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"Analysis on CBIR System for ECG Reports"

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Abstract: ***Predicting the reason and rate of accuracy on heart attacks from ECG reports is a major obsession. The automated analysis technique will age out the problems of common people in understanding the cause for heart attack. This approach has put a serious discussion platform for the analysis of a CBIR system for ECG reports. As the brisk growth of securable image information and a maximum requirement for data documentation indexing and rectification, many scholars, researchers, and scientists worked a lot on the ECG graph report. The aim of this work is to offer a comparative analysis of the several techniques and methods that were used and applied to extricate features from ECG graph reports. Comparison analysis will help the researches and scholars to choose a suitable technique or method for future scope. Several applications of feature extraction and verification are done by many types of research such as heart attack identification based on the feature. Heart attack searching by a doctor is old and required a very long time to identify a stroke. Detecting heart attack from the ECG report is demanding due to misconception, negligence, delay, the difference among the people based on age, gender and so on. Therefore the important work is to furnish an analysis of the accuracy of widely used methods by scholars and researchers in extricating features of the ECG graph reports. Finally, the results of various methods for extricating a feature from the ECG graph reports analyzed vigorously and comparison analysis effort helps the researches to slip out the time complexity in searching for different integration tasks.***

Keywords: ***ECG reports, feature extraction, heart attack, predictive analytics.***

I. INTRODUCTION

Data helps in information gathering and changing over it from the unstructured to an organized structure. The process of extracting the information from images helps in identifying the heart attack, which also provides some useful information during the heart attack detecting process. Information retrieval can also be used in ECG reports processing to identify and verify the disease. Amongst all feature extraction from ECG reports technology stands first as the important stage in analyzing the situation, remove background in the image and locating the breaks found in the images. The procedure of extracting information is not as easy as viewing the images. The process includes various critical phases including separation of background from the foreground subtraction. The content in the images will be converted into different bunches based on the sector of interest. Pixels that are present in the signal will be considered as the foreground and the reaming information will be considered as background to bifurcate with the actual and other information to be extracted. Techniques like Otsu's, cross-correlation, phase portraits properties, autoregressive, wavelet transform, Eigenvector, fast Fourier transform, linear prediction[3], independent component analysis, and artificial neural network are most commonly and regularly used methods for feature extraction from ECG reports. However, the technology has grown widely still there are some challenging areas where the error rates are significantly high in feature extrication from ECG graph reports. To investigate the challenges hurdles and to update the reasons for these, the authors have done a rigorous analysis of all the extracting techniques and tried to give the analytical comparative results in this paper. This paper also provides the significance of the analysis, importance of methodologies and algorithms used for various purposes in the field of feature extraction from the ECG reports domain. The results obtained by various scholars and researches will help us in the future to take accurate decisions in overcoming the drawbacks found in the previous research works.

A. Objective

In the present world, people are facing problems with respect to heart, brain, bone, eye issues. In some cases, identifying the diseases from the printed graphical report is a challenging task. Feature extraction from the printed graphical report is one of the most important and critical tasks to work in the medical image processing field. Using the extracted feature we can automate the current trend in the printed graphical report. This paper describes a thorough analysis of the results of various techniques, algorithms, and methodologies used to extract features from printed reports, which help to use the appropriate method based on its limitations and advantages.

II. METHODOLOGIES USED FOR FEATURE EXTRACTION BEFORE 2010 ARE STILL USE FULL?

Truly, a portion of the fundamental techniques and advancements stop as a spine, without which the present advances can't be executed to get preparing results. Some celebrated and generally utilized algorithms have been strongly inquired about and examined here. Artificial Neural Networks (ANN), Fuzzy Logic, Genetic Algorithm (GA), and Support Vector Machines (SVM), methods (S.Karpagachelvi, et al., 2010) helps to extract features from the ECG graph.AR (Auto-regression), WT (wavelet transform), Eigenvector, FFT (Fast Fourier transform), LP(Linear prediction), ICA (Independent component analysis) methods (Fatemeh Molaei Vaneghi; Maysam Oladazimi; F. Shiman; Afshan Kordi; M.J. Safari; F. Ibrahim,2012) [3] are helps to extract the feature from a scanned ECG graph.

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Researchers have used these methods for extracting a feature from the ECG graph got 96.6% accuracy from AR,92.2%fromWT,98.6% from eigenvector,92.47% from FFT,93.2% from LP,90.13% from ICA, from the above paper its promoted that eigenvector method is moderate one for feature extraction. Cross-correlation algorithm (Soha Ahmed et al 2016) will detect abnormality identified the corresponding diseases, so the examination says that these algorithms have given pleasing results and can in like manner be used with the mix of new frameworks used in the current example to achieve continuously exact results.

III. HAVE THE METHODS OBSERVED IS STILL CONTINUED, INCREASED, OR DECREASED?

In the above the patterns have been energetically expanded as the innovation developed with the generation change. Prior the component extraction procedure was utilized to simply recognize the irregularity of a heart however now feature is being separated in disease detection, heart abnormality treatment, background scenarios of the pictures, video investigation, etc the absolute best algorithms utilized in the present pattern have been quickly clarified in this segment. ICA (independent component analysis) and Adaptive sifting (Christian Wiede et al., 2016), this technique expect that our perceptions are a direct blend of the autonomous sources; subsequently it is called blind source separation. At that point, versatile channels are utilized to dispose of false recognition showing up in the structure abrupt changes in the pulse. This accuracy is less, needs to be improved for accurate measurements.ECG abnormality detection algorithm (Soha Ahmed et al., 2017) depends on cross-correlation theory which identify the abnormalities. Which perform the comparison of the ECG cycle obtained with predefined values, a drawback is requiring large processing time. Adaptive and iterative image processing technique(Prashanth Swamy et al.,2010)which involves Random transform for detect and correct skewness, then adaptively binaries by choosing thresholds then filtered by morphological filters then envelop detection and axis identification done. Finally, pixel esteems are found in the middle value to acquire the computerized ECG signal. Future task is in advancement to enhance the exactness as well as touching base at the proper dpi and the arrangement, additionally in the pipeline is the age of mechanized report and recognizing potential sicknesses dependent on the assessed parameters. This gives an accuracy of 95%. The above overview on the ongoing pattern set to concentrate include from ECG reports utilizing different methods demonstrates the pattern that has been proceeded with an expanded goal in the field of feature extraction immensely.

IV. HAS THE FIELD CHANGED IN THE WAY THAT WAS NOT FORESEEN THEN?

On the off chance that we start looking at the strategies and innovations utilized, at that point and now, we can say without much of a stretch familiarize that the field is changed more than it was normal, Earlier the techniques that were utilized to concentrate include from pictures were demonstrating extremely less exact results. There can be different explanations behind not accomplishing appropriate outcomes, that can be the nature of the picture captured if the resolution of the camera isn't high then the nature of the picture will be ruined for which handling will be very difficult. The processor speed was generally low for high-resolution pictures preparing to pay little respect to any calculation utilized for handling. The algorithms utilized at that point were not effective when the pictures were caught in various angles. The algorithms were not able to perform skew and de-skew process which is one reason for not accomplishing proficient outcomes. These challenges are currently overwhelmed by different algorithms that are utilized to play out a similar errand of removing the element from pictures. Now, the algorithms are proficient to the point that we can accomplish legitimate outcomes inside a moment utilizing a top of the line processor, paying little respect to a picture caught utilizing a high-resolution camera. Current algorithms can be prepared and connected to dependent on vital needs. They can be effectively connected to address the slant edges in the picture that isn't caught accurately. In this way, the present algorithms and the processor speed will cause us to accomplish progressively exact and proficient outcomes.

V. STRUCTURE AND METHODOLOGY FOR FEATURE EXTRACTION USING EXISTING METHODS

Figure 1 shows the generally followed stages in the feature extraction domain. There will be two stages in every single area of ailment recognition. The first stage is preparing the stage pursued by the testing stage in the second stage. In preparing stage when information is gathered either from the web source or without anyone else's input made data, there will be noises, poor quality and mutilation due to the outside components to overcome these issues preprocessing stage plays an indispensable role. In the preprocessing stage de-noising the picture, resizing the image, skew remedy of the component in the picture, thinning or thickening of the component in the picture and so on will be done. After preprocessing, the element in the picture will be distinguished utilizing foundation subtraction utilizing any of the bunching methods. This will make the work simpler to extricate the element of the picture. For the element extricated from the picture, a remarkable ID will be given and put away in the database. In the subsequent stage, testing will be finished utilizing a similar strategy with various one of a kind ID and put away in the equivalent database. These IDs will be contrasted with distinguishing and check the recognized component is the same or not, based on these outcomes, investigations for different purposes will be finished.

Applications rundown won't end in this field, a portion of the applications are a variation from the norm discovery like ischemia, coronary artery disease, cardiac arrest, congestive heart failure, arrhythmia, stroke, peripheral artery disease, congenital heart disease and so forth there are such a significant number of techniques and works done in this field.

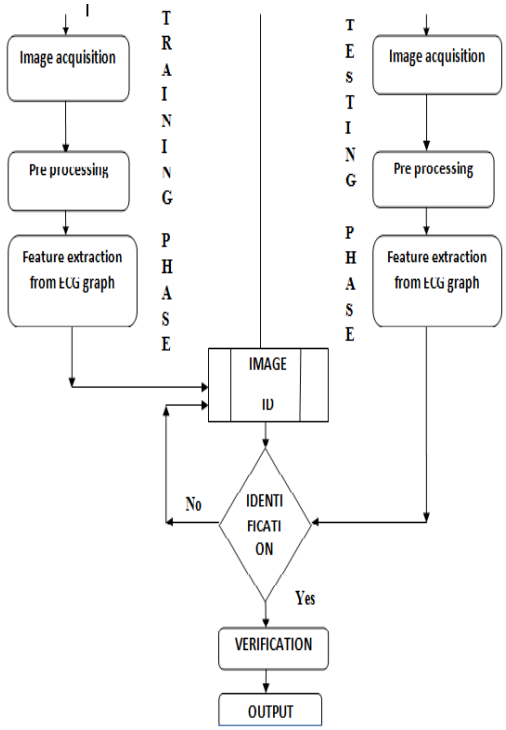

Fig. 1. Proposed block diagram for CBIR system for ECG reports.

VI. ANALYSIS ON EXISTING TECHNIQUE

Table 1 gives us the learning of focal points and restrictions of the procedure utilized in this field

VII. DISCUSSION AND ANALYSIS ON EXISTING WORK:

Even though some of the process presented in the list of overview has been tested or even improved in some aspects the fact is that none of them works as adequately superimposed feature from any case because they are application-oriented. As a result, an element picture examination is expected to empower the component data extraction framework to be utilized for a picture, including filtered record pictures, genuine scene pictures through a camcorder, caption text images, the analysis shows that most of the process fall into any one of the above mentions process and also there is a limitation in each technique to give a better detection rate with fewer false alarms without any constraints for feature extraction in different types of images. But still, to find the complete the robust and generalized technique for feature segmentation it is different to provide appropriate input to the system .so an efficient process has to be proposed for automatic wave content extraction from different images which is independent of various characteristics of wave .this paper is the first step towards helping the researchers to build such a system.

Table 1.Investigation of various techniques used for feature extrication from ECG graph reports

Sl. No	TITLE,AUTHOR	METHODOLOGY	RESULTS	LIMITATIONS AND RECOMMENDATION
1	A survey on QBIC system for Ecg reports Raghu kumar B S, Naveen B 2019	Comparison of various methods used while extracting feature from ecg reports.	Gives efficient methods to extract feature from ecg reports.	Try to highlights the specific method for feature extraction. Not taken any data set for the feature extraction only given comparison.
2	Conversion of ECG Graph into Digital Format G.Angelo Virgin, V.Vijaya Baskar 2018	Scanning resolution 200/400/600 dpi Crop region of interest Binarization by ostus algorithm Gradient based feature extraction Noise rejection Image thinning Edge detection Pixel to vector conversion	ECG graph into matrices then Matrix is converted into digital format (.dat file).	Still we can improve the overall efficiency of the method without using a dedicated hardware possible to identify a diseases present in ECG data It can apply to identify any kind of abnormality and diseases
3	ECG Signal Acquisition and Analysis for Telemonitoring Emil Plesnik, Olga Malgina, Jurij F. Tasic, Matej Zajc.,2010	Utilizations phase portraits properties with its polygons relating to ECG sign pinnacles, reveal the reason for the recognition work together with QRS complex detection.	It computes the estimations of individual beat as well as all normal beats in the watched interval.	Display visualization of the procured signal is not proper. - False QRS complex were distinguished with sign containing arrhythmias and unusual beats - Few changes of the algorithm can conquer false QRS discovery.

4	An Improved Method for Digital Time Series Signal Generation from Scanned ECG Records Prashanth Swamy, Srinivasan Jayaraman, M.Girish Chandra,2010	ecg signals were recorded from 12 lead at 25 mm/sec, Detect and correct skewness from Random transform. Adaptive binarization (Otsu's) algorithm, morphological filter and envelop detection used Digital ecg signal is obtained by averaging pixel values.	Digital time series signal conversion accuracy from ECG record is 95%.	Algorithm work only for scanning resolution of 200,300,600 dpi and jpeg,tiff,bmp/png images Cannot identify different diseases. It requires just 600 dpi for a highly contrasting output together with jpeg design.
5	A Comparative Approach to ECG Feature Extraction Methods Fatemeh Molaei Vaneghi, Maysam Oladazimi, F. Shiman, Afshan Kordi, M.J. Safari, F 2012	It is revealing ventricular potential rate in terms of sensitivity and specificity. Autoregressive 96.6% Wavelet transform 92.2% Eigen vector 98.06% Fast Fourier transform 92.4% Linear prediction 93.2% Independent component analysis 90.13% these are the methods compared here.	Eigenvector has shown better ecg signal analysis Compare to all other methods.	The mentioned methods(Sensitivity and specificity) are not satisfactory
6	ECG Trace Digitization Using Image Processing Techniques Hussain K. Khleaf, Kamarul H. Bin Gazali, Ahmed N Abdalla , Mithaq Na'ma Raheema 2016	Scanning, selecting, converting, Signal extraction and digitization slandering the signal line, Scaling and calibration of extracted signal period, Identification and feature extraction.	This method gives an accuracy of 98.6%.	With the use of different data set acquisition can able to give high accurate result.
7	Electrocardiogram (ECG) Image processing and Extraction of Numerical Information Dharmendra Gurve, et al 2016	It has sequence of execution that is image upload, image resize, axis dimension calibration, ecg trace extraction, ecg plotting	Ecg curve expressed in terms of numerical coordinates of individual points that is calibration in both X and Y axis reduces the size of the image by preserving all the characteristics of the ECG signal.	It just convert ecg signal to numerical information does not say about stroke, abnormality condition of an heart regarding age gender etc
8	Remote Heart Rate Determination in RGB Data An Investigation using Independent Component Analysis and Adaptive Filtering	Independent component analysis and adaptive filtering Fast Fourier Transform and band pass filter Christian Wiede 2016	This can achieve a mean error of 4.36BPM which corresponds to CAND of 94.5% and speed of 35FPS.	It only determine heart rate no discrimination regarding heart rate for abnormality detection Accuracy has to be improved because this system more concentrated on elderly care

9	ECG Abnormality Detection Algorithm Soha Ahmed, Ali Hilal-Alnaqbi, Mohamed Al Hemairy and Mahmoud Al Ahmad 2017	Cross correlation algorithm	Detection abnormality Identified the corresponding diseases.	Reduction in processing time is required. Instead of Comparing ECG waveforms it compares between numeric values of converted ecg graph.
10	Electrocardiogram Display Data Capturing and Digitization Based on Image Processing Techniques lai khin wee, eko Supriyanto 2009	Gary image conversion image filtering image enhancement image binary conversion	Patient's data and accurate heart rate calculation.	Delayed data disrupt data analysis Require internet facility webcam etc
11	A Review Paper on Analysis of Electrocardiograph (ECG) Signal for the Detection of Arrhythmia Abnormalities Anand Kumar Joshi, Arun Tomar, Mangesh Tomar 2014	Discrete wavelet transform(DWT) Syntactic Approach Non-syntactic Approach Hybrid Approach Transformative Approach Adaptive Neural Inference System (ANIS) as a Neural classifier	Detect the diseases like tachycardia bradycardia long QT syndrome (LQTS) short QT syndrome First-degree heart block second degree block.	It only detects specific diseases There is no heart rate measurement We can adopt system so that even measure heart beat
12	A method for conversion of paper electrocardiographic printouts to digital electrocardiographic files Fabio Badilini,T, Tanju Erdem, Wojciech Zareba, Arthur J. Moss, 2005	The basic lattice initially identify by a picture preparing motor is utilized from ECG Scan, therefore, to extrapolate the ECG wave-structures utilizing a strategy dependent on active contour modeling	advanced ECG obtained, both in waveform recreation and in QT estimations performed on unique ECG's it will gives precision of about 95%.	ECG printouts converted at 25-mm/sec speed and gain of 10 mm/mV with images of 300 dpi. The dismissal rate is undoubtedly twofold or triple by utilizing high contrast photocopies. Limitation is the risk of losing the relative arrangement between the various leads.
13	A Content Based Image Retrieval using Color and Texture Features Naushad Varish Arup Kumar Pal 2016	Grey level co-occurrence matrix(GLCM) Laplacian filter color histogram Discrete wavelet transform	Approximately 89% of accuracy will be obtained.	We can use principal component analysis as well as independent component analysis
14	Ecg feature extraction and classification using cepstrum and neural networks Kuo-kuang jen et al 2007	Cepstrum coefficient method Artificial neural network	The accuracy of diagnosing cardiac disease was above 97.5%.	It cannot be applicable to linear mapping between ECG segments with multiple beats

15	An approach for ECG Feature extraction using Daubechies 4 Wavelet Muhidin A. Mohamed et al.,2014	Daubechies Wavelet Transform method	Feature extraction is about 90% accurate.	- Amplitude and duration of intervals will take vital part. - Heart beat doesn't count. - Abnormality does not identify.
16	QRS Detection of Ecg - A Statistical Analysis I.S. Siva Rao et al.,2015	New method Pan-Tompkins and also multi-wavelet transforms method employed.	Feature extraction is about 92% accurate.	- Age and gender based Several data set need to be compared. - More affected ecg graphical reports are compared.

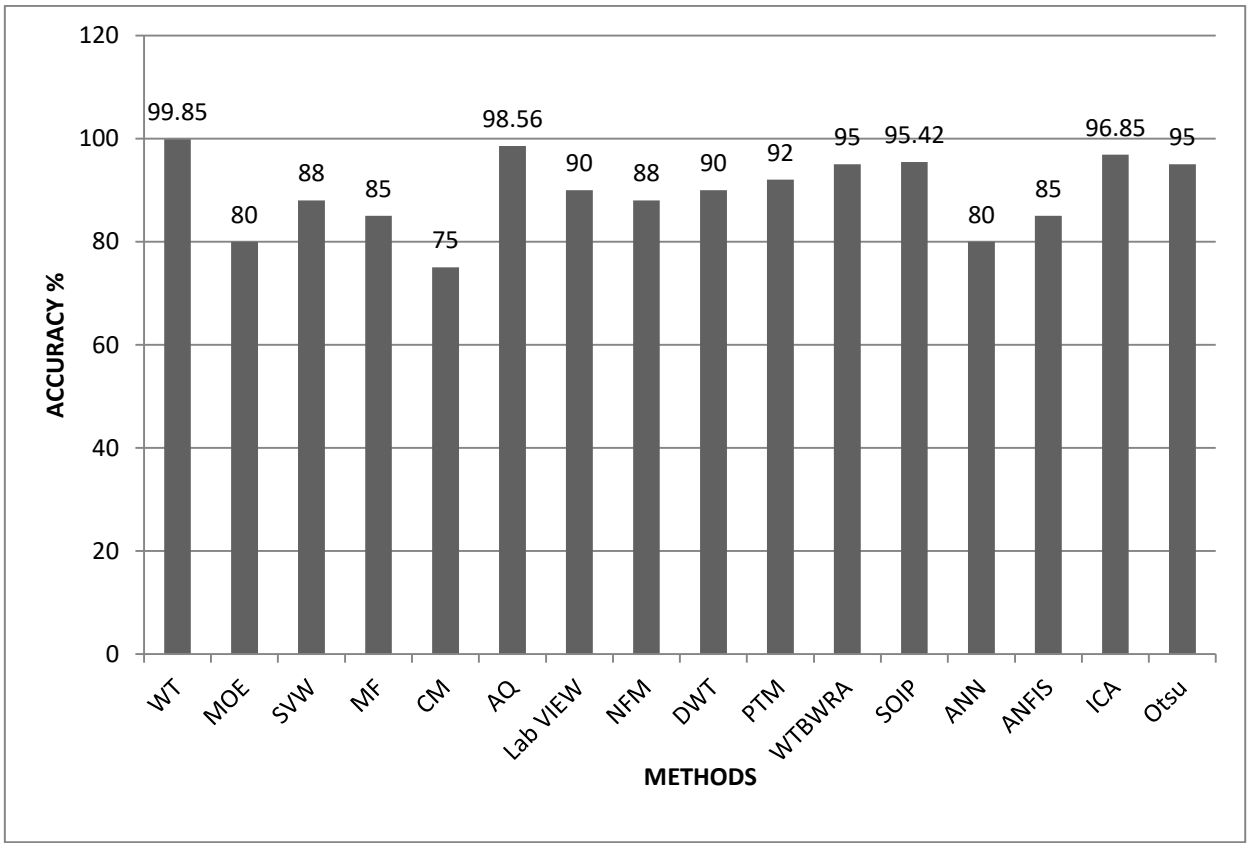

Fig. 2 .Feature extraction comparisons graph.

VIII. CONCLUION

In this paper, the researchers or scholars have intended to the issues of feature extraction frameworks. As the feature of the framework is concerned, wave in the picture with slant is an obstacle to the framework. This is a significant constraint in the present work. An effective slant estimation procedure is prescribed for the equivalent. Feature portrayal assumes an imperative job in any acknowledgment framework. They have investigated the focal points and burdens of feature portrayal. In this work right off the bat, outlined investigation of feature extraction is displayed .furthermore the real commitment and escape clauses accomplished in this examination territory are recorded lastly further look into bearing dependent on the work is likewise talked about. Additionally, it demonstrates that a paper mix of the various algorithms will bring us all the more encouraging results. Before concluding the algorithms, they need to completely examine the succession circumstance, situation and foundation of the signal contained pictures. A portion of the pictures may be taken with tainting of the dew and clamors and in some light factor might be the main consideration and in particular, thickening, diminishing and slant remedy of signal ought to be done appropriately before playing out the line-level word level, or character level division so as to concentrate signal from the pictures.

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