Determination of Pediatric Electrocardiogram Acceleration Characteristics

Keith Berry
Learning From Data
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Electrical & Computer Engineering

Project Overview

- Data Preprocessing
- Fuzzy Based Data Classification
- Acceleration and Deceleration Statistical Analysis

Data Preprocessing

- 2 GBs of ECG records
  - 50-MB text files
  - consist voltage values
  - sampled at a rate of 500 Hz

Data Example

Relevant ECG Features

- For Positive Signal Peaks
  - Time Index
  - Amplitude Values
- Peaks Represent
  - QRS Complexes
  - Noise
  - Ectopic Beats

Labeled ECG Waveform
Data Processing

- For Each Patient Record - Extracted
  - Peak-Peak Intervals
  - Peak Amplitudes
  - Peak Aspect Ratio

Peak-to-Peak Intervals

- Heart Rate
- Acceleration Rate
- Deceleration Rate
- Nominal Heart Rate

Peak Amplitudes

- Degree of Variation Indicates
  - Low Variation
    - Nominal
    - Accelerating
    - Decelerating
  - High Variation
    - Noise
    - Ectopic Beats

Peak Aspect Ratio

- Wave Form Template
- Discriminate Between
  - Normal Heart Beats
  - Noise
  - Ectopic Beats

Extracted Data

Fuzzy Based Data Classification

- Locate
  - Nominal Heartbeat
  - Acceleration
  - Deceleration
  - Noise
- In the Compressed ECG Signal

Obstructive Sleep Apnea Classification Based on Power Spectral Density Patterns in the Electrocardiogram
Obstructive Sleep Apnea Classification Based on Power Spectral Density Patterns in the Electrocardiogram

Fuzzy Membership Function

- Acceleration
  - Increase In Heart Rate
  - Normal Aspect Ratio
  - Normal Peak Amplitude
- Deceleration
  - Decrease In Heart Rate
  - Normal Aspect Ratio
  - Normal Peak Amplitude

Statistical Analysis

- Acceleration and Deceleration Rates
  - Individual and Combined
  - Minimum
  - Mean
  - Maximum

Current Status

- Data Extraction - Complete
- Fuzzy Classifier - Not Working
- Data Analysis - Being Generated Using MatLab (Back-up plan)

Future Goals

- Automate to Interface with Other Systems
  - Build Individual Patient ECG Profiles
  - Improve Confidence in ECG Signal “Interpolation”
  - Detect, Classify, and Log Ectopic Beats
Questions?