Sleep Evaluation Using Audio Signals

The following technology is a set of algorithms and a system that enables the detection of sleep quality, snoring severity and Obstructive Sleep Apnea (OSA) using audio signals acquired by a non-contact microphone.

The Clinical Need

Statistics on snoring are often contradictory, but at least 30% of adults snore. Though snoring is often considered a minor affliction, snorers can sometimes suffer severe impairment of lifestyle and other health indications such as development of carotid artery atherosclerosis, the risk of brain damage, stroke and OSA. 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, >200 million people are thought to have the condition, with an overwhelming 90% 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 was developed. Development stages already achieved include: a) Breathing sounds and 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) Breathing sounds and snore detection – above 98% detection rate, b) Sleep/wake detection – show excellent diagnostic agreement according to several parameters, epoch-by-epoch detection rate above 84%, 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 sleep evaluation (including sleep quality estimation and OSA diagnosis). The market share of home testing devices and cellular health applications related to sleep disorders is expected to increase significantly, as they are cost-effective, and more convenient, as is the case with sound detection based devices. Our system diagnostic's quality is comparable to home testing devices approved for medical use for OSA and other sleep disorder diagnosis. Our system enables the analysis of variety of important medical and physiological parameters, such as total-sleep-time, snore detection, snore severity estimation, and sleep/wake patterns to determine sleep quality and OSA.

Potential Commercial Uses and Market

The technology can be used as a device/cellular application for home detection of sleep quality, snoring severity and OSA. It can be used to evaluate the effectiveness of snoring relieves, OSA treatments and lifestyle modifications related to sleep disorders. A potential business model may be based on collaboration with snoring and therapeutics producers for a bundled deal of a therapeutic device and evaluation application, or commercialize independent free online application, generating revenues from users direction toward collaborating therapeutic producers or medical diagnostic services.

The worldwide OSA (Diagnostic & Therapeutic) devices market is expected to reach $5.3 Billion by 2020 from an estimated $3.7 Billion in 2015.

Research Team

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Patent Status

There are three relevant patent applications describing the inventions: Application numbers: PCT/IB2011/053715, PCT/IB2013/054469, and PCT/IB2014/058526.

Contact for Licensing and Investment Information

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