6th CSI-InApp National Student Project Awards 2017

AWARD APPLICATION FORM			
Project Title	Biometric Authentication based on ECG		
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DECLARATION BY PRINCIPAL/ HEAD OF THE INSTITUTION	
I certify that the above students are full time engineering students of this Institution and the Project work/Idea showcased is an original work done.	
Name and Signature	Date

GIVE TWO PAGE ABSTRACT OF THE PROJECT (NOT EXCEEDING 450 WORDS, CHARTS/DRAWINGS MAY BE ANNEXED)

Abstract

- **Project Idea**

Present-day advances in the computing and signal processing have allowed biometric systems to uniquely identify and authenticate humans in a computationally feasible manner. Biometric systems depend on a number of features including fingerprints, face, etc. However, both face and fingerprint can be compromised employing counterfeit credentials. Researchers have begun investigating electrocardiogram(ECG) signal as a biometric trait to identify individuals.

The purpose of this research project is to develop a real time system for biometric authentication with the electrocardiogram (ECG) signal. Like a fingerprint, the ECG is unique to an individual, because ECG waveforms depend on the anatomic features of the human heart and body. Also, it provides benefits such as resilience to replay attacks and spoofing. By examining the feature vectors obtained by processing ECG signals, and extracting unique features using discrete wavelet transform, our research investigates the possibility of biometric human identification based on the ECG.

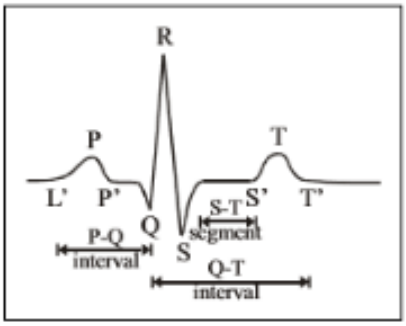

Fig. 1 ECG Signal

- **Implementation Prospects**

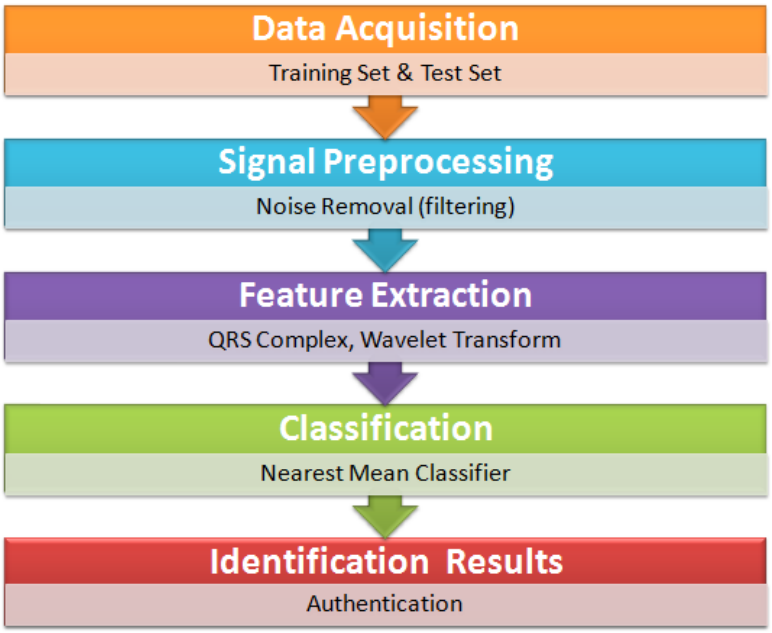

Fig. 2 System Structure

1. **Preprocessing :**

To eliminate noises, the signals are processed with filters. The filter is a combination high-pass filter and low-pass filter. A high-pass filter with a cutoff frequency of 0.5Hz is used to eliminate baseline drift. A low-pass filter with cutoff frequency of 45Hz is used to eliminate power line interference. Signal S denoted as:

$S(n), \quad n = 1,2,3...N$

2. QRS Detection :

The QRS Complex of ECG Signal is the most distinctive among all the features of ECG. Implementing Pan-Tompkin's Algorithm, allows efficient detection of QRS Complex, and thereby simplifying the task of feature extraction.

$R(n_k)$, $k = 1,2,3..., M$ Where n_k is the location of R peak.

Since the positions of R peaks $R(n_k)$ are determined, a 128-point signal segment SS_k can be obtained by taking data points from the backward 43rd point to the forward 84th point.

$SS_k = [S(n_k - 43) : S(n_k + 84)]$

Four such signal segments form a 512-points synthesis signal F:

$F = [SS_1\ SS_2\ SS_3\ SS_4]$.

3. Obtaining Wavelet Coefficients by Discrete Wavelet Transform :

With 'Haar' wavelet, the 512-points wavelet coefficients decomposed from the signal were used as the biometric “identity card” of the subject. We decompose the signal with level-9 decomposition. Wavelet coefficients decomposed from 512-points synthetic signal is shown in Fig(4).

4. Identification :

ECG of an unknown individual is acquired; Euclidean distance measure is applied to calculate the difference in the 512-point wavelet coefficient feature set between the unknown subject and all enrolled subjects. The subject with minimum computed distance is the final identification result.

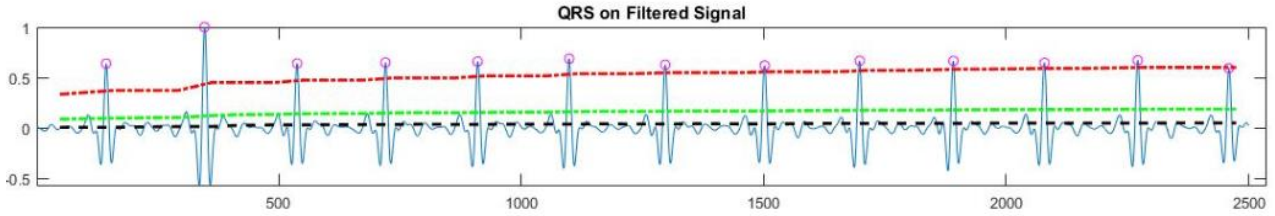

Fig.3 QRS Detection

Fig.4 512-points synthetic signal containing four QRS Complexes

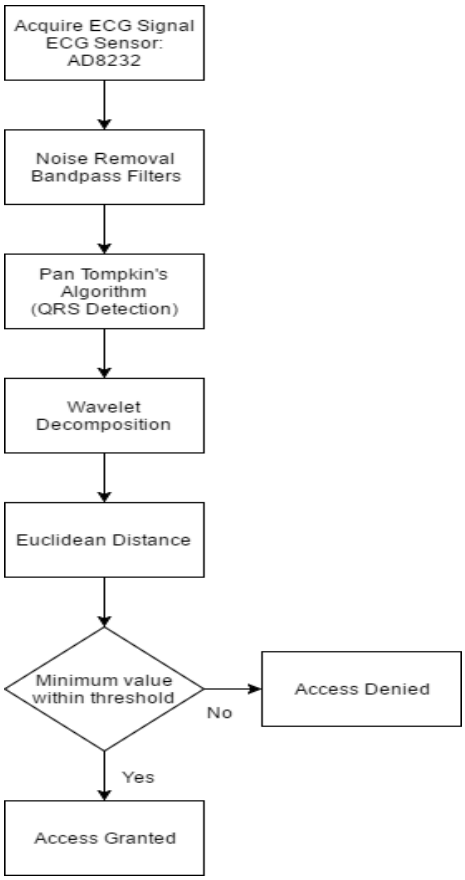

Fig. 6 Flow of Execution

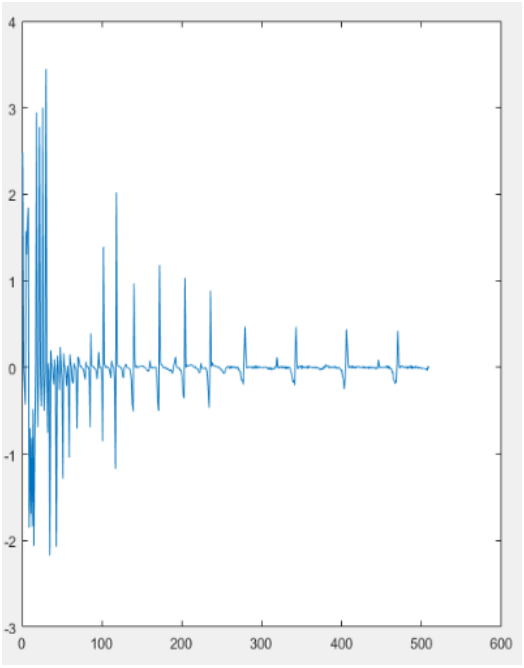

Fig.5 Wavelet Decomposition

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Award Rules:

1. There is no fee for participation
2. The contest is open to all students studying B.E/B. Tech/MCA /M.Sc. Computer Science from affiliated colleges/Universities across India
3. Participation is open to teams which can have up to five members. Team members can be from any semester, but from the same Institution. There should be a faculty member for each team as the Team Guide
4. Teams must submit a two page abstract of their project in a specified format, which can be downloaded from http://csiawards.inapp.in/apply/
5. The project must be an original work and the abstract must be certified by the Principal or Head of the Institution
6. The signed copy of the certified abstract should be sent to csiawards@inapp.in on or before 31st Jan 2017
7. The winners are decided based on a two stage expert evaluation. The first stage evaluation of abstract is based on the project idea and its implementation prospects
8. The winners selected for final round presentation will be intimated by 20th Feb 2017 via email
9. The final stage of evaluation is the demonstration of the software project before the judging panel, which will be held on 25,26 March 2017.
10. Project entries will be evaluated based on factors such as innovativeness, utility, usability and flexibility
11. The decisions of the award evaluation committee shall be final

Prizes:

- First Prize: Award Instrument and Rs 50,000
- Consolation Prize: Award Instrument and Rs 25,000

Email filled abstract to csiawards@inapp.in on or before 31Jan 2017

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