基于UWB信号的心电图监测

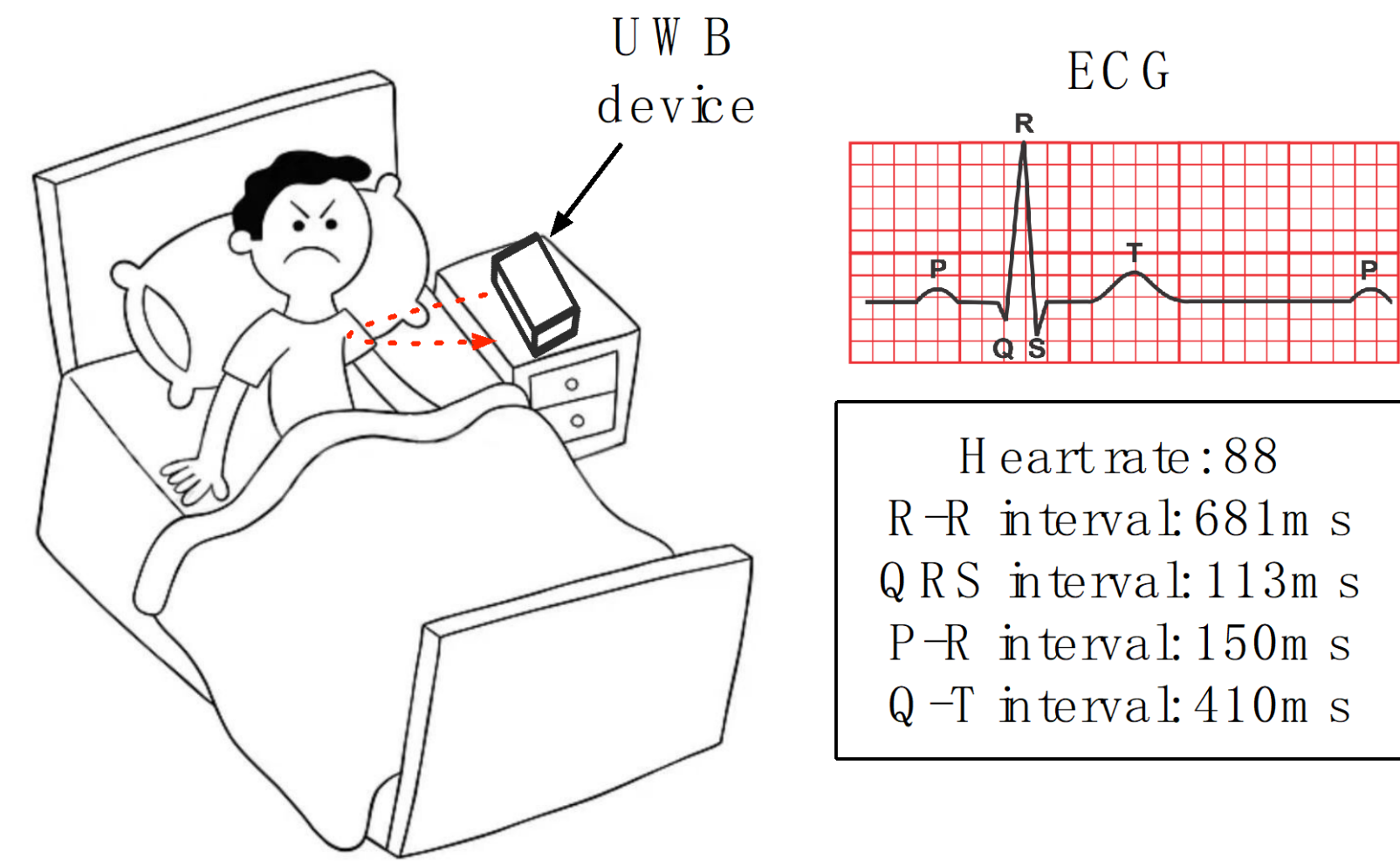## ECG-grained Cardiac Monitoring Using UWB Signals

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Motivation

☐ Cardiovascular diseases (CVDs) have been a major threat to human health for years. So, providing cardiac monitoring and CVD early warning for the people at home is of critical priority.

☐ However, what we know, no previous work has addressed the contactless ECG-grained cardiac monitoring.


ECG-grained Cardiac Monitoring

☐ Our system consists of three main modules: signal preprocessing, heartbeat waveform restoration and ECG generation.

☐ Signal preprocessing: It is divided into three steps: background subtraction, human identification and noise reduction.

☐ Heartbeat waveform restoration: We find that the phase variation range of the heartbeat signals in the UWB signals varies under different conditions. Thus, we design a restoration algorithm for heartbeat signals.
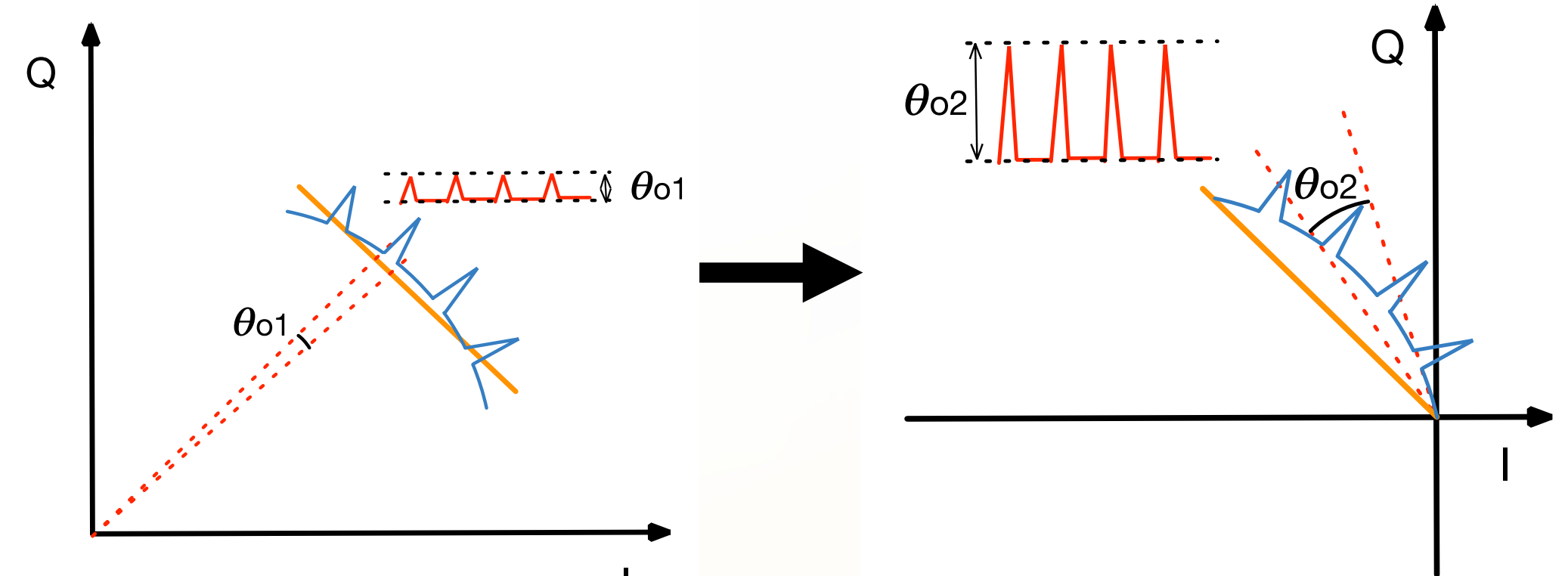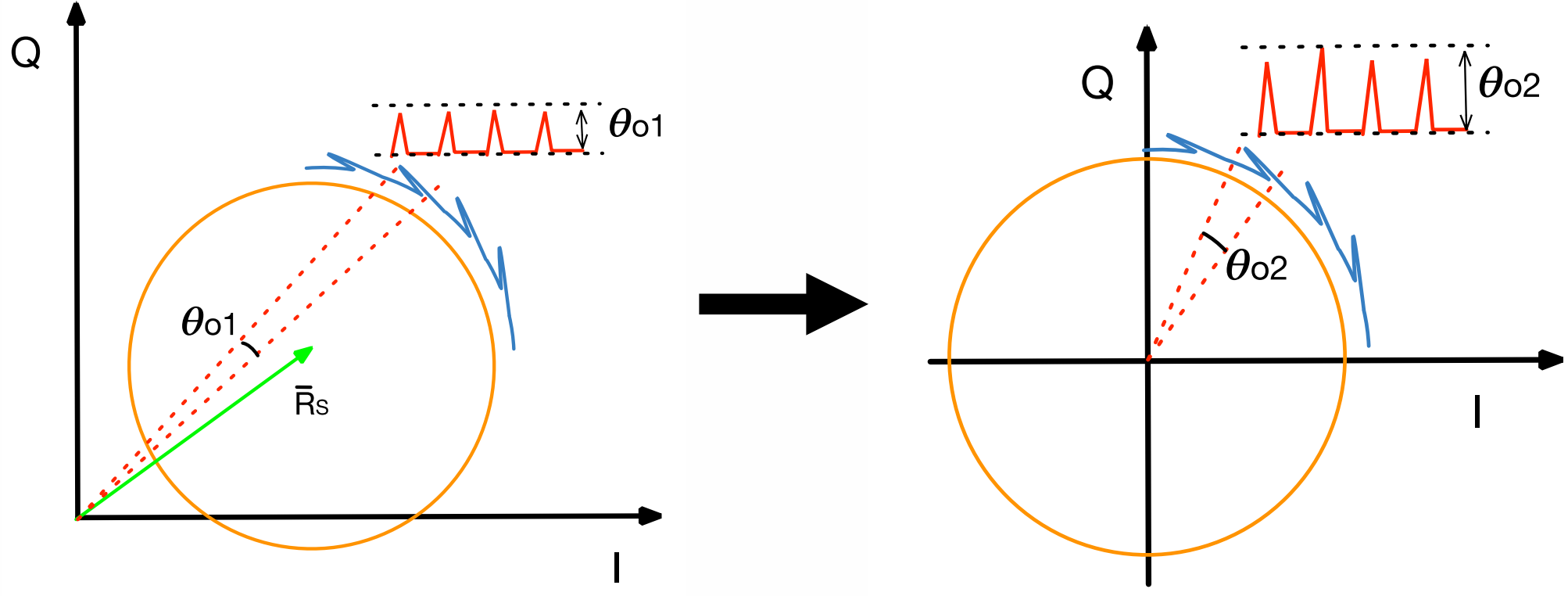
☐ ECG generation: For learning the mapping between the mechanical activity and electrical activity of the heart, we construct a GAN that integrates the features of the heartbeat activity, and minimize the difference between representations of two semantically-equivalent sequences of time-varying UWB signal to remedy the negative impact brought by noise in the UWB signal.
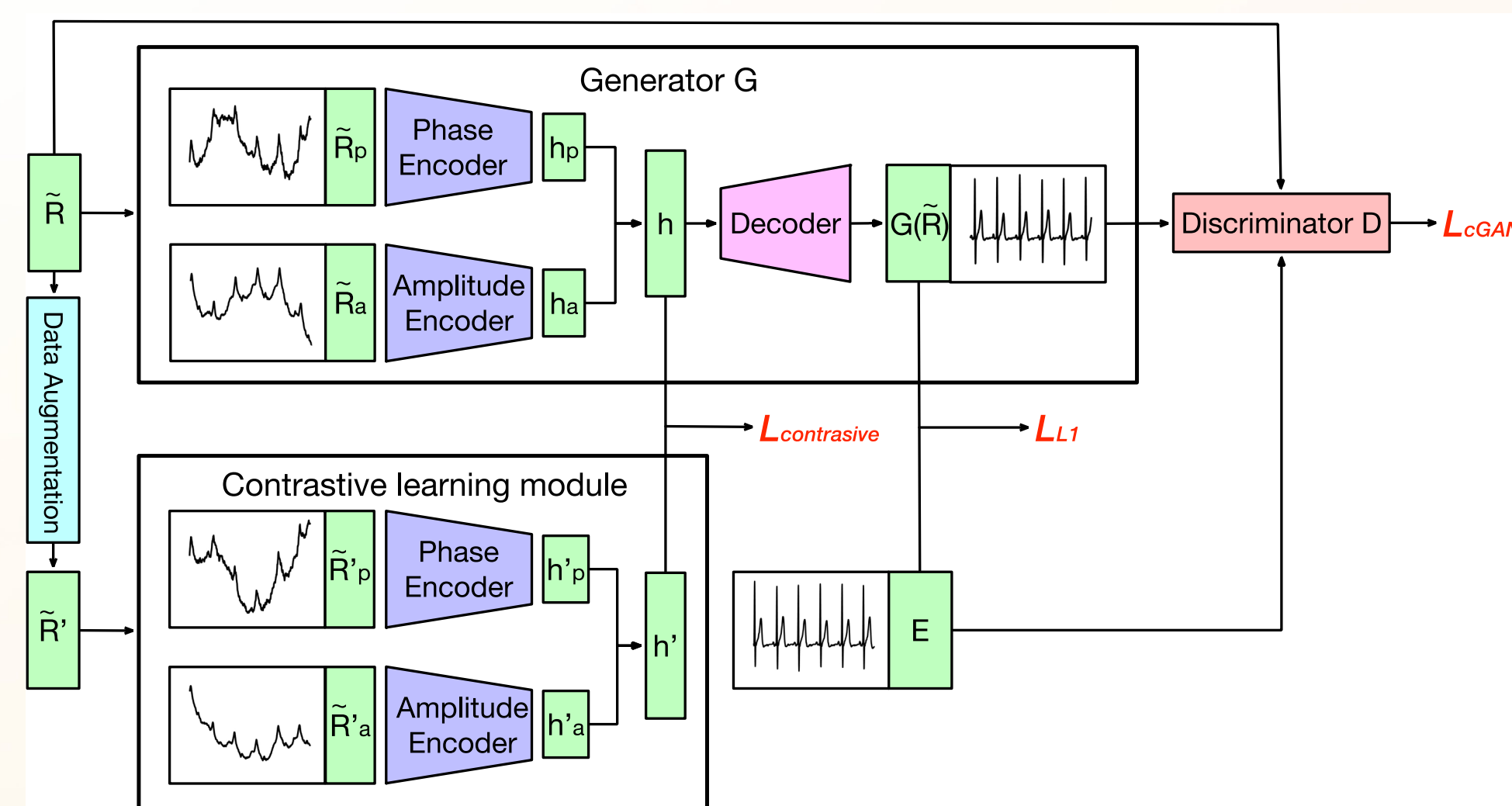
Evaluation & Results

☐ Our system RF-ECG can accurately generate ECG-grained heartbeat signals, the median errors of R-R interval, QRS interval, P-R interval, and Q-T interval are 3.7ms, 3.3ms, 13.1ms, and 12.5ms, respectively, while compared with the ground truth.

☐ Diseases such as tachycardia, bradycardia, sinus arrhythmia, and premature contractions can be diagnosed from the ECG generated by RF-ECG.