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Ballistocardiogram: Model and sensing systems

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**Abstract:**Heart motion and blood ejection during the cardiac cycle originates a set of body vibrations that are sensed through the usage of different sensing systems that provide the information on cardiac mechanics and cardiac output. Ballistocardiogram (BCG) and seismocardiogram (SCG) are the recording of body vibration induced by heart bit. The sensing of the BCG requires mechanical contact between the user body parts equipment and furniture embedded BCG sensing to provide data for that can be used to validate the BCG models. The heart activity generates a set of forces and reverberations that may be modeled in two directions, anteroposterior and dorsoventral. As the ballistocardiogram sensing is usually done at the person's back or at the posterior pelvic region the cardiac forces models are associated with these two directions. Additionally a set of results including the designed models simulations and the BCG validation signals obtained from BCG sensing systems prototypes are included in the paper.

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Contents

I. Introduction

Ballistocardiography is a non-invasive and unobtrusive method used to assess the body vibrations associated with cardiac activity and can be used to estimate changes in cardiac output. As pioneer in the BCG domain Isaac Starr described the BCG as resulting from reactions forces produced when blood circulates in the cardiac region [2]. Technological developments on the ballistic forces monitoring, together with the parallel assessment of the heart sounds [3], the electrocardiogram, or the pulse pressure profile [4], allowed the progress in extraction of the relations between the cardiac activity, ejected blood flow, cardiac forces and BCG wave contents.

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