Abstract

For severe sleep apnoea surgical intervention might be required to reduce the number of interrupted cessations experienced during sleep. Before a surgery is done, a patient has to undergo a sleep endoscopy study in which the patient is sedated and an endoscopy is inserted into the airway to assess whether the severity of the sleep apnoea can be reduced with/without surgical intervention.

The first key set of challenges with this approach are assessed sleep study does not represent natural sleep at home; requires patient to be sedated; and records less that 30 minutes of data which is not a sufficient representation of a patient’s sleep. The first section of thesis explores different camera and holder designs for intra oral upper airway imaging during ‘natural sleep’. *Five* different camera models with their respective camera holder was design and tested for home sleep on a volunteer to assess the suitability, image/video quality, and practical feasibility.

The second key set of challenges to this approach is that captured anatomical data, physiological data, physiological, and anaesthetic data are independently displayed, independently stored on different systems, independently post processed and all the data are not synchronised in time. The second section of the thesis focuses on the system design and implementation of a data capture system to merge, display, store and synchronise the anatomical, physiological, and anaesthetic data in real time in sleep studies.

The third section of this thesis focuses on the challenges faced in data capture during laryngeal aperture imaging in normal and COPD subjects. Similar to sleep apnoea studies, captured anatomical data, and flow data are independently displayed, independently stored on different systems, independently post processed and are not synchronised in time. The third section of the thesis focuses on the system design and implementation of a data capture system to merge, display, store and synchronise anatomical, and flow data in real time in laryngeal aperture imaging.