Diagnosis of Obstructive Sleep Apnea Using Snoring Sound Signals (BGN)

Yaniv Zigel, Biomedical Engineering, Faculty of Engineering Sciences, Ben-Gurion University, Beer-Sheva, Israel
Nir Ben Israel
Ariel Tarasiuk, Physiology & Neurobiology, Faculty of Health Sciences, Ben-Gurion University, Beer-Sheva, Israel

The following technology is an algorithm and a system that enables the detection of Obstructive Sleep Apnea (OSA) using snoring signals acquired by a non-contact microphone.

The Clinical Need

OSA is a chronic disorder that can lead to considerable morbidity. Partial or complete collapse of the upper airway during sleep has different effects on the human body, ranging from noisy breathing (simple snoring) to cardiovascular morbidity. Globally, 100 million people are thought to have the condition, with an overwhelming 80% of them remaining undiagnosed. Adequate diagnosis and treatment of OSA reduces complications and improves the quality of life.

Development Stage and Development Status-Summary

A system that analyses the nocturnal audio signal and combines several developed acoustic features with a classifier (for OSA snorers or simple snorers) was developed. Development stages already achieved include: a) Snore detection and analysis algorithm, b) Sleep /wake detection algorithm, c) OSA detection and severity estimation algorithms, d) Audio database of patients from sleep lab and at-home recordings. The results that were achieved in clinical studies using a combined algorithm were very good: a) Snore detection - above 98% detection rate, b) Sleep/wake detection - show excellent diagnostic agreement according to several parameters, epoch-by-epoch detection rate above 85%, c) OSA severity estimation - correlation of 0.89 with the gold-standard at laboratory sleep study.

Goals and Benefits

Currently, Polysomnography (PSG) is the gold standard approach for OSA diagnosis. However, the market share of home testing devices is expected to increase significantly as they are cost-effective, and more convenient, as is the case with sound detection based devices. Compared to other home testing devices, our system is well within the top 10% of alternative technologies. Moreover, our system enables the accurate analysis of an additional variety of important medical and physiological parameters, such as whole-time-in-bed (sleep) snore detection, snore severity estimation, and sleep/wake patterns to determine sleep quality.

Potential Commercial Uses and Market

The technology can be used as a device for home detection of OSA, a component of an existing device for OSA detection and/or treatment, or as a medical application for cellular phone. The global sleep apnea market was estimated to be $7.96 billion in 2011. Currently, 80% of the people suffering from OSA are undiagnosed and can be a target population for a cost-effective OSA sound detection technology.

Contact for more information:

Zafrir Levi, VP Business Development Engineering,

BGN Technologies Ltd. - Technology Transfer Company of Ben-Gurion University, POB 653, Beer-Sheva, 84105, Israel. Tel: +972-8-6236949 Fax: +972-8-627-6420