of nearby points in the state space. This method provides an estimation of the largest Lyapunov exponent only. The second method is based on the estimation of local Jacobi matrices and is capable of estimating all the Lyapunov exponents. Vectors of all the Lyapunov exponents for particular systems are often called their Lyapunov spectra.

3.2 Radial Basis Function Network

Radial Basis Function (RBF) Network can perform highly non-linear dynamic mappings and thus have temporally extended applications, whereas multilayer feedforward networks are confined to performing static mappings. RBF networks have been used in a number of interesting applications including

associative memories, spatiotemporal pattern classification, control, optimization, forecasting and generalization of pattern sequences.

RBF networks use unconstrained fully interconnected architectures and learning algorithms that can deal with time-varying input and/or output in non-trivial ways [9]. The RBF allows the network to remember cues from the past without complicating the learning excessively.

An RBF network is a network which in principle is set up as a regular feedforward network. This means that all neurons in one layer are connected with all neurons in the next layer. An exception is the so-called context layer which is a special case of a hidden layer. Fig. 4 shows the architecture of an RBF network. The neurons in the context layer (context neurons) hold a copy of the output of the hidden neurons. The output of each hidden neuron is copied into a specific neuron in the context layer. The value of the context neuron is used as an extra input signal for all the neurons in the hidden layer one time step later. Therefore, the RBF network has an explicit memory of one time lag.

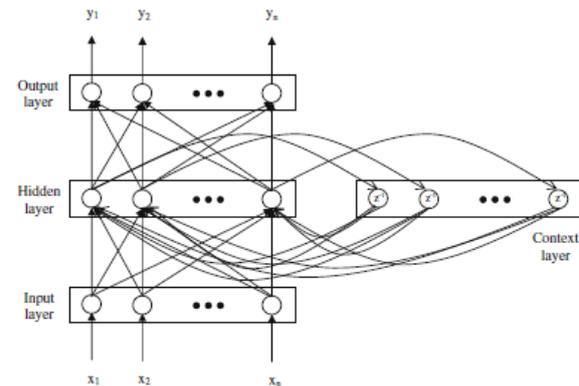


Fig.4 A schematic representation of RBF network. Z-1 represents a one time step delay unit.

4. RESULTS

In this study of automated classification of ECG signals, the Lyapunov Exponent has been calculated from the signals obtained from the Pshyionet database. The fig 5 shows some of the results. These exponents are used to train the RBF Network for the classification of the ECG signals.

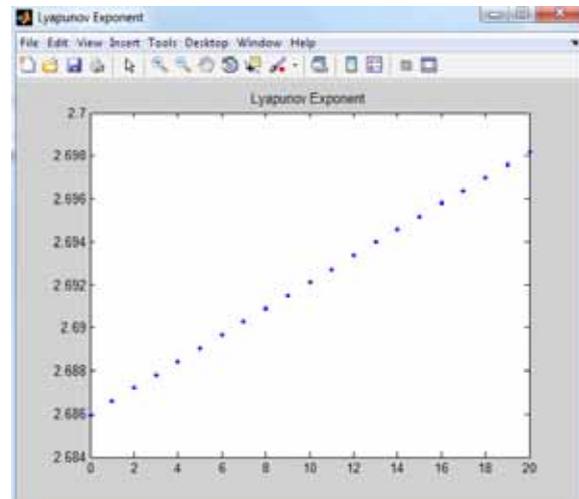


Fig 5(a). Normal Beat.

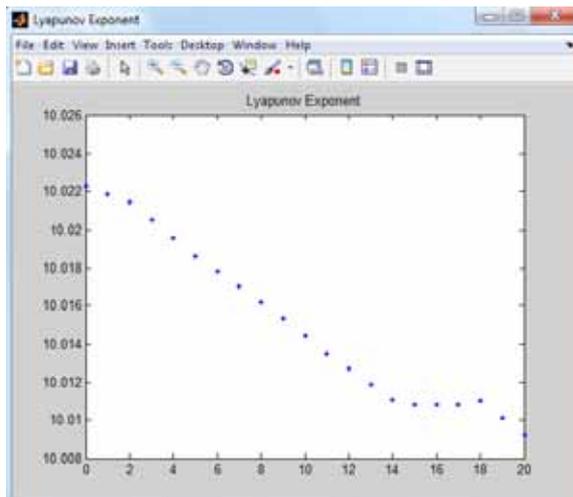


Fig 5(b). Congestive Heart Failure Beat.

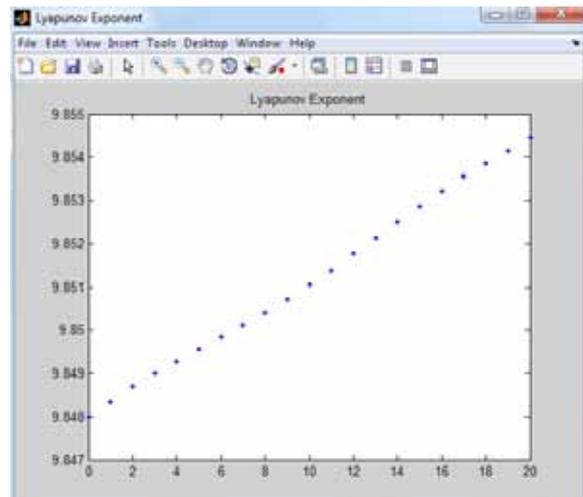


Fig 5(d). Atrial Fibrillation Beat.

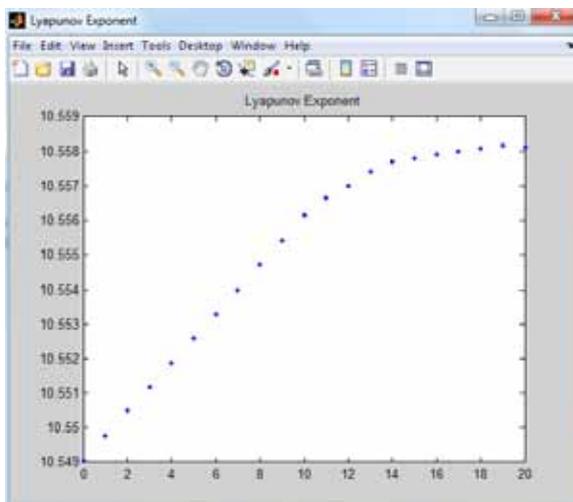


Fig 5(c). Ventricular Tachyarrhythmia Beat.

5. CONCLUSION

This study presents an attempt to develop a reliable computerized classifier, which can detect the abnormalities of the ECG signals. The classifier that will be used here is the RBF Network. This work is currently under progress. The pre-processing, feature extraction and RBF Network are the main modules of this study. These play an important role in automated diagnostic systems and therefore they play an important role in determining the classification accuracies.

REFERENCES

- [1]. Foo, S. Y., Stuart, G., Harvey, B., & Meyer-Baese, A. (2002), Neural network-based EKG pattern recognition, *Engineering Applications of Artificial Intelligence*, 15, 253–260. [2]. Kundu, M., Nasipuri, M., & Basu, D. K. (2000), Time frequency analysis, *Knowledge-based ECG interpretation: A critical review*. *Pattern Recognition*, 33, 351–373. [3]. Ubeyli, E. D. (2008b), Implementing wavelet transform/mixture of experts network for analysis of electrocardiogram beats. *Expert Systems*, 25(2), 150–162. [4]. Philip de Chazal, Member, IEEE, Maria O'Dwyer, and Richard B. Reilly, Senior Member, IEEE, Automatic Classification of Heartbeats Using ECG Morphology and Heartbeat Interval Features, *VOL. 51, NO. 7, JULY 2004*, pg 1196-1206. [5]. S. Karpagachelvi, Dr. M. Arthanari, M.Sivakumar, Automatic Classification of Heartbeats Using ECG Morphology and Heartbeat Interval Features, *Doctoral Research Scholar, Anna University, Coimbatore, Tamilnadu, India, Vol. 4, No. 1; January 2011*. [6]. N. Belgacem, M.A Chikh, F. Bereksi Reguig, Biomedical Engineering Laboratory, Department of Electronics, Science Engineering Faculty, Supervised Classification of ECG Using Neural Networks, *Abou Bekr Belkaid University, B.P.230, Chetouane, Tlemcen, Algeria*. [7]. Turker Ince, Serkan Kiranyaz, and Moncef Gabbouj, A Generic and Robust System for Automated Patient-Specific Classification of ECG Signals, *IEEE Transactions on Biomedical Engineering*, VOL. 56, NO. 5, MAY 2009, 899-906. [8]. S. Karpagachelvi, Dr. M. Arthanari, M.Sivakumar, *IJCSI International Journal of Computer Science Issues*, Classification of Electrocardiogram Signals With Extreme Learning Machine and Relevance Vector Machine, Vol. 8, Issue 1, January 2011. [9]. Prakash dixit, Dr. Sulochana Wadhawani, ME. Student, Elect. Engg. Dept. M. I. T.S. Gwalior, Madhya Pradesh. *Elect. Engg. Dept. M. I. T.S, Gwalior, Madhya Pradesh, Automatic Classification of Cardiac Abnormalities Using Hermite function*, *International Journal of Engineering Sciences Research-IJESR*, Vol 02, Issue 04; August-December 2011. [10]. Mohamed I. Owis, Ahmed H. Abou-Zied, Study of Features Based on Nonlinear Dynamical Modeling in ECG Arrhythmia Detection and Classification, *IEEE Transactions on Biomedical Engineering*, VOL. 49, NO. 7, JULY 2006 pg 733-736. [11]. E. Derya Ubeyli, Adaptive Neuro-Fuzzy Inference System for Classification of ECG Signals TOBB Ekonomi ve Teknoloji University, pg 1192–1199 (2010). [12]. Mohamed I.Owis, Yasser M. Kadah, Robust Feature Extraction from ECG Signals Based on Nonlinear Dynamical Modeling Biomedical Engineering Dept., Cairo University, Oct 2006, pg 674-681. [13]. Aldo Bonasera, Maide Bucolo, Mapping Heart Dynamics by using Nonlinear Indicators *Moria C Virzi, IEEE EBMS, Aug 2007*. [14]. T.M. Nazmy, H. EL Messiry, B. AL Bokhity, A Stochastic Nonlinear Autoregressive Algorithm Reflects Nonlinear Dynamics of Heart-Rate Fluctuations, *University of Ain Shams, Egypt, 2008*. [15]. Nahid Ghofrani, Reza Bostani, Reliable Features for an ECG-based Biometric System 17th Iranian Conference of Biomedical Engineering, Nov 2010. [16]. Ching Kun Chen, Chung Liang Lin, Yen Ming Chiu, Individual Identification Based on Chaotic Electrocardiogram Signals, *IEEE conference, 2011*, pg 1771-1776. [17]. Tapobrata Lahiri, Upendra Kumar, Hrishikesh Mishra, Subrata Sarkar and Arunava Das Roy, Indian Institute of Information Technology, Allahabad, Analysis of ECG signal by chaos principle to help automatic diagnosis of myocardial infarction, pg 866-870.]



Sara Publishing Academy
Indian Journal Of Applied Research
Journal for All Subjects



Editor,
Indian Journal Of Applied Research
8-A, Banans, Opp. SLU Girls College,
New Congres Bhavan, Paldi, Ahmedabad-380006.
Contact.: +91-9824097643 E-mail : editor@ijar.in

Printed at Unique Offset, Novatsing Rupam Estate, Opp. Abhay Estate, Tavdipura, Shahibaug, Ahmedabad