

Electrocardiogram

This work is about the *electrocardiogram* (ECG) signal. This signal measures the electric activity of the heart over time. A typical ECG tracing of a normal heartbeat (or cardiac cycle) consists of a P wave, a QRS complex and a T wave. This is illustrated in Figure 1.

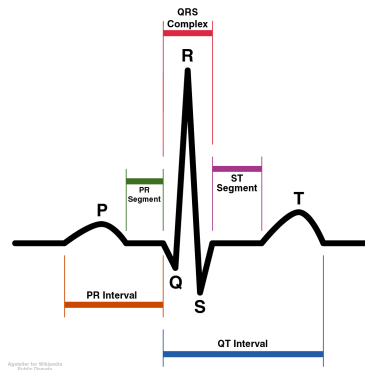


Figure 1: Typical PQRST wave in an ECG signal

In this work the ECG signal will be used to measure the heart beat and to estimate the average PQRST wave.

1. Load the `ecg.mat` matlab file and visualize the `ecg` signal.
2. Remove the low frequency drift in order to align the R-peaks.
3. From the obtained signal implement an algorithm to detect the R-Peaks in the ECG.
4. Use the previously detected R-peaks and the sampling frequency to estimate and plot the heart beat over time. Use a linear interpolator to define the heart beat signal between the R-peak positions.
5. Select a window of 600 samples around each detected R-peak and estimate the mean PQRST wave. Visualize the obtained mean wave.
6. Calculate the PQRST wave standard deviation, σ , and plot the -3σ to $+3\sigma$ interval. Compare with the simultaneous plot of all the PQRST waves.