

On the Way to a Cable Free Operating Theater: An Operating Table with Integrated Multimodal Monitoring

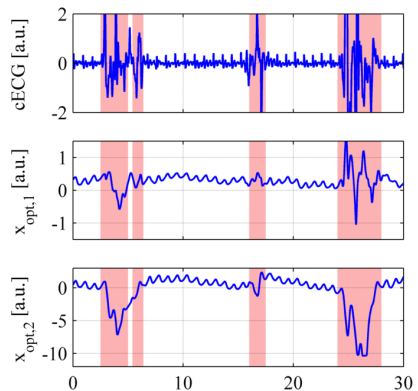
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On the way to a cable free operating theater a new operating table is developed featuring into the table integrated sensors for patient monitoring, which do not necessarily need a direct contact to the naked skin, and a magnetic tracking system. The integration of these modalities reduces costs (disposables are avoided) and preparation time and increases patient safety. Preliminary tests showed no influence of the magnetic tracking system on the measurement of the electrocardiogram (ECG).

The monitoring sensors are new multimodal sensors, which combine a capacitive electric field sensor with a reflective optical sensor and a temperature measurement. This multimodal measurement allows a reliable vital sign measurement by use of redundancy and plausibility checks.

The capacitive electric field sensor offers the opportunity to measure the ECG contactless and even through clothes. However, it has the large drawback of a high sensitivity to severe motion artifacts which are most probably mainly caused by triboelectricity. Existing methods which try to detect these motion artifacts are only suboptimal as they do not measure all effects at the electrode body interface. In this paper, a novel artifact detection method for capacitive ECG measurements is presented. This method is based on an optical measurement and does not suffer from the drawbacks of the existing methods as it measures all motions at the electrode body interface. Together with an adaptive threshold based algorithm of the optical signal, intervals with artifacts can reliably be identified and discarded which results e.g. in a robust estimation of heart rate.



Capacitive ECG Signal and the corresponding optical signals in which the results of the artifact detection algorithm are highlighted.