**摘要**

論文名稱：設計與實作智慧型工廠即時資訊監控系統

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關鍵詞：多導睡眠圖1、阻塞性睡眠呼吸暫停2、腦電圖3、密度估計4、隱藏式

　　雖然睡眠的重要性日益得到認可，但缺乏強大而有效的算法會妨礙健康人和睡眠障礙患者的可擴展睡眠評估。多導睡眠圖1（Polysomnography, PSG）和視覺/手動評分仍然是睡眠評估的黃金標準，但需要更高效/自動化的系統。大多數先前的作品已證明算法與健康/正常（Healthy/Normal, HN）個體的金標準高度一致，而不是那些患有睡眠障礙的人。方法：本文提出了一個統計框架，可自動估計阻塞性睡眠呼吸暫停2（Obstructive Sleep Apnea, OSA）患者的全夜睡眠結構，最常見的睡眠障礙。從65個HN / OSA睡眠研究中提取單通道正面腦電圖3，並在60 903 30 s睡眠時期分解為11個光譜特徵。該算法利用核密度估計4來生成階段特定的可能性，並利用5狀態隱藏式馬可夫模型5來估計每晚睡眠體系結構。結果：與完整PSG專家評分的比較顯示該算法與黃金標準公平一致（中位數的Cohen's kappa = 0.532）。此外，分析顯示中位評分一致性略有下降，因為OSA嚴重程度從HN（kappa = 0.63）增加至嚴重（kappa = 0.47）。來自Physionet Sleep-EDF資料庫的HN資料的單獨實現導致中值kappa = 0.65，進一步表明該算法的廣泛適用性。結論：這項工作的結果表明，所提出的單通道框架可以模擬OSA中睡眠結構的專家級評分。意義：為了更準確地模擬睡眠期間的生理變異而構建的算法可以幫助推進自動化睡眠評估，用於睡眠醫學中的實際和一般用途。

**ABSTRACT**

Thesis Title：A State Space and Density Estimation Framework for Sleep Staging in Obstructive Sleep Apnea

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Keywords：Polysomnography1, obstructive sleep apnea2, electroencephalography3, density estimation4, hidden Markov model5.

　　Although the importance of sleep is increasingly recognized, the lack of robust and efficient algorithms hinders scalable sleep assessment in healthy persons and those with sleep disorders. Polysomnography1 (PSG) and visual/manual scoring remain the gold standard in sleep evaluation, but more efficient/automated systems are needed. Most previous works have demonstrated algorithms in high agreement with the gold standard in healthy/normal (HN) individuals-not those with sleep disorders. Methods: This paper presents a statistical framework that automatically estimates whole-night sleep architecture in patients with obstructive sleep apnea2 (OSA)-the most common sleep disorder. Single-channel frontal electroencephalography3 was extracted from 65 HN/OSA sleep studies, and decomposed into 11 spectral features in 60 903 30 s sleep epochs. The algorithm leveraged kernel density estimation4 to generate stage-specific likelihoods, and a 5-state hidden Markov model5 to estimate per-night sleep architecture. Results: Comparisons to full PSG expert scoring revealed the algorithm was in fair agreement with the gold standard (median Cohen's kappa = 0.53). Further, analysis revealed modest decreases in median scoring agreement as OSA severity increased from HN (kappa = 0.63) to severe (kappa = 0.47). A separate implementation on HN data from the Physionet Sleep-EDF Database resulted in a median kappa = 0.65, further indicating the algorithm's broad applicability. Conclusion: Results of this work indicate the proposed single-channel framework can emulate expert-level scoring of sleep architecture in OSA. Significance: Algorithms constructed to more accurately model physiological variability during sleep may help advance automated sleep assessment, for practical and general use in sleep medicine.

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　　時光飛逝轉眼間碩士求學日子即將邁入第二年，在這段學習得時光中不僅學到很多專業知識，更重要的是透過不斷的研讀論文訓練及報告，學習到如何將資料作整合並報告，給聆聽的人能夠透過我的講解了解論文的內容。

　　在此我要先感謝論文寫作課程的老師　賴柏洲教授，從上學期教授的參考文獻格式，到現在的整篇論文格式寫作，讓我學習到一個論文除了內容外，其中的格式也是相當重要，老師也不吝嗇地分享自己的經驗給予我們。而我們交給老師的每一份作業老師也都會細細的閱讀，找出我們缺漏的地方並予以告知，讓我們在之後寫論文時可以更加得心應手。除此之外老師講自己的人生經歷讓我們受益良多。感謝老師的敦敦教誨。

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1. **緒論**
   1. **研究背景**

　　隨著智慧工廠的蓬勃發展，工業技術也產生了更進一步的革新，在此概念下生產模式也逐漸向智慧工廠的概念邁進，式也逐漸向智慧工廠的概念邁進，並使傳統單一生產模式轉變為多產線協同生產、客製

1. **方法**
2. **結果**
3. **討論**
4. **結論**
5. **研讀心得**

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