Beeston, A.V. and Brown, G.J. (2015). Auditory models for robust analysis of snoring in domestic recordings.
Proc. Newcastle Sleep 2015 - British Sleep Society biennial scientific conference, Newcastle, UK, 22-24 October 2015.

Auditory models for robust analysis of snoring in domestic recordings

Amy V. Beeston and Guy J. Brown
Department of Computer Science, University of Sheffield

Obstructive sleep apnoea (OSA) is an under-diagnosed condition of increasing prevalence (Malhotra et al, 2015). Preliminary screening for OSA might soon be achievable in the home, for instance by analysis of snore sounds recorded via a smartphone. Previous approaches to snore detection (e.g., Dafna et al, 2013) typically assume that high quality audio recordings are available, such as those made in sleep labs with high quality microphones. Domestic recordings are of much lower quality, and include various sources of environmental noise.

The current paper describes a system for detecting snoring events in domestic audio recordings. Principles from human auditory processing are used to segregate snore sounds from other background sounds. In the first stage of the system, incoming sound is analysed into frequency bands by a model of peripheral auditory filtering. Snore sounds may be partially masked by environmental noise, such as the aircraft noise in the figure. Here, we segregate snore sounds from other noises using acoustic cues relating to onsets, amplitude modulation and fundamental frequency.

Our system is evaluated on home audio recordings streamed via a smartphone app, and is shown to be more robust than standard techniques when background noise is present. The availability of a robust system for automatically classifying snore events could form the basis for domestic screening for OSA. It also allows longitudinal studies that are not practical to conduct in a sleep lab, so that snoring behaviour can be assessed over many nights. In this way, our system will provide new data about the inter-night variability of snoring on a large scale.

References

Dafna, E., Tarasiuk, A., & Zigel, Y. (2013). PLoS ONE, 8(12), e84139-14.
Malhotra, A., Orr, J. E., & Owens, R. L. (2015). The Lancet Respiratory, 1-7.

Acknowledgements

Funded by Innovate UK via a KTP with Passion for Life Healthcare.