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| Imperial college london |
| Intra Oral Imaging: Sleep Apnoea and Laryngeal Dynamic Aperture |
| April 2016  Esuabom Dijemeni |
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Submitted in partial fulfilment of the requirement of the degree of Doctor of Philosophy

DEPARTMENT OF BIOENGINEERING

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Supervised by

Dr. Robert J. Dickinson

# Declaration

I hereby declare that this submission is my own work and that it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Esuabom Dijemeni

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# Abstract

A sleep apnoea patient has to undergo a sleep endoscopy study in order to assess the severity of the apnea and whether surgical intervention required. The sleep apnea patient is sedated and an endoscopy is inserted into the airway to assess the airway.

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.

# Acknowledgements

Sdas

To my father

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# Section 1 – Sleep Apnoea

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