NOHAYO

Smart Solutions for Wearables

Cardiorespiratory Library

Breathing Rate Tracking Algorithm

We enable any kind of wearable device that contains PPG optical sensor and an accelerometer to become a Respiration (Breathing)-Rate (RR) tracker. No need to wear anything on the chest or near the nose.

Our algorithm is highly accurate, very slim in terms of memory usage and computational complexity, and can be used for many applications such as Biofeedback, Meditation, General Health Status and more.

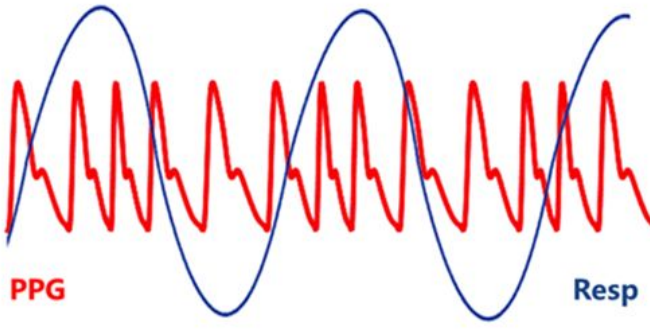
Why is RR measurement important?

Respiratory rate is a fundamental vital sign that is sensitive to different pathological conditions (e.g., adverse cardiac events, pneumonia, and clinical deterioration) and stressors, including emotional stress, cognitive load, heat, cold, physical effort, and exercise-induced fatigue.

It's insightful to track Respiratory Rate daily. 2 or more consecutive days with elevated RR and Heart Rate, paired with suppressed HRV, can indicate impending illness.

How do we do it?

The algorithmic solution analyzes modulations in both 3D Accelerometer and PPG pulse signals, removes motion artefacts, and tracks the Respiratory rate at any activity done by the user (Sleep, Daily activities, Jogging etc.).



Nohayo RR algorithm performance

The algorithm is implemented in embedded C and can run on wearables like a smartwatch, ring, and earbuds that has a PPG, a 3D accelerometer, and a DSP unit.

The algorithm was compared to SensiumVitals, an FDA cleared vital signs chest patch, and shows the accuracy shown in the table

	Accuracy, RPM	Range of RR
Sleep	±0.88	5-15
Rest, Low Activity	±1.76	8-25
Jogging	±2.21	12-35

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