# An Alternative to Derive the Instantaneous Frequency of the Chest Compressions to Suppress the CPR Artifact

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The resuscitation outcome in cardiac arrest is tightly linked to minimizing interruptions in chest compression during cardiopulmonary resuscitation (CPR). Unfortunately, current automated external defibrillators (AEDs) require interruption of chest compressions for reliable rhythm analyses, as the artifacts caused by CPR corrupt the ECG signal. Filtering the artifact would allow a reliable diagnosis during CPR, thus reducing the hands-off interval and increasing resuscitation success.

Adaptive filters have been proposed to suppress the CPR artifact, either by analyzing the ECG alone or using reference signal(s). The latter provide better results than those based exclusively on the surface ECG. The instantaneous frequency of the compressions, derived from the chest compression signal, has been recently proposed to model the CPR artifact. Unfortunately, incorporating the compression depth in current AEDs involves important hardware modifications, as it should be acquired using accelerometers located in the chest compression pads.

In this work the transthoracic impedance was tested to extract the instantaneous frequency of the compressions required by an adaptive filter to suppress the CPR artifact. Transthoracic impedance signal is currently acquired by AEDs, and incorporating the suppressing system would only require software modifications.

The methods were tested using a database of 380 88 shockable and 292 non-shockable records. In each record, the initial 15s were corrupted by a CPR artifact followed by 15s without artifact. Sensitivities and specificities were obtained, before and after filtering, using a rhythm analysis algorithm from a commercial AED.

The sensitivity and specificity for the corrupted intervals were 55.68% and 92.12% respectively. After filtering, the sensitivity and specificity were 92.05% and 89.38% when the frequency of the compressions was derived from the compression depth; and 95.45% and 86.30% when it was derived from the transthoracic impedance signal. It could be concluded that similar improvement was obtained with both signals.