Problem Statement and Goals
RwaveDetection

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Table 1: Revision History

Date	Developer(s)	Change
January 16, 2025	Junwei Lin	Creation

1 Problem Statement

R-wave detection is a critical task in ECG (electrocardiogram) signal processing, serving important purposes such as heart rate calculation, arrhythmia analysis, cardiac conduction evaluation, and heart disease diagnosis. The patient's ECG signal is sampled by the sensor and converted into a digital signal, where we can detect R-waves. However, since the sampling is not under an ideal condition, a large amount of clutter wave is mixed into the original signal, such as utility frequency. So we need a strong filtering algorithm to filter out redundant signals, and then accurately capture the peaks of R-waves.

1.1 Problem

Given a single channel unfiltered ECG signal, find the index of each R wave peak.

1.2 Inputs and Outputs

1.2.1 Inputs

1. Sampling frequency

2. Sampling data file

1.2.2 Outputs

1. Index of R-wave peaks

2. A graph that shows all the R-wave peaks

1.3 Stakeholders

1.4 Environment

debian-12.9.0-amd64

2 Goals

3 Stretch Goals

4 Challenge Level and Extras

[State your expected challenge level (advanced, general or basic). The challenge can come through the required domain knowledge, the implementation or something else. Usually the greater the novelty of a project the greater its challenge level. You should include your rationale for the selected level. Approval of the level will be part of the discussion with the instructor for approving the project. The challenge level, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

[Teams may wish to include extras as either potential bonus grades, or to make up for a less advanced challenge level. Potential extras include usability testing, code walkthroughs, user documentation, formal proof, GenderMag personas, Design Thinking, etc. Normally the maximum number of extras will be two. Approval of the extras will be part of the discussion with the instructor for approving the project. The extras, with the approval (or request) of the instructor, can be modified over the course of the term. —SS]

Appendix — Reflection

[Not required for CAS 741 —SS]

The purpose of reflection questions is to give you a chance to assess your own learning and that of your group as a whole, and to find ways to improve in the future. Reflection is an important part of the learning process. Reflection is also an essential component of a successful software development process.

Reflections are most interesting and useful when they're honest, even if the stories they tell are imperfect. You will be marked based on your depth of thought and analysis, and not based on the content of the reflections themselves. Thus, for full marks we encourage you to answer openly and honestly and to avoid simply writing "what you think the evaluator wants to hear."

Please answer the following questions. Some questions can be answered on the team level, but where appropriate, each team member should write their own response:

1. What went well while writing this deliverable?

2. What pain points did you experience during this deliverable, and how did you resolve them?

3. How did you and your team adjust the scope of your goals to ensure they are suitable for a Capstone project (not overly ambitious but also of appropriate complexity for a senior design project)?