

Towards a less intrusive sleep monitoring system

at the

14th International Conference on Wearable and Implantable Body Sensor Networks

BSN2017, Eindhoven, The Netherlands

Date & Venue

Tuesday, 9 May, 2017, 9:00 – 13:00

Philips Auditorium, the High Tech Campus, Eindhoven, The Netherlands

Organizers

Carolina Varon, KU Leuven, Belgium

Xi Long, Philips Research and Eindhoven University of Technology, Eindhoven, The Netherlands

Abstract

Sleep is a complex process that plays a key role in maintaining homeostasis, well-being and overall health. Even though, humans should spend up to one-third of their life sleeping, the current 24-hour society is keeping them from getting the necessary amount of sleep. This, so-called, “sleep deprivation” has been associated with reductions of cognitive and behavioural performance, depression, memory loss, and cardiovascular diseases. This reduction in sleep quality is, however, not only caused by the high demands of society, but also by sleep disorders, such as insomnia and sleep apnea.

The gold standard in sleep medicine is the polysomnography (PSG), which is a sleep test used to monitor sleep and diagnose sleep disorders. Although PSG is the most powerful tool in sleep medicine, it requires overnight hospitalization and it is associated with high costs and reduced comfort. The reason for this relies on the fact that PSG requires, on the one hand, costly sleep centre facilities and sleep experts, and on the other hand, the use of instruments that may interfere with the normal sleep pattern. These limitations have motivated a numerous amount of studies, where the focus has been on the development of non-intrusive technologies for the monitoring of sleep. These new technologies aim to bring sleep monitoring to a home environment, where the assessment of sleep quality can be done during more than one night. In addition, these technologies might improve the continuous monitoring of sleep in infants, since sleep is also one of the most important factors in their neural development, particularly for preterm infants. Therefore, continuous sleep monitoring could provide an indicator of such development over time. Moreover, non-intrusive sleep monitoring methods are required to ensure a comfortable measurement, with a minimal burden on infants.

In this context, this workshop summarizes different technologies and algorithms that have been developed for the monitoring of sleep in preterm infants and adults using non-intrusive sensors.

The first talk will focus on the development of a ballistocardiographic system that can be used to monitor sleep in preterm infants. Then, algorithms for sleep/wake detection using actigraphy for insomniacs will be introduced. After that, a method based on the oxygen saturation (SpO_2) signal, used for predicting cardiac comorbidity of patients suffering from obstructive sleep apnea (OSA) will be discussed. Next, a summary of algorithms based on pulse photoplethysmography used to detect OSA will be presented, and finally, research on the use of the ECG-derived respiratory signal for sleep monitoring will be summarized.

Speakers

Rohan Joshi	Department of Industrial Design, Eindhoven University of Technology, The Netherlands
Xi Long , Ph.D.	Philips Research and Eindhoven University of Technology, The Netherlands
Margot Deviaene	Department of Electrical Engineering, KU Leuven, Belgium
Jesús Lázaro , Ph.D.	Department of Electrical Engineering, KU Leuven, Belgium
Carolina Varon , Ph.D.	Department of Electrical Engineering, KU Leuven, Belgium

Introduction

9:00 – 9:05

Carolina Varon, Xi Long

A ballistocardiographic setup for monitoring movement in preterm infants

9:05 – 9:45

Rohan Joshi

Sleep/Wake detection for insomniacs

9:45 – 10:25

Xi Long

Cardiac phenotyping of OSAS patients using oxygen saturation

10:25 – 11:05

Margot Deviaene

Break

11:05 – 11:25

Towards a detection of obstructive sleep apnea syndrome based on pulse photoplethysmography

11:25 – 12:05

Jesús Lázaro

The use of the ECG-derived respiration in the detection of sleep apnea

12:05 – 12:45

Carolina Varon

Joint Discussion

12:45 – 13:00

All