13th GOLDEN SILICON AWARDS

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Super Smart Sweet-Scented Sleep System (6S)

智慧芳香舒眠系統

隊伍名稱

睡眠工作坊 / Sleep Studio

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作品摘要

人的一生中有將近三分之一的時間在睡眠中度過，睡眠不僅能讓身體得到適當的休息，更在身心各方面有著關鍵的影響，舉凡情緒、壓力、記憶及健康，都和睡眠息息相關，擁有良好的睡眠才能讓身心保持在最佳狀態。然而，睡眠品質不佳是現代人的通病，根據台灣睡眠醫學會的調查，國人睡眠滿意度從2000年的89%下降至2009年的63%，並統計出現今有高達六成的國人擁有失眠現象。為解決大眾的睡眠問題，本團隊以入睡過程、睡眠深度、最佳起床時機等角度切入，開發並設計出此套居家型的「智慧芳香舒眠系統」。

「智慧芳香舒眠系統」分為三部分執行，分別為：

Ⅰ)無線睡眠腦波量測：

本系統採用無線腦波帽且搭配乾式量測電極，此設備可讓使用者在自我居家環境中使用，突破傳統多頻道睡眠檢查系統空間上的限制，不僅方便且更加舒適。

Ⅱ)自動化睡眠週期判讀專家系統：

依據睡眠專家的判讀知識結合機器學習（睡眠腦波特徵擷取和層級式分類）建立出自動判讀睡眠系統，即時偵測受測者的睡眠週期。

Ⅲ) 智慧控制舒眠反饋機制：

此控制機制根據前兩項技術所偵測到的睡眠週期，適時的利用無線傳輸繼電器進行智慧控制舒眠反饋，舒眠反饋機制包含芳香精油、舒壓音樂以及檯燈等。

利用輕巧便捷的無線腦波帽結合睡眠專家判讀系統自動偵測睡眠週期，再藉由無線繼電器在適當的時候給予助眠刺激（包括檯燈、音樂、精油機），進而提升使用者睡眠的「質」，幫助使用者在有限的睡眠時間裡，有效改善睡眠品質及強化睡眠深度，減緩失眠問題，讓睡眠效益達到最佳化。此系統亦紀錄儲存使用者睡眠腦波以及相關資訊，讓使用者能夠提供充足的資訊給予醫生，以利於睡眠相關障礙評估診斷。
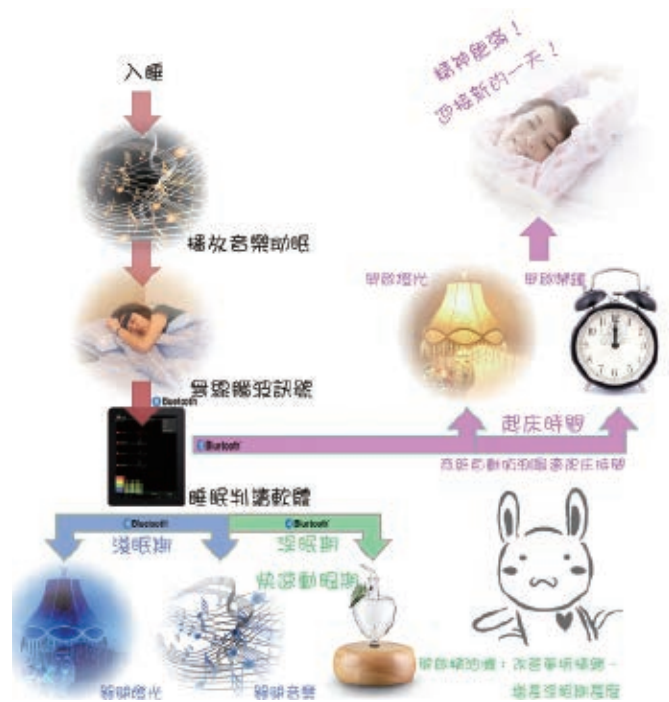

圖1 > 系統流程圖

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於 1989 年及 1992 年各別取得美國普渡大學電機系計算機工程碩士與博士學位。畢業後即任教於交通大學，目前為交通大學電控工程研究所、電機工程學系及資訊工程學系的講座教授，並擔任交通大學教務長一職，同時擔任臺灣聯合大學、交大腦科學中心主任、IEEE Fellow 和 IEEE Transactions on Fuzzy Systems 主編及多本期刊之副編輯。

研究領域
電腦視覺、腦機介面、模糊類神經網路、語音處理與控制、智慧型資訊科技。

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2007 年取得交通大學電機與控制工程博士。目前任教於交通大學生物資訊及系統生物研究所，並擔任加州大學聖地牙哥分校之長期訪問學者，同時為 Journal of Neuroscience and Neuroengineering 以及 IEEE Transactions on Neural Networks and Learning Systems 期刊副編輯、Neural Networks Society 和 Fuzzy Systems 領域之技術委員。

研究領域
神經工程、計算神經科學、腦機介面、神經訊號處理、遠距健康照護、機械學習和圖形識別。

Abstract

People will spend almost one third of their lifetime on sleeping. Adequate and high quality sleep is a key part of a healthy life, and can benefit and affect your physical or psychological state, such as motions, pressure, memory and health. The quality, depth and length of time in sleep are highly related to our lives, and people cannot stand a top status in the next day without a good sleep. However, the awful quality for sleep is a common problem nowadays. According to a research by Taiwan Society of Sleep Medicine(TSSM), the satisfaction of sleep in our country has dropped from 89% in 2000 to 63% in 2009. Also, their newest statistics report that over 60% people are having insomnia problem. In order to solve the poor sleeping quality problem, our group considered the related factors, such as ways to sleep, depth of sleep, wake up timing, and build up the household system, called "Super Smart Sweet-Scented Sleep System". "Super Smart Sweet-Scented Sleep System" can be divided into three parts:

Ⅰ) Wireless sleeping brain-wave measurement:

This system uses a "wireless brain-wave measurement hat" with dry electrodes, the device allows users to use freely at home, without the space limits as Polysomnography does.

Ⅱ) Automatic sleep-cycle-reading expert system:

According to the experts' interpretation knowledge and machine learning (a layer classifier extracting the brain waves' features), the expert system is built up and real time detects users' sleep cycles.

Ⅲ) Smart well-sleep-feedback controlling mechanism:

Based on the sleep detected by the two former technology, this controlling mechanism can properly use a wireless relay to smartly control well-sleep-feedback, which includes essential oils, comforting music, soft light and so on.

The system use a portable wireless brain-wave measurement device and sleep expert system automatically to detect sleep cycle, and provide sleep-helping stimulus, like lamps, music, essential oils, with a wireless relay at proper moments. These greatly promote users' sleep quality, strengthen their depth of sleep, and reduce the happening rate of insomnia. That is, the efficiency of sleep can be amplified to the best. This system also saves the records of users' sleep waves and the related status, and this provides doctors enough information to make good poor-sleep diagnosis.

Fig.2 > sleep environment