

# Multi-point accelerometric detection and principal component analysis of heart sounds

Simone De Panfilis<sup>1</sup>, Carlo Moroni<sup>2</sup> Fabrizio Pompili<sup>3</sup>, and Giorgio Parisi<sup>2</sup>  
Rosario Cassone<sup>3</sup>

<sup>1</sup> Istituto Italiano di Tecnologia, Rome (Italy)

<sup>2</sup> University of Rome, Rome (Italy)

<sup>3</sup> Centro per l'innovazione tecnologica in cardiologia e ricerca scientifica nel settore cardiovascolare ONLUS, Rome (Italy)

**Abstract.** Heart sounds are a fundamental physiological variable that provide a unique insight into cardiac semiotics. However a deterministic and unambiguous association between noises in cardiac dynamics is far from being accomplished yet due to many and different overlapping events which contribute to the acoustic emission. In this report, we present a new equipment for the detection of heart sounds, based on a set of accelerometric sensors placed in contact with the chest skin on the precordial area, and are able to measure simultaneously the vibration induced on the chest surface by the heart's mechanical activity. By utilizing advanced algorithms for the data treatment, such as wavelet decomposition and principal component analysis, we are able to condense the spatially extended acoustic information and to provide a synthetical representation of the heart activity.