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Automatic Ecg Using Xml data Processing to Identify the Type of Heart Disease A.Snighdha me Cse.gkm College of Engineering and Technology Chennai, India

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ABSTRACT

Electrocardiography is the recording of electrical activity of the heart. Existing methodology focuses on diagnosing cardiac abnormalities by using xml ontology to identify the type of disease acquired. A schema of ontology is generated on basis of cardiac diagnosis report prediction with start, peak and end points of the ECG curve measured with its x and y axis positions. A xml schema is the description of type of xml document typically expressed in terms of constraints on the structure and contents of the documents. A xml schema is generated from the generated ontological schema records for easy mapping for the input electrocardiographic data. The resultant of existing system is the diagnosis report of input electrocardiographic data. The resultant sort out the possible abnormalities with the advent of the pulse rate estimated in the ECG curve.The proposed system incorporates the technique of automatic generation of diagnosis report with the ECG image. A validation process is incorporated in the proposed system to remove the noisy information from the inputted image as it deceives the accuracy of the diagnosis report. An ontological schema is used to identify cardiac prediction of curves. Existing system involves inappropriate diagnosis as the inputted image may contain noisy information which may lead to false disease prediction. The proposed system overcomes the problem of false disease prediction by validating the image using histogram validation.

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INTRODUCTION

Image processing is one of the recent trends in computer technology that plays a vital role in medical field that analyze and predict the disease syndrome. Electrocardiogram (ECG) data are stored and analyzed in different formats, devices, and computer platforms. As a result, ECG data from different monitoring devices cannot be displayed unless the user has access to the proprietary software of each particular device. An ontological schema is designed to identify the cardiac predictions of curves and xml schema is exploited in an approach to map the ontological schema information with the inputted image. Existing system attains the problem of inappropriate diagnosis as the inputted ECG image sample acquires noisy information that leads to false prediction of syndromes. The resultant of the projected system generates the syndrome diagnosis with a valid input image thereby identifying the rhythm, endpoint and axis positions of the curve. With respect to disease diagnosis from the output of these ECG systems, automated systems have been developed that can serve as supportive decision aids to physicians diagnosing cardiac conditions. By examining the ECG signal, a number of informative measurements can be derived from the characteristic ECG waveform that, in turn, can lead to a deduction of a specific cardiac condition. Hidden Markov models have been used to examine ECG wave forms to detect abnormal heart rhythm. No system have been reported for a automatic detection of robust suite of cardiac abnormalities that have detected through ECG waveforms. HL 7 standard was selected as medical data exchange standard. ECG section of the HL7 point-of-care medical device communication standard makes no causal connection between the ECG measurements and the ECG diagnostics.

ECG output data are not shared among different products, or able to be presented in a ubiquitous manner across heterogeneous computing platforms that do not contain the vendor’s ECG software display product. The diagnosis knowledge was collected from available rules obtained from a variety of sources including cardiology textbooks, interviews with experienced cardiac surgeons, and peer reviewed papers. The developed ontology provides a structure for representation and open exchange of ECG data so that it can be made readily available

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for viewing on multitude of computing platforms. The ontology was encoded in xml vocabularies providing human and machine readable formats allowing it to be displayed on an internet browser. The ontology that was developed used to integrate ECG waveform data.

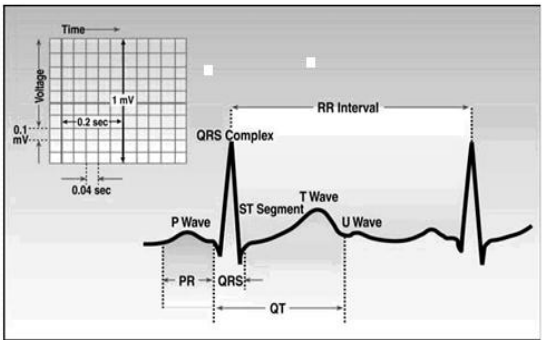


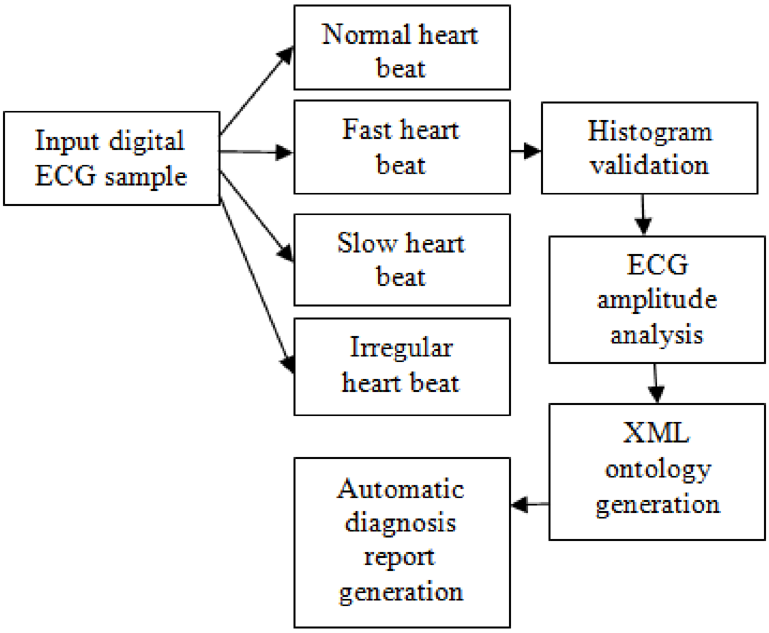
Fig. 1: ECG Wave Structure.

Ecg wave structure:

The ECG wave structure should be studied to analyze the image for determining the specific cardiac conditions to detect the type of heart disease. The study of ECG wave structure helps in segmenting the affected portions of the ECG using segmentation algorithm.HL7 provides standards for the exchange and sharing of electronic health information. HL7 was designed to address the interface the interface requirements of an entire health care organization. It is important that the ECG section of the HL7 point-of-care medical device communication standard makes no casual connection between the ECG measurement and diagnostics. The diagnosis knowledge was collected from the available rules obtained from the variety of sources including cardiology text books, interviews with experienced cardiac surgeons, and peer reviewed papers in published literature.

An ontology based system representing the structure for the presentation, measurement of ECG data, and criteria for diagnosis was developed. The structure of the ontology was synthesized from the HL7 medical communication standard.

System Design:



The input ECG sample evolves the image acquisition module where ECG data is inputted and information access of the ECG image processing is done which is known as real time image acquisition. This evolves retrieving images from a source that is automatically captured from the input images. Performing image acquisition in image processing is always the first step in the workflow sequence. Histogram validation involves the analysis of input data which will be validated from the conditions such as (slow, fast, irregular, and normal of the heart. Usually time domain ECG signals are used to validate the ECG image. The validation is used for removing the noisy information so that the image may be further validated and segmented.

Image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. Each of the pixels in a region are similar with respect to some characteristic or computed property. Signal contains noise components due to various sources that are suppressed during processing of ECG signal. The noise components can be removed by tuning up the image and performing the gray scale conversion where the image is analysed as black and white images for further processing. The image is segmented based on color of intensity and pixel for a region. Segmentation is performed by using “Region vs Edge Based Segmentation Algorithm”. Ontology need for ontology alignment arose out of the need to integrate heterogeneous databases ones developed independently and thus each having their own data vocabulary. In the Semantic web context involving many actors providing their own ontology matching has taken a critical place for helping heterogeneous resources to interoperate.

XML schema mapping is performed based on ontology schema mapping which is known as “XML Schema Definition Language” OR XSD. XML Schema documents are used to define and validate the content and structure of XML data. An XML schema is a description of a type of XML document, typically expressed in terms of constraints on the structure and content of documents of that type, above and beyond the basic syntactical constraints imposed by XML itself. These constraints are generally expressed using some combination of grammatical rules governing the order of elements, Boolean predicates that the content must satisfy, data types governing the content of elements and attributes, and more specialized rules such as uniqueness and referential integrity constraints. The final report is generated based based on XML Schema to match the type of disease based upon the time interval and amplitude of ECG wave derived from segmentation. The Final reports is comprehensive for the following reasons in Best-Case Performance, Average-Case Performance, Worst-Case Performance, Reliability.

Image Validation:

ECG data is inputted and the information access of the ECG image processing is done known as real-time image acquisition. Analysis of the input data will be validated from the conditions such as (slow, fast ,irregular ,normal)of heart.

Usually time-domain ECG signals are used to validate the ECG Image. New computerized ECG recorders utilize frequency information to detect pathological condition. The RGB values are retrieved from the given image for the processing of the image.

Image tune up:

Image Tune up is the removal of noise information from the image. Existing Methodology does not tune-up the image of the ECG before processing as the noise percentage misleads to the diagnosis report. The process improves the quality of the image for gray scale conversion. The Validated ECG sample image has been measured with its height and amplitude to measure the abnormalities. The horizontal and vertical resolution of the image is improved for the processing of the image.

Gray Scale Conversion:

A gray scale is an image in which the value of the pixel is a single sample that is it carries only intensity information. Gray Scale Conversion involves the images composed of black and white colour images varying from black at weak intensity to white at the strongest.Gray Scale Conversion is the initial process for validating the image in image processing. The black and white images are obtained by finding the average of RGB values.

Image Segmentation:

The result of image segmentation is a set of segments that collectively cover the entire image, or a set of contours extracted from the image. The result of image segmentation is a set of segments that collectively cover the entire age, or a set of contours extracted from the image Each of the pixels in a region are similar with respect to some characteristic or computed property.Segmentation is the separation of one or more regions or objects in an image based on a discontinuity or a similarity criterion. Edges of the images are segmented for mapping the type of cardiac disease.

Segmentation is achieved by using “Region vs Edge based Segmentation Algorithm”.

Bezier algorithm for image segmentation:

```
CalculateLenth(segmentIndex0, t0, segmentIndex1, t1)
{
//assert(segmentIndex0 &lt;= segmentIndex1)
 if(segmentIndex0 == segmentIndex1)
{
```

```
assert(t1 &gt;= t0);
}
p0 = getPoint(curveIndex0, t0);
beginningLength = (drawingPoints[segmentIndex0 + 1] – p0).Length;
 p1 = getPoint(curveIndex1, t1);
endLength = (drawingPoints[segmentIndex1] – p1).Length;
 length = beginningLength + endLength;

 if(segmentIndex0 != segmentIndex1)
{
midLength = accumulativeLength[segmentIndex0 + 2] –accumulativeLength[segmentIndex1];
 length += midLength;
 }
 return length;
}
```

Image Analysis:

Image Analysis module involves the process of performing the ontology schema mapping based on segmentation. XML Schema mapping is achieved from ontology schema mapping using xml schema. Xml schema describes the structure of a xml document. Mapping is done for the time interval and amplitude with the type of disease which has been derived from segmentation The final phase involves the process of generating the reports using xml schema to detect the type of heart disease for patients.

Xml schema for mapping the type of disease

```
<?xml version="1.0"?>
<ECG xmlns:xsi="http://www.w3.org/2001/XMLSchema
-
instance">
<Lead>MLII</Lead>
<GraphInfo>
<XAxis>
<IntervalScale>0.003</
IntervalScale>
<StartTime>10</StartTime>
<EndTime>29.997</EndTime>
<TimeUnit>Second</TimeUnit>
</XAxis>
<YAxis>
<DigitalData>
-
0.27,
-
0.255,
-
0.245,
-
0.24,
-
0.24,
-
0.245,
-
0.25,
-
0.235,
-
0.225,
-
0.235,
-
0.23,
```

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-
0.245,
-
0.245,
-
0.24,
-
0.23,
-
0.225,[..]
</DigitalData>
<AmpUnit>mV</AmpUnit>
</YAxis>
</GraphInfo>
<WaveComponent>
<Pwave>
<Start>14</Start>
<Peak>29</Peak>
<End>53</End>
</Pwave>
<QRScomplex>
<Start>70</Start>
<Peak>89</Peak>
<End>99</End>
</QRScomplex>
<Twave>
<Start>
188</Start>
<Peak>214</Peak>
<End>251</End>
</Twave>
</WaveComponent>

<?xml version="1.0"?>
<ECG xmlns:xsi="http://www.w3.org/2001/XMLSchema
-
instance">
<Lead>MLII</Lead>
<GraphInfo>
<XAxis>
<IntervalScale>0.003</IntervalScale>
<StartTime>10</StartTime>
<EndTime>29.997</EndTime>
<TimeUnit>Second</TimeUnit>
</XAxis>
<YAxis>
<DigitalData>
-
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-
0.255,
-
0.245,
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0.24,
-
0.24,
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0.245,
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0.25,
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0.235,
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0.225,
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0.235,
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0.23,
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0.245,
-
0.245,
-
0.24,
-
0.23,
-
0.225,
-
0.22,
-
0.215,
-
0.205,
-
0.
18,
-
0.155,
-
0.145,
-
0.145,
-
0.145,
0.165,[..]
</
DigitalData>
<AmpUnit>mV</AmpUnit>
</YAxis>
</GraphInfo>
<WaveComponent>
<Pwave>
[..]
<Duration>0.13</Duration>
<Amplitude>0.16</Amplitude>
<PPInterval>0.87</PPInterval>
<Measurements>Normal</Measurements>
</Pwave>
<QRScomplex>
[..]
</QRScomplex>
<Twave>
[..]
</Twave>
</WaveComponent>
[..]
<Rhythm>
<AtrialRhythm>Irregular</AtrialRhythm>

<VentricularRhythm>Irregular</VentricularRhythm>
</Rhythm>
<HeartRate>
<Atrial>
<AtrRate>46
-
120</AtrRate>
<AtrStatus>Various
Rates</AtrStatus>
</Atrial>
<Ventricular>
<VenRate>49
-
104</VenRate>
<VenStatus>Various Rates</VenStatus>
</Ventricular>
</HeartRate>
<Abnormality>Irregular Rhythm,Premature Ventricular
Contraction</Abnormality>

Experimental results:

The system was able to diagnose each and every ECG with heart rates, heart rhythm, abnormal ECG measurements, and possible diagnostic findings. Therefore, it was concluded that the system amply demonstrated interoperable capability because it was able to present all diagnosis results in a browser from the encoded representation of the open standard HL7 Ontology. The results showed the determination of heart disease by analysing the image as a whole. By analysing the image provided the accuracy for the determination of heart disease. The results showed more accuracy than the data got from the ECG recorders directly.

Discussion:

When an abnormal condition exists within another abnormal condition then misdiagnosis may occur. For example, when an ECG strip has multiple beats of Left Bundle Branch Block, and there is a single beat of Premature Ventricular Contraction occurring between those Left Bundle Branch Block beats, the model will detect Left Bundle Branch Block but may or may not detect Premature Ventricular Contraction.

One ECG record was diagnosed as a normal ECG by a physician. However, the model found ‘Irregular Rhythm’ in this ECG strip. The atrial rate which was measured by P-P duration has slightly varied rates. The model incorrectly diagnosed Irregular Rhythm because it detected a wide range of atrial rates from 54 to 66 beats per minute.

Conclusion:

The developed metaphysics provides a structure for the illustration and open exchange of electrocardiogram information for viewing on a large number of computing platforms. The metaphysics was encoded in XML vocabularies providing human and code formats, permitting it to be displayed in a web browser. Electrocardiogram information is shared and diagnosed across systems while not the requirement for proprietary electrocardiogram computer code. It additionally promotes the utilization of the HL7 customary for information exchange and provides an automatic electrocardiogram diagnosing system with acceptable accuracy rates which might be used as a decision-aid for electrocardiogram diagnosing. Such technology advances rising telemedicine and helpful technologies for providing higher aid to patients. The validation of the image for further processing of the image is achieved by using histogram validation. The histogram validation validates the correctness of the image. The image is tuned up to remove the noise information from the image so that the required image for processing only is obtained. The Gray Scale conversion is performed for further process of segmentation. The segmentation process should be performed for segmenting the images into pixels based on color of intensity, pixel for a region and 3d interpolation. The image is considered as a whole instead of deriving time intervals and amplitude from the ECG waveform. The segmentation is achieved by using “Region vs Edge Based Segmentation Algorithm”. Xml schema derives the structure of the document for the final process of generating the report for the prediction of appropriate disease for patients. The resultant of the projected system generates the syndrome diagnosing with a sound input image thereby distinctive the rhythm, endpoint and axis positions of the curve.

Future Work:

Future research can improve understanding of ECG data diagnosis and develop a more accurate ECG diagnosis model. An example of methods to improve the accuracy rate of the model is to include ECG images as pattern recognition of knowledge for diagnosis. More detailed measurement of the ECG waveform can also be implemented for a wider range of diagnosis. Demographic information such as age and gender can also be included for a more accurate ECG prediction algorithm. Moreover, an inclusion of a preliminary morphological classification with information of beat number and beat type in the current ontology may add benefit.

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