

# Crisp Literature Review One and Scalable Framework: Active Model to Create Synthetic Electrocardiogram Signals

<sup>1</sup>Yogesh Sawant , Prof.Dr.Naveen kumar<sup>2</sup>

<sup>1</sup> Dept. Computer Engineering Bharati Vidyapeeth Deemed University

<sup>2</sup> Dept. Computer Engineering Bharati Vidyapeeth Deemed University

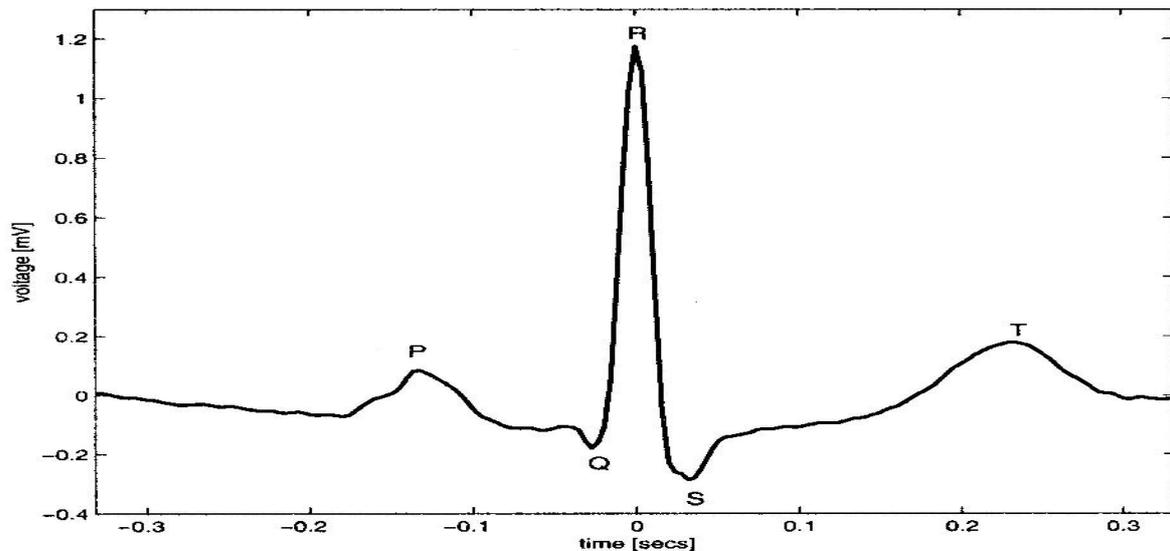
## ABSTRACT

*Human heart is vital organ and main function point in human body. Today's life style and eating sleeping habits have given rise to health issues. This problem directly impact in proper function of human heart. ECG technology analysis human heart beats and presents observations on flaws find in heart functioning. Analyzing and Monitoring ECG Signals accurately in order to take preventive measures is active requirement of health care domain. Numerous research works exist on generating ECG signals . current research problem exists on dynamic model design and development for generating ECG synthetic signals. Proposed article survey Existing models in ECG signals ,finding smaller to larger issues and presents technology to overcome this problem. Proposed algorithm introduces three coupled ordinary differential mathematical equation for systemic ECG generation. Administrator handling framework can input in  $\mu$ (mean ),  $sd$ (standard Deviation), PQRST cycle, RR power analysis in heart rate analysis. Respiratory sinus arrhythmia and MW(Mayer waves) together at higher frequency and lower frequency have been implemented in system. Beat variation in ECG timing and morphology with QT and R-peak values are analyzed in framework. Proposed framework assist in clinical analysis and taken in preventive actions with remote monitoring of ECG Signals. Presented article is crisp survey on ten articles similar in context and related to health care domain. Issues and challenges have been highlighted. Comparative analysis is been done and observations present system to be best Proposed technique is currently only one singular work which is been future extended to cloud domain.*

**Keywords:** ECG, Heart Analysis, Heart Beats, HRV (Heart rate variability), QRS morphology, Synthetic ECG

## 1. INTRODUCTION

Electrocardiogram is a time-variable indicator shimmering ionic present flow that grounds cardiac threads to bond and afterward relax. surface ECG is gained by Footage of possible alteration amid two conductors positioned on surface of skin. A single standard cycle of ECG signifies consecutive atrial depolarization or repolarization and ventricular repolarization that occurs with each heartbeat. These can be approximately linked with peaks and cribs of ECG waveform branded P, Q, R, S, and T illustrated in Figure 1. As presented in paper [5] Retrieval of useful medical evidence from real data consisting of noisy values in ECG requires consistent signal dispensation methods [10]. These comprise R-peak discovery [9] QT-intermission discovery [7], and cradle of heart rate and breathing ratio from ECG [3]. RR-ratio is time among successive R-points reverse of R point time intermission stretches prompt heart rate. A sequence of RR-intermissions is recognized as a RR tachogram and divergence in these RR-intermissions discloses significant info around bodily state of human .Currently new healthcare l signal dispensation procedures are typically assessed by smearing them to ECGs in large databanks that s Physionet database [4]. Although this gives administrator an sign of the correctness of a presented algorithm in real time when applied to real values it is problematic to conclude how Recital would differ in dissimilar medical settings with a variety of sound points and specimen rates. Having admittance to realistic simulated ECG indications may enable this evaluation.



**Figure 1:** P,Q,R,S,T Wave Form as mentioned in [10]

This article presents a framework for producing a artificial ECG Signs with truthful PQRST morphology and recommended heart rate crescendos. The target of this framework is to offer a customary truthful ECG analysis with known physiognomies that could be Produced with exact mathematical analysis that as in terms of  $\mu$ (mean) and  $Sd$ (Standard Deviation) On heart rate and regularity-domain features of heart rate erraticism (HRE) for example LF(low frequency)or HF( high frequency) ratio, defined as the fraction of value between 0.015–0.15 Hz OR 0.15–0.4 Hz in the RR graph [7]. By Producing a signal that signifies a typical entity ECG, enables a contrast of dissimilar signal processing techniques. Artificial ECG could be generated with dissimilar specimen incidences and dissimilar noise phases in directive to launch presentation of a assumed method. This act could be evaluated, for illustration, number of true positives and false positives or true negatives, and false negatives for each samples . Such presentation valuation might be castoff as point of standard might allow medicinal domain to determine one of medical I signal processing techniques best and foremost best for application scenario.

## 2.BACKGROUND KNOWLEDGE

Every beat of heart could be perceived as a sequence of ricochets away from model on ECG. These ricochets imitate time progress of electrical action in heart that inductees muscle reduction. single sinus cycle of ECG consistent to single heartbeat is conventionally tagged with the literatures P, Q, R, S, and T on every of its rotating points (Fig. 1). ECG might be separated into following sections:

- ❖ QT-interval: time amid start of ventricular de-polarization and the end of ventricular repolarization. medical studies have confirmed that QT-interval Upturns linearly as RR-interlude increases [4]. Protracted QT-interval might linked with overdue ventricular repolarization that might root ventricular tachyarrhythmias primary to unexpected cardiac death.
- ❖ QRS-complex: principal-amplitude portion in ECG produced by streams produced as when ventricles De-polarize previous to their shrinkage. Although atrial repolarization happens before ventricular de-polarization latter waveform is of much superior amplitude and atrial repolarization is therefore not understood on ECG
- ❖ P-wave: A minor little-power ricochet left from model instigated by depolarization of patios previous to Atrial reduction as beginning wavefront spreads from SA node over and done with atria.
- ❖ PQ-intermission: time amongst beginning of atrial depolarization and commencement of ventricular depolarization
- ❖ T-wave: Ventricular repolarization whereby cardiac power is equipped for next series of ECG.
- ❖ ST-interval: period between end of S-wave and commencement of T-wave. Meaningfully raised or depressed profusions absent from baseline are frequently related with heart sickness.

HRV (heart rate Variability): Examination of variations in prompt heart proportion period series by beat-to-beat RR inference is termed as HRV Examination [5], [10]. HRV Examination s has been revealed to deliver a valuation of cardiac issues [5]. balance among effects of concerned and parasympathetic schemes two conflicting performing divisions of autonomic nervous scheme is mentioned to as sympatho-vagal equilibrium and is whispered to be imitated in t beat-to-beat variations of cardiac series. heart rate is specified by mutual of RR-interval in components of strokes per miniature. heart rate might be amplified by sluggish performing sympathetic action or reduced by wild performing parasympathetic action.

**2. LITERATURE SURVEY**

**2.1 Tabular Survey**

<b>Author/Year</b>	<b>Abstract &amp; Methodology</b>	<b>Merits/ Demerits</b>	<b>Future Work</b>
Laguna/98	Lessons on frequency behavior of a least-Square method to evaluate power spectral density of unevenly sampled signals. Proposed Work assists in HEART RATE VARIABILITY (HRV) analysis and presents . proposed procedure assist in selecting stationary heart rate time interval for HRV	Work is been simulated and needs to be carried out on real scenario or real value datasets	Low Pass Sampling can enhance system and is scope of future work
Deober/78	Beat to beat cardio model for human heart examination is been presented for slight change in BP(blood pressure) and Heart Rate(HR). baroflex windkessel properties and mathematical differentiation are techniques used in model.	Simulated test scenario	Frequency modeling needs to considered as it majorly impacts results .
Task force/96	Presents complete report on HR analysis issues anad problems in techniques used for modeling ECG techniques	A large survey on techniques behind ECG and human Heart Examination	Largely focuses to numerous work like QT cycle modeling, HRVT
Schwartz/78	Presents analysis of fifty five patients and modeling of QT interval in heart examination and focuses to find sudden death issues	Greater variability in QT interval higher risk of sudden death	Work needs to focuses on QT interval in heart examination.
Malik/95	Focuses to find heart rate variability ration on real time scenarios	HRV analysis highly impact ratio of heart diseases and assist in predicting any risk factors observed	HRV is core baseline in heart examination and continuous and hidden patterns needs to detected in sign waves to find risk factors
Moody/86	Respiratory signals may be derived from body surface ECGs by measuring fluctuations in the mean cardiac electrical axis which accompany respiration. Two ongoing clinical studies illustrate the value of the ECG-derived respiration (EDR) technique. The first study demonstrates the feasibility of using Holter recordings as a screening test for sleep apnea. In a sample of 9 patients, diagnoses based on the EDR were confirmed by simultaneous polysomnography in all but one case. In the second study, Cheyne-Stokes respiration was observed in a group of patients with severe congestive heart failure. EDR analysis showed that the phenomenon occurred in 8 patients out of 10 who were studied, and that its incidence decreased in 7 of these 8 after chronic oral administration of a positive inotropic agent	Smaller cases studies is only drawback observed	clinical studies described above suggest the value of the EDR technique. In the first study, EDR provided a new approach to monitoring respiration for the purpose of identifying sleep apnea. This approach is far less costly than studies requiring fully equipped sleep laboratories, and may be more suitable for serial studies and evaluation of therapy as well as for screening. Second study, the EDR increase utility of an existing Holter database: it is now possible to use a library of ECG recordings as a library of respiration recordings. Without the EDR technique, we would have no information about

			respiratory patterns in these patients, because no conventional long-term respiration recordings were made. information using EDR, able to study dynamics of Cheyne-Stokes breathing in CHF and its relationship to heart rate variability
Pan	Developed real-time algorithm For detection Of QRS complexes Of ECG signals. Recognizes QRS complexes based upon digital analyses of slope, amplitude, and width. Digital bandpass filter reduces False detections caused By various types Of interference Present in ECG signals.	False positive values are been generated which need to eliminated.	Failed to properly Detect only 0.675 percent Of the beats
Davey/99	Qt interval is highly related to heart rate examination. No method exists to accurate examination of QT interval. QT interval is related inversely to heart attack. Proposed technique sums up QT intervals at rest and at real time comparative analysis is been done. Proposed technique implements QT correction technique and reduces false positive values.	Numerous measures are required in proposed technique. As such proposed technique is time complex	Better System configuration with better algorithm would enhance system performance.
McSharry	Presents Dynamic Model for Synthetic ECG Generation. In puts three factor equations for Accurate ECG Generation.	Dynamic physiological technique .has maximum scope of enhancement.	valuable tool for testing biomedical signal processing algorithms in context of ECG signals sampling frequencies

## 2.2 Problem Definition

Problem Definition Approach has been kept Simple (KIS) to Develop system from simple to complex problem solving. Proposed System introduces technology in unique combination of Engineering and Medical field. Engineering and Medical field comes together it leads to a product which helps in “Welfare Of Masses”.

## 3. PROPOSED SYSTEM

Proposed System is Telemonitoring for Medical practice that involves remotely monitoring patients. Convenient for patients to avoid travel and to get Emergency treatment. Provide emergency treatment. Provides way to use medical device or monitor that produces a complete overview of a patient’s health status by gathering vital signs and other health information.

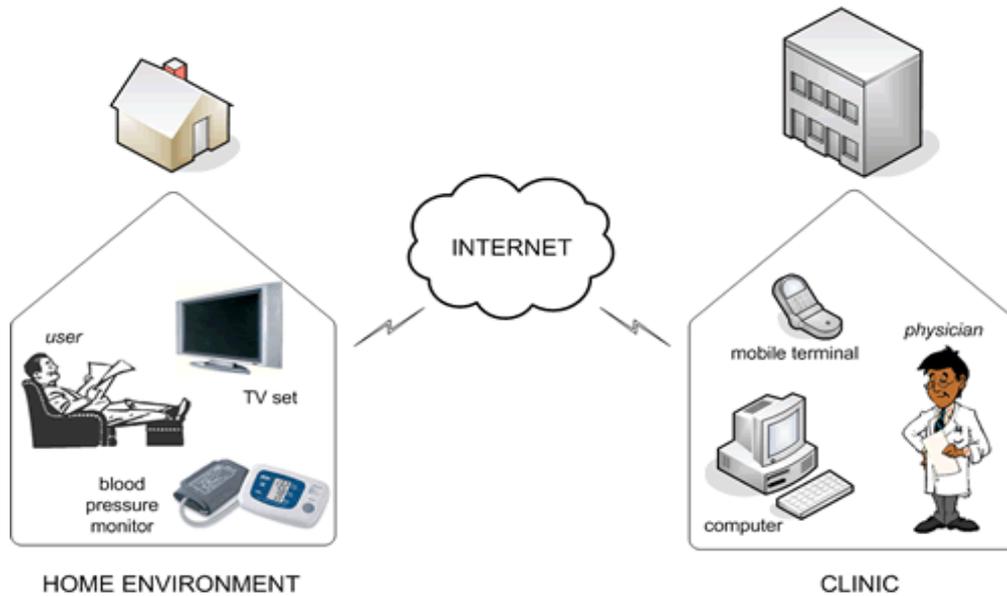


Figure 2: Proposed System Overview

Proposed System Work Flow



Proposed Technique:

- ❖ ECG Machine
- ❖ ECG File
- ❖ Send File to Mobile of ECG
- ❖ Reply from doctor
- ❖ Expert Advice on ECG

**3 Phase Modules**

- I) Doctor Module
- II) Server
- III) Patient Module

**Server**



**Patient Side**



**Doctor Side**

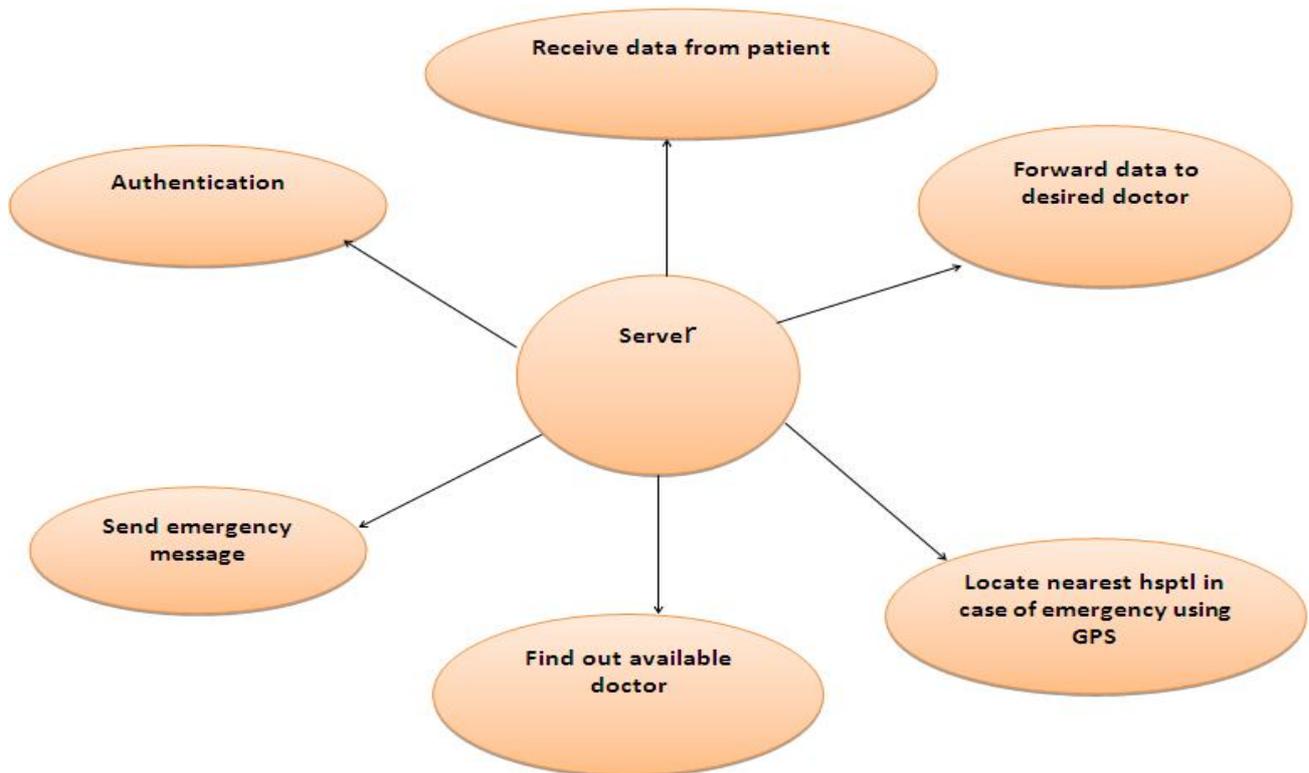
**Module 1: Patient Side**



**ECG-Machine**

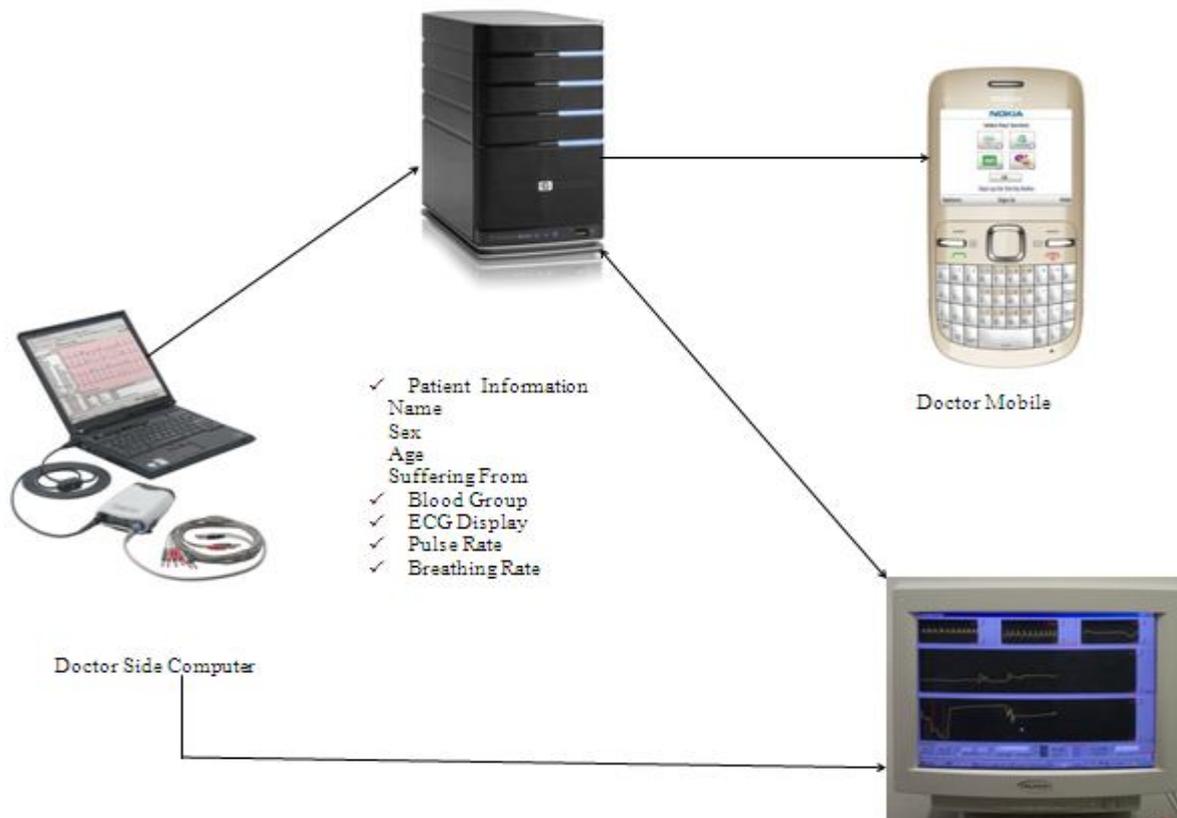


Other values like Blood Group, Age, Sex ..are entered manually.



**Module 2: Server Side**

**Module 3: Doctor Side**



## Conclusion

Proposed Framework is Scalable System for Dynamic ECG Generation and Assist in predictive Analysis for heart diseases. Preventive measures could be taken faster. Assists rural people in cardiac emergencies Applicable in Medical Field. Helps to treat the patient within shortest time period in emergencies .The technology could be extended to other similar scenario, generalized scalable framework. Future system should overcome file size issue and avoid Intranet and enhance speed of system.

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## AUTHOR



### **Prof. Dr. Naveen JayaKumar:**

Profile: Associate professor in computer Engineering Bharati Vidyapeeth College of Engineering Pune. Published 12 Articles in international journal. Two IEEE and 1 ACM Articles. Distinguished professor and Guide. Work Experience 6 years. Research Area Software Engineering, Distributed File System.

**Scholar Yogesh Sawant:** Pursuing M.tech Computer. research Area Data-Mining .