A12-091

作品名稱	使用無線腦電訊號之神經復健系統 **Neuro-rehabilitation Using Wireless EEG**
隊伍名稱	神經系統的魔術師 / **Neuro-magicians**
隊　長	黃煜傑　交通大學電機與控制工程研究所
隊　員	吳晉晟　交通大學電機工程研究所 葉韋麟　交通大學電機工程研究所 邱健豪　交通大學電機與控制工程研究所
指導教授	邱俊誠　交通大學電機與控制工程研究所

無線傳輸模組驅動復健機器

Fig.2 > 自發性神經復健貼片擺放示意圖

作品摘要 Abstract

「神經系統的魔術師」是一套以傳統復健機制為基礎，根據神經聯結關係所開發的新式神經復健與評估系統，系統中亦包含「自發性神經復健機制」與「近紅外光譜血氧量測評估機制」等功能。此系統不僅改善了傳統被動式復健的盲點，而且具有成本低、省時與省人力等諸多優點，因此「神經系統的魔術師」可協助腦神經受損患者，進行自發性復健運動，並提供初步的神經復原程度評估。

此系統透過動作想像分析演算法，即時判讀復健者腦波中特定動作想像訊號，並觸發復健機器自動運轉進而帶動患者肢體運動，使復健者依照「自身意志」決策復健機具運轉，達到自發性復健目的。再加上同步進行的腦部近紅外光譜血氧量測，可長時間記錄腦部血氧變化，作為患部復原程度評估依據。

最後為了縮小系統體積並使其具備無線傳輸功能，類比與數位訊號處理與分析演算法整合為一混合訊號自發性復健系統晶片，置於軟性貼片探頭之中（Fig.1），便於貼附頭部，並透過藍芽模組進行訊號傳輸與復健機器控制（Fig.2），使其更臻於舒適輕便與連續監控功能。

The Neuro-rehabilitation system is a novel brain neural rehabilitation system which is based on the traditional rehabilitation procedure and composed of both spontaneous mechanism and near infrared spectroscopy (NIRS) oxygen saturation evaluation. The system is not only to improve the drawbacks of traditional rehabilitation but also to reduce both the cost and time of rehabilitation. Therefore, the system provides the spontaneous rehabilitation initial evaluation for the brain recovering patient.

In the system, the motor imagery algorithm could be identified the designated events from the brain wave and then trigger the motor-equipped rehabilitation machine to automatically guide the subject's hand motion with corresponding sensation. Moreover, the simultaneous NIRS measurement could be recorded the variation of oxygen saturation of brain for rehabilitation evaluation.

In order to mass reduction and wireless. Eventually, the complex analog processing circuit and signal processing algorithm would be integrated to form the neural-rehabilitation system on a chip and embedded into a portable probe for carried on head application. Additionally, the brain wave data and trigger command signal would be communicated through the Bluetooth module for comfortable and spontaneous rehabilitated concern.
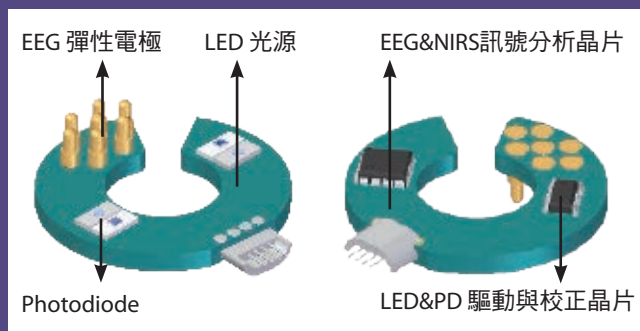
EEG 彈性電極　　LED 光源　　EEG&NIRS訊號分析晶片

Photodiode　　LED&PD 驅動與校正晶片

Fig.1 > 自發性神經復健貼片探頭